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PART 1/2

**COMMISSION STAFF WORKING DOCUMENT**

**Third Biennial Report of the EU**

***Accompanying the document***

**Commission Report**

**Seventh national communication and third biennial report from the European Union under the UN Framework Convention on Climate Change (UNFCCC) (required under the UNFCCC and the Kyoto Protocol)**

{C(2017) 8511 final} - {SWD(2017) 457 final}

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## 1. INTRODUCTION

This is the third Biennial Report of the European Union (EU), as required under Article 18(1) of Regulation (EU) No 525/2013 and Decision 2/CP.17 of the Conference of the Parties under the United Nations Framework Convention on Climate Change (UNFCCC).

## 2. INFORMATION ON GREENHOUSE GAS EMISSIONS AND TRENDS

This section summarises information on the EU's historical greenhouse gas (GHG) emissions since 1990.

The GHG emission data presented in this Biennial Report (referred to here for simplicity as the Report or 3BR) are consistent with the GHG emissions reported by the EU in 2017 under the Convention to the UNFCCC secretariat[1]and correspond to the totals in the CRF tables under the Convention[2].

### 2.1. Geographical coverage

The EU submits an inventory for EU-28 under the UNFCCC; a detailed overview of the geographical coverage is presented in Table 1.17 of the EU national inventory report, as submitted to the UNFCCC in 2017 (EU NIR 2017) and is summarised in **Error! Reference source not found.** of the 7NC.

This Report presents greenhouse gas emission trends for the European Union (EU) only. The time series considered is 1990 to 2015. In this Report, the European Union is referred to as the EU.

### 2.2. Sectoral scope

The sectoral scope of the emissions in this Report aligns with the reporting requirements under the Convention[3].

Indirect emissions of $CO_2$ are included in all the emission data quoted in this Report.

International aviation emissions are excluded from the totals, unless otherwise indicated.

### 2.3. Summary information on GHG emission trends

The emission data presented here is based on the European Union's national greenhouse gas inventory covering the period 1990 to 2015, submitted to the UNFCCC on 31st May, 2017[4]. The inventory is in line with the UNFCCC reporting guidelines on annual inventories for Parties included in Annex I to the Convention (Decision 24/CP.19) and with Regulation (EU) No 525/2013.

#### 2.3.1. *Trends in total GHG emissions*

EU GHG emissions are the sum of Member State (MS) emissions. This means trends in EU GHG emissions fully reflect emission trends at MS level. Most EU MS reduced GHG emissions between 1990 and 2015 (see Table 2-1**)** and consequently total GHG emissions,

1 http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/10116.php

2 http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/eua-2017-crf-31may17.zip

3 UNFCCC, 2013 http://unfccc.int/resource/docs/2013/cop19/eng/10a03.pdf#page=2

4 UNFCCC National Inventory Submissions 2017 http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/10116.php#fn1

without Land Use, Land-Use Change and Forestry (LULUCF), in the EU-28 decreased by 23.7 % between 1990 and 2015 (-1 337 million tonnes $CO_2$ equivalents).

For comparability with the EU 2020 target, emissions from international aviation would be included in the totals. When these emissions are included, the decrease is 1 265 million tonnes $CO_2$ equivalents or 22.1 % in 2015 compared to 1990.

Emissions per capita in the EU-28 dropped by 28.7 % for the same period, from 11.9 t/capita, to 8.9 t/capita. Emissions in the EU-28 have been decreasing while the economy has grown; the decoupling of economic growth from GHG emissions has been progressing steadily since 1990.

**Table 2-1 EU-28 GHG emissions in $CO_2$ equivalents (without LULUCF)**

| Member State | Emissions (million tonnes) | | | Change (%) | |
|---|---|---|---|---|---|
| | 1990 | 2015 | 2014 to 2015 | 2014 to 2015 | 1990 to 2015 |
| | | | | | |
| Belgium | 146.3 | 117.4 | 2.47 | 2.9% | -19.7% |
| Bulgaria | 103.7 | 61.5 | 3.36 | 6.9% | -40.7% |
| Czech Republic | 197.9 | 127.9 | 3.98 | 1.0% | -35.4% |
| Denmark | 70.4 | 48.3 | 0.45 | -4.9% | -31.3% |
| Germany | 1 250.9 | 901.9 | 0.01 | -0.3% | -27.9% |
| Estonia | 40.4 | 18.0 | 1.31 | -14.4% | -55.3% |
| Ireland | 56.1 | 59.9 | -2.47 | 3.7% | 6.7% |
| Greece | 103.1 | 95.7 | -3.04 | -3.7% | -7.1% |
| Spain | 287.8 | 335.7 | -3.57 | 3.5% | 16.6% |
| France | 547.1 | 457.1 | 3.64 | 0.8% | -16.4% |
| Croatia | 31.2 | 23.5 | -2.33 | 2.0% | -24.6% |
| Italy | 519.9 | 433.0 | -3.64 | 2.3% | -16.7% |
| Cyprus | 5.6 | 8.4 | 3.21 | 0.1% | 50.0% |
| Latvia | 26.2 | 11.3 | 2.12 | 1.0% | -56.8% |
| Lithuania | 48.0 | 20.1 | 9.70 | 1.1% | -58.2% |
| Luxembourg | 12.7 | 10.3 | 0.11 | -4.5% | -19.3% |
| Hungary | 93.9 | 61.1 | 0.23 | 5.6% | -34.9% |
| Malta | 2.4 | 2.2 | -0.49 | -24.0% | -6.5% |
| Netherlands | 221.4 | 195.2 | -0.70 | 4.1% | -11.8% |
| Austria | 78.8 | 78.9 | 7.66 | 3.2% | 0.1% |
| Poland | 467.9 | 385.8 | 2.87 | 0.8% | -17.5% |
| Portugal | 59.6 | 68.9 | 4.56 | 7.1% | 15.7% |
| Romania | 246.3 | 116.4 | 1.01 | 0.9% | -52.7% |
| Slovenia | 18.6 | 16.8 | 0.59 | 1.3% | -9.5% |
| Slovakia | 74.5 | 41.3 | 0.22 | 1.5% | -44.6% |

| Member State | Emissions (million tonnes) | | | Change (%) | |
|---|---|---|---|---|---|
| | 1990 | 2015 | 2014 to 2015 | 2014 to 2015 | 1990 to 2015 |
| Finland | 71.3 | 55.6 | 11.45 | -6.0% | -22.1% |
| Sweden | 71.6 | 53.7 | -0.15 | -0.3% | -25.1% |
| United Kingdom | 793.6 | 503.5 | -19.42 | -3.7% | -36.6% |
| | | | | | |
| **EU-28** | 5 647.1 | 4 309.6 | 23.15 | 0.5% | -23.7% |
| EU-28 International bunkers: Aviation | 69.3 | 142.2 | 4.92 | 1.2% | 54.3% |
| EU-28 International bunkers: Navigation | 110.3 | 134.8 | -1.57 | -1.1% | 22.2% |

The overall EU GHG emission trend is dominated by the two largest emitters, Germany and the United Kingdom. Together, these two Member States account for more than one third of total EU-28 GHG emissions in 2015. Germany and the United Kingdom have achieved total domestic GHG emission reductions in 2015 of 639 million tonnes of $CO_2$ equivalents compared to 1990 (not counting carbon sinks).

The main reasons for the considerable reduction in GHG emissions in Germany since 1990 are increases in efficiency of power and heating plants, and, the economic restructuring of the five new Länder after German reunification. The reduction in GHG emissions in the United Kingdom was primarily the result of liberalising energy markets and the subsequent fuel switching from oil and coal to gas in electricity production, $N_2O$ emission reduction measures taken in the production of adipic acid and limiting emissions from the waste sector.

France and Italy were the third and fourth largest emitters in 2015, with a share in the EU total of 10.6 % and 10.0 % respectively. Italy's GHG emissions were 16.7 % below 1990 levels in 2015. They increased in the years following 1990, primarily due to increases in road transport, electricity and heat production, and petroleum refining. However, Italian emissions decreased after 2004 with significant drops in 2009, 2012 and 2013, which were mainly due to the economic crisis and reductions in industrial output during these years. In France, large reductions were achieved in $N_2O$ emissions from adipic acid production, but $CO_2$ emissions from road transport and HFC emissions from consumption of halocarbons increased considerably between 1990 and 2015.

Poland and Spain are the fifth and sixth largest emitters in the EU-28, accounting for 9.0 % and 7.8 %, respectively, of total EU-28 GHG emissions in 2015. Spain increased emissions by 16.6 % between 1990 and 2015. This was largely due to emission increases from road transport, electricity and heat production, and households and services. Poland decreased GHG emissions by 17.5 % between 1990 and 2015. The main factors for decreasing emissions in Poland – as with other new Member States – was the decline of energy-inefficient heavy industry and the overall restructuring of the economy in the late 1980s and early 1990s. The notable exception was transport (especially road transport), where emissions increased strongly.

### 2.3.2. *Trends in emission by GHG in the EU-28*

Table 2-2 gives an overview of the main trends in EU-28 GHG emissions and removals for 1990 to 2015. Note that in some cases emissions and removals from the LULUCF sectors are included in the totals, and, the GHG emissions are presented as masses and not in terms of $CO_2$ equivalents.

The most important GHG by far is $CO_2$, accounting for 81.2 % of total EU-28 emissions in 2015, excluding LULUCF. In 2015, EU-28 $CO_2$ emissions without LULUCF were 3 498 million tonnes, which was 21.5 % below 1990 levels.

**Table 2-2 Overview of EU-28 GHG emissions and removals from 1990 to 2015 in $CO_2$ equivalents**

| GHG or category | GHG emissions (million tonnes) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 2005 | 2010 | 2013 | 2014 | 2015 |
| | | | | | | | | |
| $CO_2$ emissions (without LULUCF) | 4 457 | 4 199 | 4 163 | 4 290 | 3 931 | 3 643 | 3 469 | 3 498 |
| Net $CO_2$ emissions/removals (including LULUCF) | 4 206 | 3 915 | 3 841 | 3 954 | 3 592 | 3 307 | 3 141 | 3 174 |
| | | | | | | | | |
| $CH_4$ emissions without $CH_4$ from LULUCF | 728 | 663 | 606 | 546 | 492 | 465 | 458 | 456 |
| $CH_4$ emissions with $CH_4$ from LULUCF | 735 | 671 | 614 | 553 | 498 | 470 | 463 | 461 |
| | | | | | | | | |
| $N_2O$ emissions without $N_2O$ from LULUCF | 385 | 348 | 305 | 285 | 239 | 233 | 235 | 236 |
| $N_2O$ emissions with $N_2O$ from LULUCF | 398 | 361 | 319 | 298 | 253 | 246 | 249 | 250 |
| | | | | | | | | |
| HFCs | 29 | 44 | 53 | 73 | 102 | 110 | 113 | 108 |
| PFCs | 26 | 17 | 12 | 7 | 4 | 4 | 4 | 4 |
| Unspecified mix of HFCs and PFCs | 6 | 6 | 2 | 1 | 0 | 0 | 0 | 0 |
| $SF_6$ | 11 | 15 | 11 | 8 | 6 | 6 | 6 | 6 |
| $NF_3$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | | | | | | |
| Indirect $CO_2$ emissions | 4 | 4 | 3 | 2 | 2 | 2 | 2 | 2 |
| | | | | | | | | |
| Total (without LULUCF with indirect) | 5 647 | 5 295 | 5 155 | 5 214 | 4 777 | 4 464 | 4 286 | 4 310 |
| | | | | | | | | |
| International bunkers: Aviation | 69 | 86 | 116 | 132 | 132 | 135 | 137 | 142 |
| International bunkers: Marine | 110 | 111 | 135 | 161 | 159 | 140 | 136 | 135 |

**Notes**

Indirect $CO_2$ The $CO_2$ resulting from the atmospheric oxidation of $CH_4$, CO and NMVOC is referred to as indirect $CO_2$. Indirect $CO_2$ resulting from the oxidation of $CH_4$, CO and NMVOCs produced by fossil fuel combustion are included in the general methodological approach for the EU GHG inventory which assumes that all the

carbon in the fuel (minus the portion that remains as soot or ash) is oxidized to $CO_2$ whereas actually a fraction of this carbon is initially emitted as $CH_4$, CO or NMVOC.

For further details see Section 9 of the EU 2017 NIR "*Indirect $CO_2$ and nitrous oxide emissions*".

### 2.3.3. *Trends in GHG emissions from main source and sink categories in the EU-28*

Table 2-3 gives an overview of EU-28 GHG emissions in the main source categories for 1990 to 2015. The most important sector by far is energy (which includes emissions from combustion and fugitive sources), accounting for 77.9 % of total EU-28 emissions in 2015. The second largest sector is agriculture (10.1 %), followed by industrial processes and product use (8.7 %).

**Table 2-3 Overview of EU-28 GHG emissions in the main source and sink categories 1990 to 2015 in $CO_2$ equivalents**

| GHG sector (1 to 6), or category (aviation/marine) | | GHG emissions (million tonnes) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1990 | 1995 | 2000 | 2005 | 2010 | 2013 | 2014 | 2015 |
| **1. Energy** | Emissions | 4 337 | 4 071 | 4 005 | 4 108 | 3 790 | 3 513 | 3 329 | 3 358 |
| | % total emissions | 76.8 % | 76.9 % | 77.7 % | 78.8 % | 78.7 % | 78.7 % | 77.7 % | 77.9 % |
| **2. Industrial Processes and Product Use** | Emissions | 516.9 | 497.2 | 452.5 | 460.0 | 390.0 | 371.6 | 378.0 | 373.9 |
| | % total emissions | 9.2 % | 9.4 % | 8.8 % | 8.8 % | 8.2 % | 8.3 % | 8.8 % | 8.7 % |
| **3. Agriculture** | Emissions | 548 | 478 | 464 | 440 | 426 | 427 | 434 | 437 |
| | % total emissions | 9.7 % | 9.0 % | 9.0 % | 8.4 % | 8.9 % | 9.6 % | 10.1 % | 10.1 % |
| **4. Land-Use, Land-Use Change and Forestry** | Net emissions | -232 | -262 | -301 | -316 | -320 | -318 | -309 | -305 |
| **5. Waste** | Emissions | 241 | 245 | 231 | 203 | 170 | 151 | 144 | 139 |
| | % total emissions | 4.3 % | 4.6 % | 4.5 % | 3.9 % | 3.6 % | 3.4 % | 3.4 % | 3.2 % |
| **6. Other** | Emissions | | | | | | | | |
| | % total emissions | | | | | | | | |
| | | | | | | | | | |
| **Indirect $CO_2$ emissions** | Emissions | 4.4 | 3.7 | 2.7 | 2.4 | 2.0 | 1.7 | 1.6 | 1.7 |
| | % total emissions | 0.08 % | 0.07 % | 0.05 % | 0.05 % | 0.04 % | 0.04 % | 0.04 % | 0.04 % |
| | | | | | | | | | |

| GHG sector (1 to 6), or category (aviation/marine) | | GHG emissions (million tonnes) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1990 | 1995 | 2000 | 2005 | 2010 | 2013 | 2014 | 2015 |
| **Total (with net $CO_2$ emissions/removals)** | | 5 415 | 5 033 | 4 854 | 4 897 | 4 457 | 4 145 | 3 977 | 4 005 |
| **Total (without LULUCF)** | | 5 647 | 5 295 | 5 155 | 5 214 | 4 777 | 4 464 | 4 286 | 4 310 |
| | | | | | | | | | |
| **International bunkers: Aviation** | | 69 | 86 | 116 | 132 | 132 | 135 | 137 | 142 |
| **International bunkers: Marine** | | 110 | 111 | 135 | 161 | 159 | 140 | 136 | 135 |

**Notes**

"% total emissions": Total emissions without LULUCF, and with indirect $CO_2$

"Total (with net $CO_2$ emissions/removals)": Total includes LULUCF emissions and removals, and, indirect $CO_2$ emissions

Table 2-4 shows the sources with the largest contribution to the change in total GHG emissions in the EU-28 between 1990 and 2015.

**Table 2-4 Overview of EU-28 source categories whose emissions have increased or decreased by more than 20 million tonnes $CO_2$ equivalent in the period 1990 to 2015.**

| Source category | Million tonnes ($CO_2$ equivalents) |
|---|---|
| Road transportation ($CO_2$ from 1.A.3.b) | 142 |
| Refrigeration and air conditioning (HFCs from 2.F.1) | 97 |
| Fugitive emissions from natural gas ($CH_4$ from 1.B.2.b) | -21 |
| Aluminium production (PFCs from 2.C.3) | -21 |
| Agricultural soils: direct $N_2O$ emissions from managed soils ($N_2O$ from 3.D.1) | -26 |
| Cement production ($CO_2$ from 2.A.1) | -28 |
| Fluorochemical production (HFCs from 2.B.9) | -29 |
| Commercial/institutional ($CO_2$ from 1.A.4.a) | -43 |
| Enteric fermentation: cattle ($CH_4$ from 3.A.1) | -44 |
| Nitric acid production ($N_2O$ from 2.B.2) | -45 |
| Adipic acid production ($N_2O$ from 2.B.3) | -57 |
| Manufacture of solid fuels and other energy industries ($CO_2$ from 1.A.1.c) | -62 |

| | |
|---|---|
| Coal mining and handling ($CH_4$ from 1.B.1.a) | -67 |
| Managed waste disposal sites ($CH_4$ from 5.A.1) | -78 |
| Iron and steel production ($CO_2$ from 1.A.2.a +2.C.1) | -106 |
| Residential: fuels ($CO_2$ from 1.A.4.b) | -126 |
| Manufacturing industries (excluding iron and steel) (energy-related $CO_2$ from 1.A.2 excl. 1.A.2.a) | -279 |
| Public electricity and heat production ($CO_2$ from 1.A.1.a) | -373 |
| **Total** | -1 336 |

**Notes**

As the table only presents sectors whose emissions have increased or decreased by at least 20 million tonnes $CO_2$ equivalent, the sum for each sector grouping does not match the total change listed at the bottom of the table. International aviation and navigation excluded from the table

Source: EEA

### 2.3.4. *Change in emissions from Key Categories*

Key categories are defined as the sources or removals of emissions that have a significant influence on the inventory as a whole, in terms of the absolute level of the emissions, the trend, or both. Key categories are normally resolved by fuel, or other activity, in addition to category and gas.

The sections below present information about key categories, grouped according to GHG.

The key categories in the section below are taken from the key category analysis presented in the 2017 GHG inventory, excluding LULUCF. The percentages are expressed as a percentage of the total EU GHG emissions, without LULUCF, and including indirect $CO_2$. In a couple of cases, a higher level of category aggregation has been used to present the data, for example, 1.B.1 rather than 1.B.1.a.

Figures are provided in each section to illustrate the changes in emissions for key categories. The presentation of the key categories in the figures has been simplified to show the emissions according to GHG from the whole category, but not the emissions from a specific fuel associated with the key category.

#### 2.3.4.1. Carbon dioxide

$CO_2$ emissions accounted for approximately 81 % of total EU-28 GHG emissions in 2015 and decreased by approximately 22 % since 1990 to 959 million tonnes $CO_2$ in 2015.

The largest key category in the EU-28, for $CO_2$ emissions, is ‘electricity and heat production’, accounting for 24.6 % of total greenhouse gas emissions in 2015 and for 86.1 % of greenhouse gas emissions of the ‘energy industries’ sector. Figure 2-1, below, shows this category has the largest decrease in emissions between 1990 and 2015. Fuel used in the category decreased by 13.1 % in the EU-28 between 1990 and 2015, however, $CO_2$ emissions from ‘public electricity and heat production’ declined faster than the change in fuel consumption. Between 1990 and 2015, $CO_2$ emissions from electricity and heat production

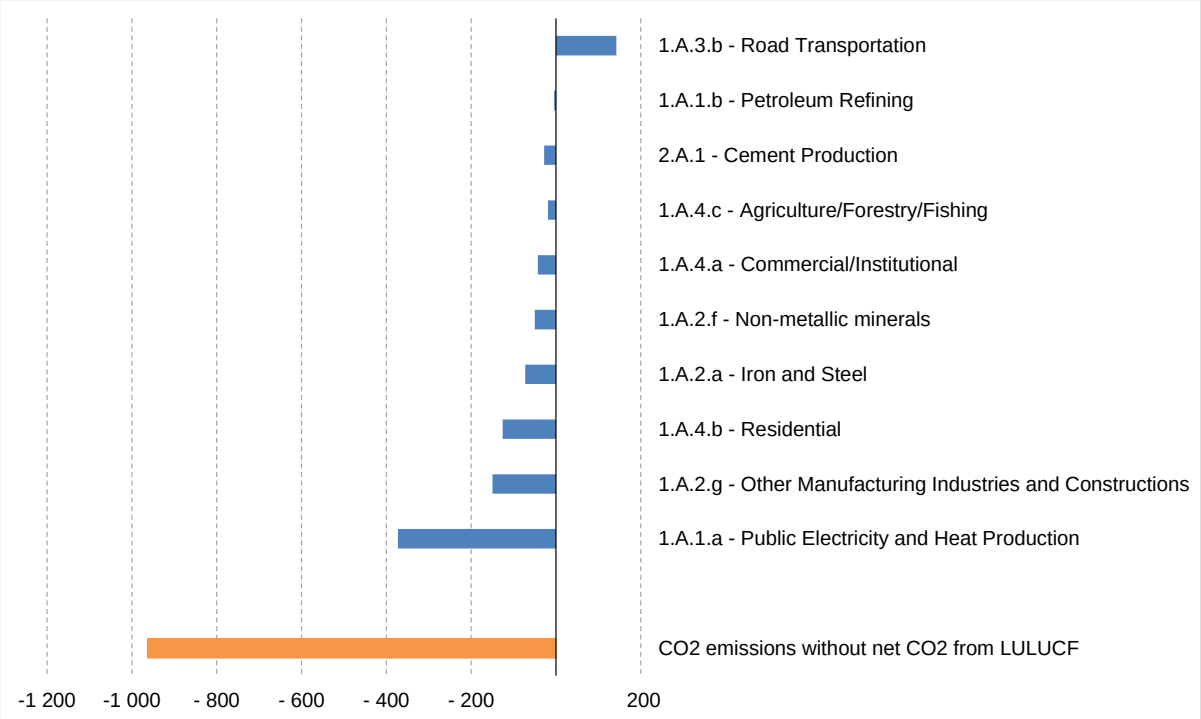
decreased by 26.0 % in the EU-28. The main factors at EU-28 responsible for the decrease have been improvements in energy efficiency and fossil fuel switching from coal to gas.

The second largest key category, for $CO_2$ emissions, is 'road transportation' accounting for 19.8 % of total GHG emissions in 2015 (excluding bunker emissions). By 2015, $CO_2$ emissions from the category were 20.0 % higher than their 1990 levels in the EU-28 due to an increase in fossil fuel consumption in particular until 2007 (see Figure 2-1). The overall net increase was fully accounted for by a strong uptake of diesel and a decline in gasoline use. Energy efficiency improvements and to a lesser extent increased use of less carbon intensive fuels, such as liquefied petroleum gas (LPG), natural gas, and biofuel blends, have led to levels of road transport emissions that would have been otherwise higher.

The third largest key category, for $CO_2$ emissions, is 'residential' accounting for 8.8 % of total GHG emissions in 2015. Between 1990 and 2015, $CO_2$ emissions from the category decreased by 25.0 % in the EU-28. The consumption of gas and liquid fuels has fallen in this sector in part due to energy efficiency measures outweighing the increase in energy demand as the number of dwellings has increased.

The fourth largest key category, for $CO_2$ emissions, is 'manufacturing industries and construction' accounting for 3.6 % of total GHG emissions in 2015. Between 1990 and 2015, $CO_2$ emissions from the category decreased by 49.0 % in the EU-28. Emissions from this key category are due to fossil fuel consumption in, which was 43.8 % below 1990 levels in 2015. A shift from solid and liquid fuels to mainly natural gas took place and an increase of biomass and other fuels has occurred.

**Figure 2-1 Change of $CO_2$ emissions by large key categories 1990 to 2015 in $CO_2$ equivalents (millions tonnes $CO_2$) for EU-28.**




Source: EEA

2.3.4.2. Methane

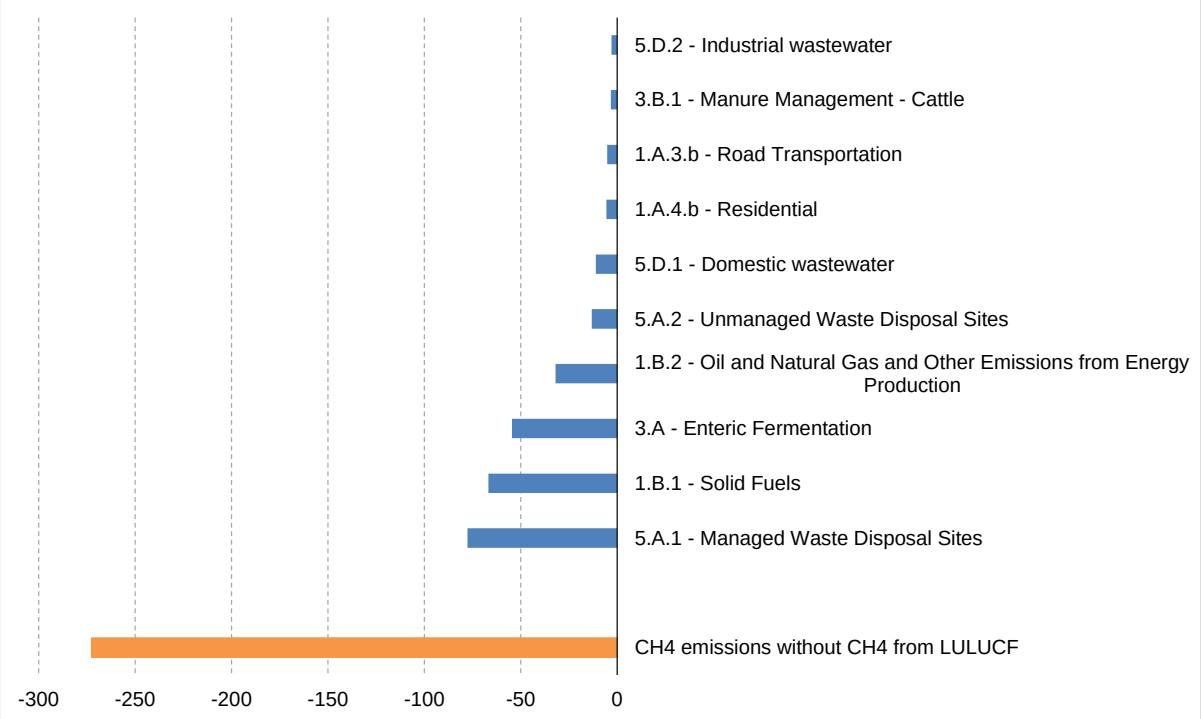
Methane emissions accounted for 10.6 % of total EU-28 GHG emissions in 2015 and decreased by 37.4 % since 1990 to 456.0 million tonnes $CO_2$ equivalents in 2015 (see Figure 2-2).

We have simplified the presentation of the key categories for $CH_4$. There are a number of key categories under category 3.A 'enteric fermentation', but for simplicity, we have assumed that the category 'enteric fermentation' represents all these key categories.

Using this simplifying assumption, the largest key category, for $CH_4$ emissions, is 'enteric fermentation (see Figure 2-2), accounting for 4.5 % of total greenhouse gas emissions in 2015. Between 1990 and 2015, $CH_4$ emissions from the category decreased by 22.1 % due to the impact of the Common Agricultural Policy (CAP). A key factor was overproduction control through 'milk quotas' and this has limited the economic attractiveness of cattle production

The second largest key category, for $CH_4$ emissions, is 5.A.1 'managed waste disposal sites', accounting for 2.0 % of total greenhouse gas emissions in 2015. Between 1990 and 2015, $CH_4$ emissions from the category decreased by 47.3 %. Key factors here are the increased use of recycling which have reduced volumes of waste going to landfill, and the incineration of waste with energy recovery.

**Figure 2-2 Change of $CH_4$ emissions by large key categories 1990 to 2015 in $CO_2$ equivalents (million tonnes) for EU-28.**




Source: EEA

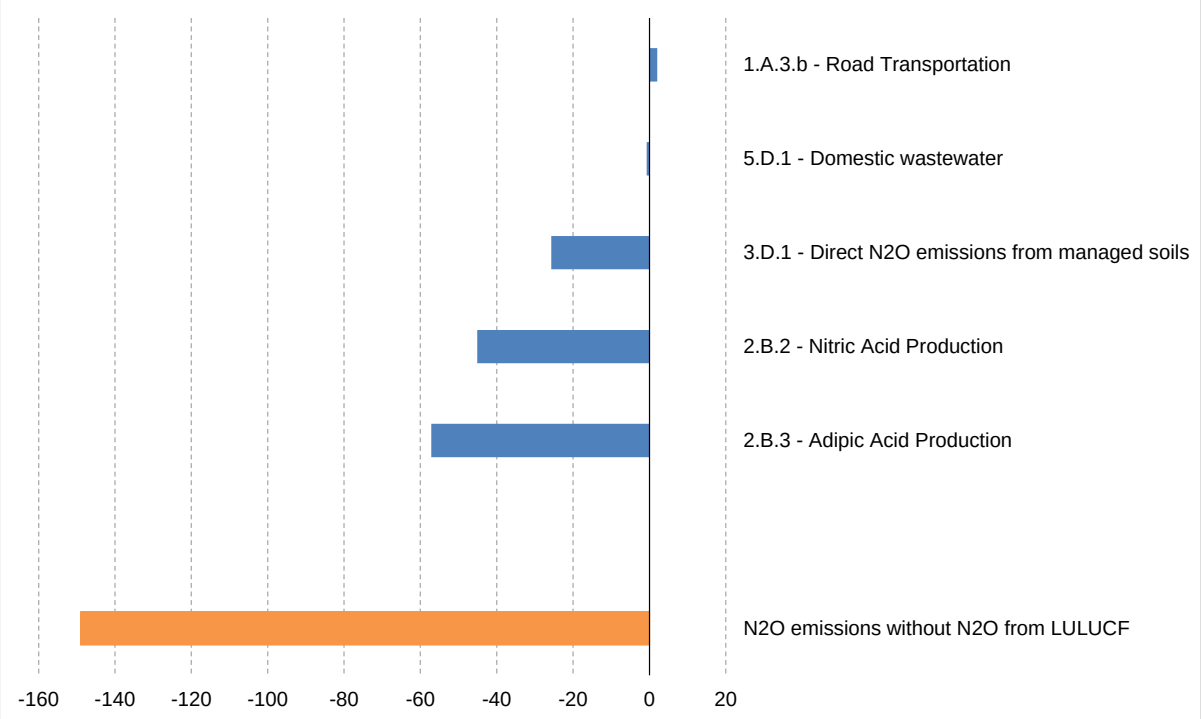
### 2.3.4.3. Nitrous oxide

$N_2O$ emissions accounted for 5.5 %of total EU-28 GHG emissions and decreased by 38.7 % to 236 million tonnes $CO_2$ equivalents in 2015 (see Figure 2-3).

The largest key category, for $N_2O$ emissions, is 'Direct $N_2O$ emissions from managed soils' accounting for 3.1 % of total GHG emissions in 2015. Between 1990 and 2015, $N_2O$ emissions from the category decreased by 16.2 % in the EU-28. Lower use of fertilisers per cropland combined with lower cropland area led to substantial reductions in $N_2O$ emissions from agricultural soils.

The second largest key category, for $N_2O$ emissions, is 'road transportation' accounting for 3.1 % of total GHG emissions in 2015. It is the use of diesel fuel that makes this category a key category. Between 1990 and 2015, $N_2O$ emissions from the category increased by 30.9 % in the EU-28. A key factor here is the increase in the proportion of diesel fuelled vehicles over the time period.

**Figure 2-3 Change of $N_2O$ emissions by large key categories 1990 to 2015 in $CO_2$ equivalents (million tonnes) for EU-28.**




Source: EEA

### 2.3.4.4. Fluorinated gases

Fluorinated gas emissions (HFCs, PFCs, $SF_6$ and $NF_3$) accounted for 2.7 % of total EU-28 GHG emissions and increased by 64.1 % to 117.9 million tonnes $CO_2$ equivalents in 2015 (see Figure 2-4).

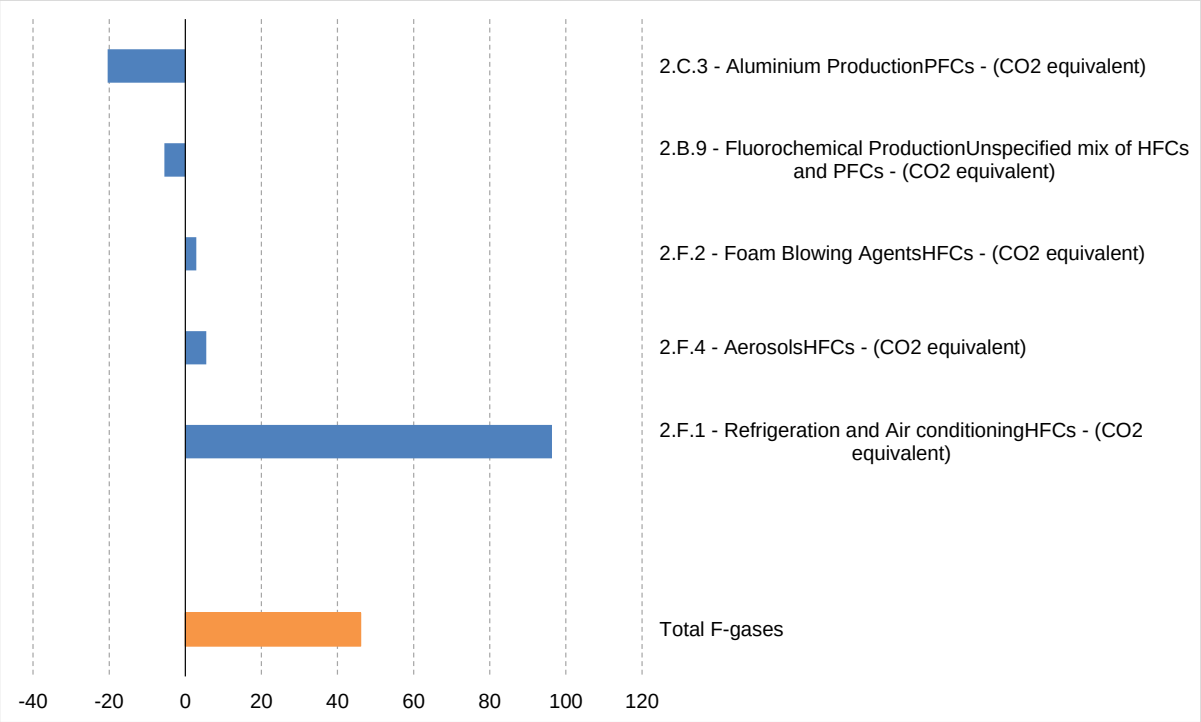
The largest and dominant key category, for fluorinated gas emissions, is 'refrigeration and air conditioning' accounting for 2.2 % of total GHG emissions in 2015. It is HFC emissions that

make this category a key category. In 1990 HFC emissions from this category were trivial. By 2015, emissions had risen to 96.3 million tonnes $CO_2$ equivalents. The main reason for this is the phase-out of ozone-depleting substances such as chlorofluorocarbons under the Montreal Protocol and the replacement of these substances with HFCs, mainly in refrigeration, air conditioning, foam production and as aerosol propellants.

Providing some counterbalance to this increase, HFC emissions from the 'production of halocarbons' decreased substantially. The decrease started in 1998 and was strongest in 1999 and 2000. This is mostly the result of reducing HFC-23 by-production by destroying this substance as part of the process.

Of the remaining F-gas emissions, both perfluorocarbons (PFCs) and sulphur hexafluoride ($SF_6$) decreased.

**Figure 2-4 Change of F-gas emissions by large key categories 1990 to 2015 in $CO_2$ equivalents (million tonnes) for EU-28.**

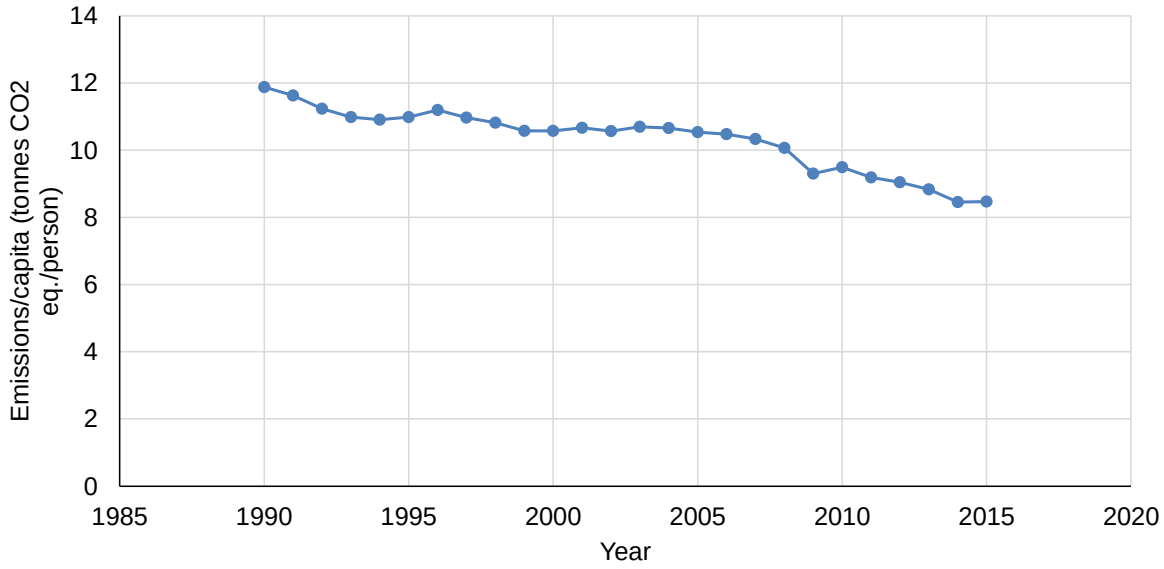



Source: EEA

### 2.3.5. *Key drivers affecting emission trends*

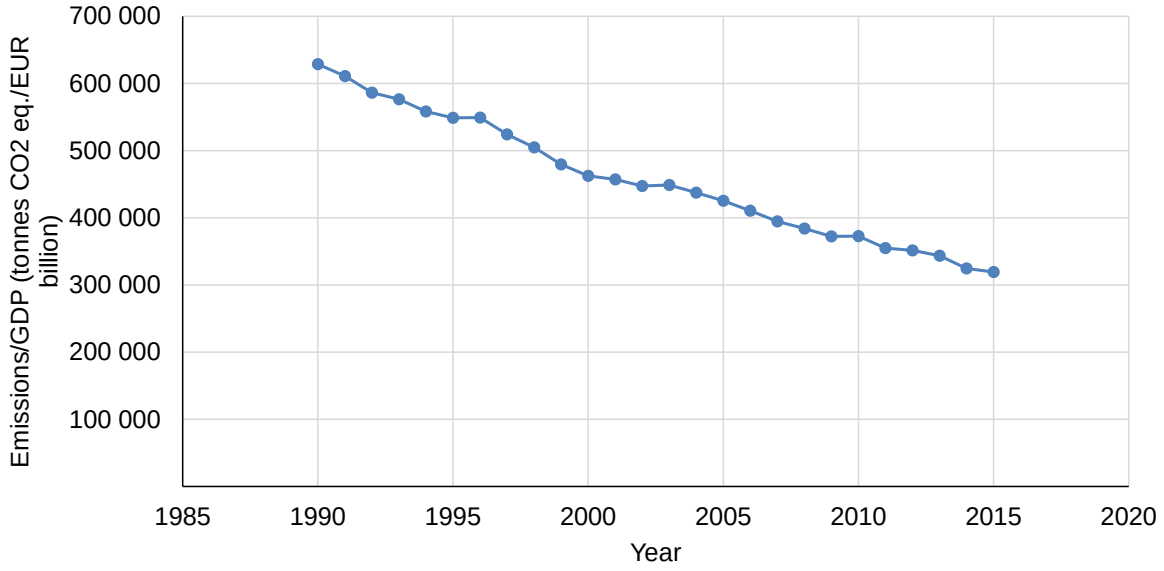
The main reasons for the changes during the period 1990 to 2015 are described in more detail in Section 2 "*National Circumstances*" of the 7NC. Two main drivers of GHG emissions are population and economic growth. As described in Section 2, population grew by 7 % and GDP increased by approximately 50 % between 1990 and 2015. As GHG emissions declined by 23.7 %, without LULUCF and without international aviation, and, with indirect $CO_2$, both GHG per capita (see Figure 2-5) and GHG emissions per GDP (see Figure 2-6) fell considerably. The decoupling of economic growth from GHG emissions has been progressing steadily since 1990.

**Figure 2-5 GHG emissions per capita 1990 to 2015 for EU-28.**




Source: EEA, Eurostat

**Figure 2-6 GHG emissions per GDP 1990 to 2015 for EU-28.**




Source: EEA, Eurostat

The sections below summarise the main reasons for the changes in GHG emissions in the EU during the period 2014 to 2015.

2.3.5.1. Main reasons for changes in EU-28 emissions, 2014 to 2015

The section discusses the changes in GHG emissions between 2014 and 2015, based on the 2017 inventory.

The analysis in Table 2-5 shows that the largest increases occurred in the 'buildings' sector, including residential, commercial and institutional, and, in road transportation.

**Table 2-5 Overview of the largest emission changes by key sector in EU-28, 2014-2015**

| Source category | Million tonnes ($CO_2$ equivalents) |
|---|---|
| Public electricity and heat production ($CO_2$ from 1.A.1.a) | – 13.2 |
| Refrigeration and air conditioning (HFCs from 2.F.1) | – 5.0 |
| Managed waste disposal sites ($CH_4$ from 5.A.1) | – 4.0 |
| International aviation ($CO_2$ from 1.D.1.a)* | 5.0 |
| Commercial/institutional ($CO_2$ from 1.A.4.a) | 5.6 |
| Road transportation ($CO_2$ from 1.A.3.b) | 13.6 |
| Residential ($CO_2$ from 1.A.4.b) | 19.5 |
| Total | 23.1 |

**Notes** The table shows only those sectors where emissions have increased or decreased by at least 3 million tonnes of $CO_2$ equivalent between 2014 and 2015. The table reflects the emission reductions according to the EU's geographical scope under KP and includes Iceland *International aviation is not included in national totals under KP/UNFCCC but it is included under the EU internal scope. Iceland is included in the former but not in the latter.

Source: EEA

Heat consumption in the EU can be supplied via distributed systems from thermal stations (reported under public electricity and heat production) and/or as a process of direct combustion in buildings (reported under residential and commercial/institutional). The consumption and emissions of the residential and commercial sectors reported in GHG inventories capture by and large the bulk of heat consumption and emissions from fossil fuels. Emissions in these sectors increased by 4.9 % in 2015 yet 2015 had the second lowest heat consumption in the EU. This is because 2014 recorded the lowest ever heat consumption and the highest average temperatures in Europe during the previous 25 years. There was subsequently an increased demand for heating in 2015 compared to 2014.

It is worth noting that emissions from public electricity and heat production decreased in 2015 even though the production of both heat and electricity actually increased that year. The main reason was lower use of coal and increased use of gas and biomass, which led to an improvement of the carbon intensity of the power sector and resulted in lower emissions in spite of increased output. The trigger for such an increase in output could higher heat consumption or electricity, or both.

GHG inventories provide evidence of the fuel input and the emissions output from electricity and heat production, but without distinguishing between emissions from heat and from electricity. According to energy statistics reported to Eurostat, there was an increase in both heat output and electricity output from conventional thermal power stations (including district heating) and this overall increase also applied to the residential sector. In addition, electricity in some countries is also used for heating purposes, so part of the increase in electricity in 2015 may also be attributed to higher heat demand in these countries.

The other key sector where emissions increased in 2015 was road transportation. It is the second largest source of emissions in the EU (after the power sector) and the positive trend of emission reductions observed since 2007 was reversed in 2014 and confirmed in 2015.

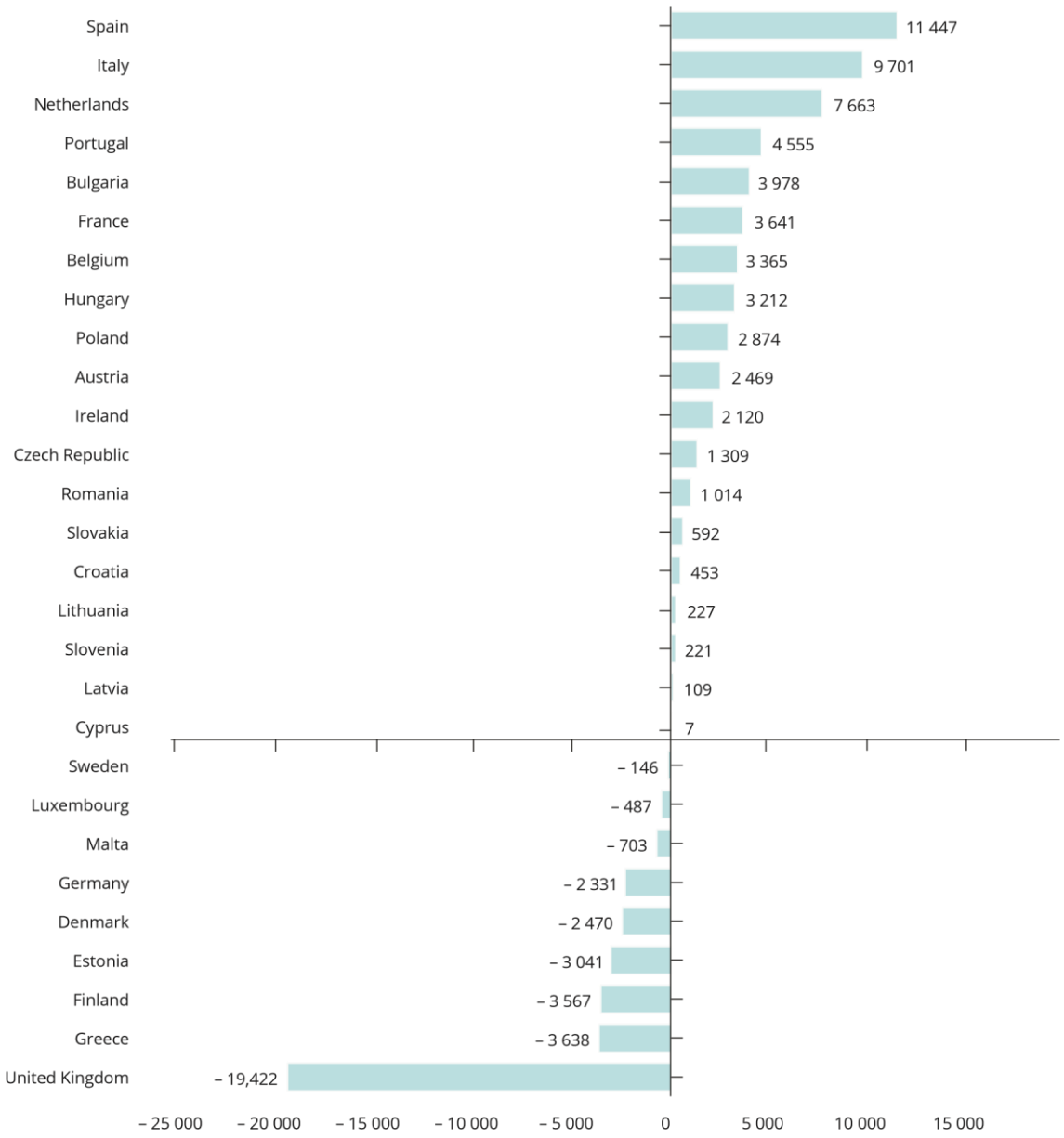
Road transport emissions increased by 1.6 % in 2015. The increase was fully accounted for by diesel consumption, whereas gasoline emissions continued declining. About 70 % of the increase came from passenger cars, 20 % from heavy duty vehicles, 4 % from light duty vehicles and the remaining 1 % from motorcycles.

International aviation is not included in national totals under the Kyoto Protocol but it is integrated in the EU internal scope and the 20 % 2020 target. Emissions continued increasing in 2015.

Figure 2-7 shows the absolute change in total GHG emissions, excluding LULUCF, by Member States between 2014 and 2015. Emissions increased in 19 Member States, particularly in Spain, Italy and the Netherlands, and decreased in 9 Member States, mainly in the United Kingdom.

The main reasons for the increase in emissions in Spain are the substantial increase in coal for electricity generation, the increase in the use of diesel for road transportation, particularly passenger cars, and the higher use of gas in the commercial/institutional sector. GDP also went up strongly in 2015 and renewables decreased in terms of primary energy, mainly for hydro but also for wind and biogas. In Italy, the main reasons were the strong increase in gas consumption in the residential sector, due to higher heat demand, as well as in the power sector. In the Netherlands, higher emissions were by and large the result of increased coal used for power generation as well as of gas in the residential sector due to colder winter conditions. Finally, the United Kingdom reported the largest decrease in emissions of the EU in 2015, in spite of the colder winter. This was primarily due to a strong reduction in coal use and an increase in renewables and nuclear for electricity generation.

**Figure 2-7 Change in total GHG emissions, excluding LULUCF, between 2014 and 2015 by EU Member State (kilo tonnes $CO_2$ equivalent)**




Source: EEA

### 2.3.6. *Information on indirect GHG emissions*

Emissions of CO, $NO_x$, NMVOC and $SO_2$ have to be reported under the UNFCCC because these gases influence climate change indirectly: CO, $NO_x$ and NMVOC are precursor substances for ozone which itself is a greenhouse gas. Sulphur emissions produce microscopic particles (aerosols) that can reflect sunlight back out into space and also affect cloud formation. Table 2-6 shows the total indirect GHG and $SO_2$ emissions in the EU-28 between 1990 and 2015.

All emissions were reduced significantly from 1990 levels: the largest reduction was achieved in $SO_2$ (-87 %) followed by, CO (-67 %), $NO_x$ (-57 %) and NMVOC (-60 %).

The largest emitters, Germany, France, the United Kingdom, Spain, and Italy made up 61 % of total EU $NO_x$ emissions in 2015. All EU-28 Member States reduced their $NO_x$ emissions between 1990 and 2015.

**Table 2-6 Overview of EU-28 indirect GHGs for 1990 to 2015**

| GHG or category | GHG emissions (kilo tonnes) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 2005 | 2010 | 2013 | 2014 | 2015 |
| | | | | | | | | |
| $NO_x$ | 17 991 | 15 439 | 13 394 | 12 275 | 9 649 | 8 527 | 8 003 | 7 667 |
| CO | 63 998 | 51 875 | 40 073 | 31 593 | 26 765 | 23 138 | 21 414 | 21 155 |
| NMVOC | 16 952 | 13 696 | 11 255 | 9 277 | 7 777 | 7 058 | 6 758 | 6 751 |
| $SO_2$ | 24 876 | 15 911 | 9 589 | 7 407 | 4 531 | 3 545 | 3 217 | 3 114 |

**Notes** These emissions include the very small contribution from Iceland
Source: EEA

### 2.3.7. *Accuracy/Uncertainty of the data*

Table 2-7 shows the main results of the uncertainty analysis on the magnitude (level) of emissions for the EU-28. Fuel combustion activities are associated with the lowest uncertainties (0.9 %) and the highest uncertainties are associated with agriculture (46 %). Overall uncertainty estimates including LULUCF of all the EU-28 GHG emissions are estimated at 6.1 %, and excluding LULUCF, slightly lower, at 5.1 %.

With regard to uncertainty estimates on the trend in emissions, fuel combustion activities are associated with the lowest uncertainties (0.3 %) and the highest estimates are for LULUCF (19 %). Overall trend uncertainty (including LULUCF) of all GHG emissions is estimated to be 1.1 %.

**Table 2-7 Approach 1 uncertainty estimates of EU-28 GHG emissions for the main sectors**. (Emissions in kilo tonnes $CO_2$ eq.)

| Sector | Emissions 1990 | Emissions 2015 | Emission trends 1990 to 2015 | Level uncertainty estimates based on MS uncertainty estimates | Trend uncertainty estimates based on MS uncertainty estimates |
|---|---|---|---|---|---|
| 1.A Fuel combustion activities | 4 135 921 | 3 235 842 | -21.8 % | 0.9 % | 0.3 % |
| 1.B Fugitive emissions | 196 697 | 89 108 | -54.7 % | 18.3 % | 8.1 % |
| 2. Industrial Processes and Product Use | 517 735 | 342 609 | -33.8 % | 11.0 % | 4.9 % |
| 3. Agriculture | 540 946 | 435 365 | -19.5 % | 45.8 % | 2.9 % |
| 4. LULUCF | -208 240 | -282 549 | 35.7 % | 36.7 % | 18.6 % |

| Sector | Emissions 1990 | Emissions 2015 | Emission trends 1990 to 2015 | Level uncertainty estimates based on MS uncertainty estimates | Trend uncertainty estimates based on MS uncertainty estimates |
|---|---|---|---|---|---|
| 5. Waste | 239 014 | 136 092 | -43.1 % | 52.3 % | 11.9 % |
| **Total (including LULUCF)** | **5 422 073** | **3 956 467** | **-27.0 %** | **6.1 %** | **1.1 %** |
| **Total (excluding LULUCF)** | **5 630 313** | **4 239 017** | **-24.7 %** | **5.1 %** | **0.8 %** |

**Notes** These estimates include the very small effects of Iceland. Uncertainties for the sum of GHGs. Emissions are in Gg $CO_2$ equivalents; they are slightly lower than the emissions included in CTF Table 1 (a) because not all Member States estimate uncertainties for all emissions and this table reflects the emissions for which uncertainty estimates are available. Values expressed as 95 % Confidence Intervals.

Source: EEA

## 2.4. The EU inventory arrangements

Section 3.3 of the National Communication provides full details of the EU inventory arrangements.

In the EU, the legal basis for the compilation of the Union greenhouse gas inventory is 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 (hereafter referred to as the Monitoring Mechanism Regulation or MMR). Commission delegated regulation (EU) 666/2014 establishes the substantive requirements for the EU national system[5]. The EU national inventory system as well as the QA/QC programme is described in more detail in a Commission Staff Working Document[6].

The main institutions involved in the compilation of the EU GHG inventory are the Member States, the European Commission Directorate-General for Climate Action, the European Environment Agency (EEA) and its European Topic Centre on Air Pollution and Climate Change Mitigation (ETC/ACM), Eurostat, and the Joint Research Centre (JRC).

Since the submission of the second biennial report from the European Union under the UNFCCC, no changes have occurred in the inventory arrangements.

It is important to mention that in the context of the Kyoto Protocol, a key change to previous inventory submissions of the EU under the Kyoto Protocol is that the Kyoto greenhouse inventory for the second commitment period has a different coverage of countries due to the

5 http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2014.179.01.0026.01.ENG

6 Commission Staff Working Document SWD(2013)308 final on Elements of the Union greenhouse gas inventory system and the Quality Assurance and Control (QA/QC) programme.

scope of the terms of the joint fulfilment agreement for the second commitment period which includes 28 Member States and Iceland.

## 2.5. Quality Assurance/Quality Control (QA/QC) procedures

The quality of the Union GHG inventory depends on the quality of the Member States' inventories, the QA/QC procedures of the Member States and the quality of the compilation process of the EU inventory. The Member States and also the EU as a whole have implemented QA/QC procedures in order to comply with the IPCC good practice guidance.

The EU QA/QC programme[7] describes the quality objectives and the inventory quality assurance and quality control plan for the Union GHG inventory including responsibilities and the time schedule for the performance of the QA/QC procedures. Definitions of quality assurance, quality control and related terms used are those provided in IPCC 2006 Guidelines and Guidelines for National Systems under the Kyoto Protocol. The EU QA/QC programme is reviewed annually and modified or updated as appropriate.

The European Commission (DG Climate Action) is responsible for coordinating QA/QC activities for the Union inventory and ensures that the objectives of the QA/QC programme are implemented and the QA/QC plan is developed. The European Environment Agency (EEA) is responsible for the annual implementation of QA/QC procedures for the Union inventory.

The overall objectives of the EU QA/QC programme are:

- To establish quality objectives for the Union GHG inventory, taking into account the specific nature of this inventory as a compilation of Member States' GHG inventories;
- To implement the quality objectives in the design of the QA/QC plan, defining general and specific QC procedures for the EU GHG inventory submission;
- To provide a Union inventory of GHG emissions and removals consistent with the sum of Member States' inventories and covering the EU's geographical area;
- To ensure the timeliness of Member States' GHG inventory submissions To the EU;
- To ensure the completeness of the Union GHG inventory, inter alia, by implementing procedures To estimate any data missing from the national inventories, in consultation with the MS concerned;
- To contribute To the improvement of quality of Member States' inventories and;
- To provide assistance for the implementation of national QA/QC programmes.

A number of specific objectives have been elaborated in order to ensure that the Union GHG inventory complies with the UNFCCC inventory principles of transparency, completeness, consistency, comparability, accuracy and timeliness.

7 Commission Staff Working Document. Elements of the Union greenhouse gas inventory system and the Quality Assurance and Control (QA/QC) programme Brussels, 12.8.2013 SWD(2013) 308 final. https://ec.europa.eu/clima/sites/clima/files/strategies/progress/monitoring/docs/swd_2013_308_en.pdf

In the QA/QC plan, quality control procedures before and during the compilation of the Union GHG inventory are listed. In addition, QA procedures, procedures for documentation and archiving, the time schedules for QA/QC procedures and the provisions related to the inventory improvement plan are included.

QC procedures are performed at several different stages during the preparation of the Union inventory. Firstly, a range of checks are used to determine the consistency and completeness of Member States' data so that they may be compiled in a transparent manner at EU level. Secondly, checks are carried out to ensure that the data are compiled correctly at EU level to meet the overall reporting requirements. Thirdly, a number of checks are conducted with regard to data archiving and documentation to meet various other data quality objectives.

### 2.5.1. Data gap filling procedure for GHG emissions

The Union GHG inventory is compiled by using the inventory submissions of the EU Member States. If a MS does not submit all data required for the compilation of the Union inventory by 15 March of a reporting year, the Commission prepares estimates for data missing for that MS. Gap filling techniques are only used where necessary. The EU NIR 2017 provides a description of the approach taken to "gap fill", in Section 1.7.3 "*Data gaps and gap-filling*".

Since 2011, GHG inventory estimates have been complete for all EU Member States, and therefore no gap filling has been needed.

## 3. QUANTIFIED ECONOMY-WIDE EMISSION REDUCTION TARGET

This section explains the EU 2020 emission reduction target under the UNFCCC and the target compliance architecture set up within the EU in order to meet that target. It also gives an overview of other EU emission reduction targets that are helping achieve the quantified economy-wide emission reduction target under the UN.

### 3.1. The EU target under the Convention

In 2010, the EU submitted a pledge to reduce its GHG emissions by 2020 by 20 % compared to 1990 levels, in order to contribute to achieving the ultimate objective of the UNFCCC: 'to stabilise GHG concentrations at a level that would prevent dangerous anthropogenic (human-induced) interference with the climate system'[8], or, in other words, to limit the global temperature increase to less than 2°C compared to temperature levels before industrialization (FCCC/CP/2010/7/Add.1). The EU had also committed to raising this target to a 30 % emission reduction by 2020 compared with 1990 levels, provided that other developed countries also commit to achieving comparable emission reductions, and that developing countries contribute adequately, according to their responsibilities and respective capabilities. This offer was reiterated in the submission to the UNFCCC by the EU-28 and Iceland on 30 April 2014[9].

The definition of the Convention target 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' (FCCC/SB/2011/INF.1/Rev.1 of 7 June 2011). 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 (FCCC/AWGLCA/2012/MISC.1).

The EU's accounting rules for the target under the UNFCCC are more ambitious than the current rules under the Kyoto Protocol, for example, including international aviation, and adding an annual compliance cycle for emissions under the Effort Sharing Decision (ESD; see section ) or higher Clean Development Mechanism (CDM) quality standards under the EU Emissions Trading System (EU ETS) (FCCC/TP/2013/7). Accordingly, the following assumptions and conditions apply to the EU's 20 % target under the UNFCCC:

- The EU Convention pledge does not include emissions/removals from Land Use, Land Use Change and Forestry, 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 Kyoto Protocol;
- The target covers the gases $CO_2$, $CH_4$, $N_2O$, HFCs, PFCs and $SF_6$;

[8] First steps to a safer future: Introducing the United Nations Framework Convention on Climate Change http://unfccc.int/essential/_background/convention/items/6036.php

[9] European Union, its Member States and Iceland submission pursuant to par 9 of decision 1/CMP.8' http://ec.europa.eu/clima/policies/international/negotiations/docs/eu_submission_20140430_en.pdf

- The target refers to 1990 as a single base year for all covered gases and all Member States. Emissions from international aviation to the extent it is included in the EU ETS are included in the target[10];
- A limited number of CERs, ERUs and units from new market-based mechanisms may be used to achieve the target (see Section 2.2.2.3): 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 ESD sectors, the annual use of international credits is limited to up to 3 % of each Member State's ESD emissions in 2005, with a limited number of Member States being permitted to use an additional 1 % from projects in Least Developed Countries (LDCs) or Small Island Developing States (SIDS), subject to conditions;
- The Global Warming Potentials (GWPs) used to aggregate GHG emissions up to 2020 under EU legislation were those based on the Second Assessment Report of the IPCC when the target was submitted. In accordance with the CMP Decision to revise the GWPs to those from the IPCC Fourth Assessment Report (AR4) revised GWPs from AR4 were adopted for the EU ETS. The revised GWPs were taken into account for the revision of the ESD target. For the implementation until 2020, GWPs from AR4 will be used consistently with the UNFCCC reporting guidelines for GHG inventories.

**Table 3-1 Key facts of the Convention 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 it is included in the EU ETS. |
| Land Use, Land-Use Change, and Forests (LULUCF) | Accounted under KP, reported in EU inventories under the Convention. 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. |

[10] In the EU, the sum of emissions covered by categories 1.A.3.a 'domestic aviation' and memo item 'international bunkers - 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.

## 3.2. The EU target compliance architecture

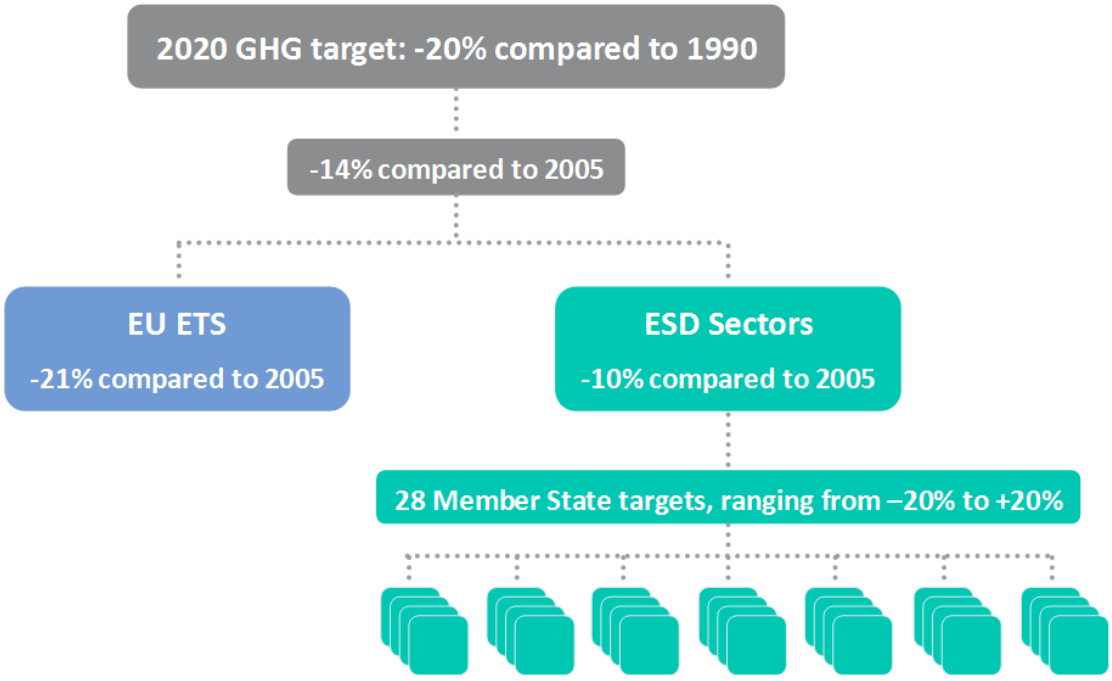
### 3.2.1. *The 2020 climate and energy package*

In 2009 the EU established internal rules under its "2020 climate and energy package"[11] - these underpin the EU implementation of the target under the Convention. The 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 the ETS and ESD sectors. 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 Member States (MS) through individual national GHG targets.

The distribution of the total target across the ETS and ESD is shown in Figure 3-1.

**Figure 3-1 GHG targets under the 2020 climate and energy package**




Source: European Commission

Under the revised EU ETS Directive (Directive 2009/29/EC), a single ETS cap covers the EU Member States and three participating non-EU countries (Norway, Iceland and Liechtenstein), and there are no further individual caps by country. Allowances allocated in the EU ETS from 2013 to 2020 decrease by 1.74 % annually, starting from the average level of allowances issued by Member States for the second trading period (2008–2012).

[11] http://ec.europa.eu/clima/policies/package/index_en.htm

The three non-EU countries participating in EU ETS (Norway, Iceland and Liechtenstein) are also subject to a similarly defined cap and the same annual decrease in allowance allocation.

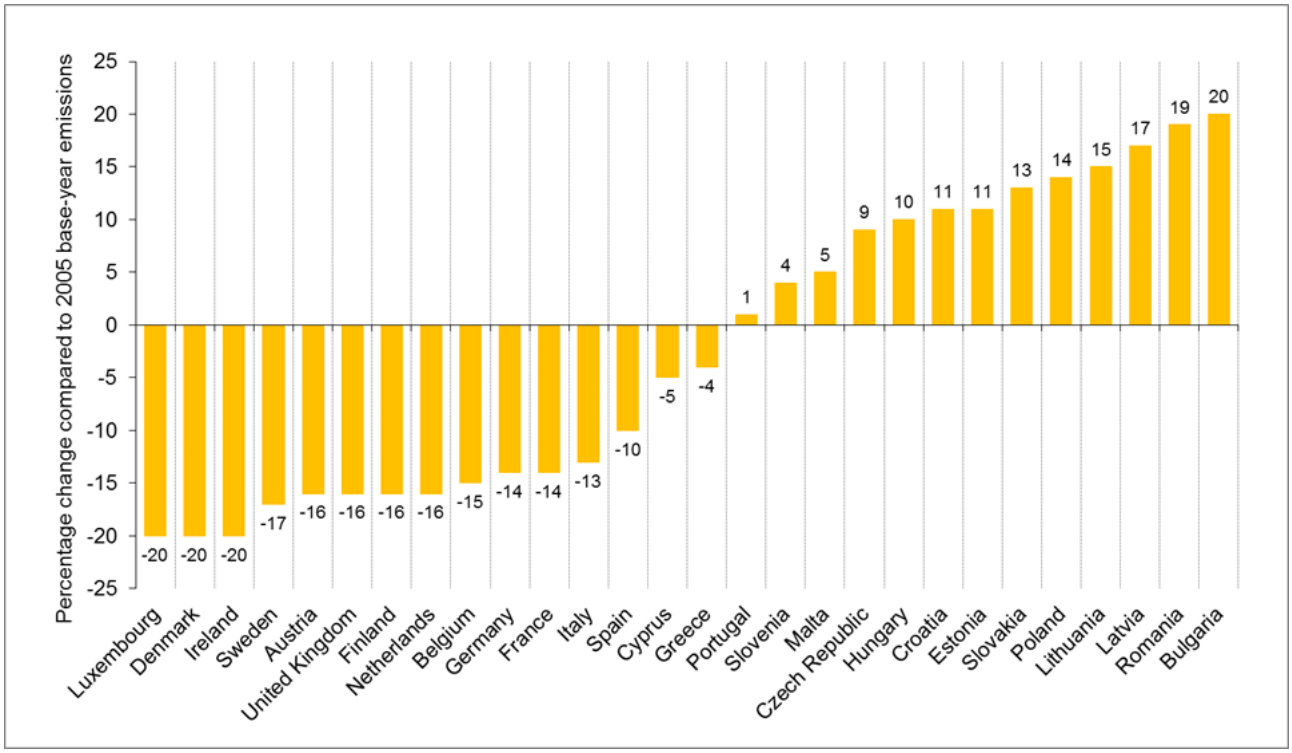
For further additional information on recent changes in the EU ETS see section 4.2.1.

The vast majority of emissions within the EU which fall outside the scope of the EU ETS are addressed under the Effort Sharing Decision (ESD) (Decision No 406/2009/EC). The ESD covers emissions from all sources outside the EU ETS, except for emissions from domestic and international aviation (which were included in the EU ETS from 1 January 2012), international maritime emissions, and emissions and removals from land use, land-use change and forestry (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 accounted for 55 % of total GHG emissions in the EU in 2013[12].

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 Member State (see Figure 3-2). Under the Effort Sharing Decision, national emission targets for 2020 are set, expressed as percentage changes from 2005 levels. These changes have been transferred into binding quantified annual reduction targets for the period from 2013 to 2020 (Commission Decisions 2013/162/EU and 2013/634/EU), denominated in Annual Emission Allocations (AEAs). At country level, 2020 targets under the ESD range from -20 % to +20 %, compared to 2005 levels. ESD targets for 2020 for each EU Member State are shown in Figure 3-2 .

[12] European Commission. Commission Staff Working Document - Accompanying the document: Report from the Commission to the European Parliament and the Council on evaluating the implementation of Decision No. 406/2009/EC pursuant to its Article 14. (SWD(2016) 251 final). 2016. https://ec.europa.eu/transparency/regdoc/rep/10102/2016/EN/10102-2016-251-EN-F1-1-ANNEX-1.PDF

**Figure 3-2 National 2020 GHG emission limits under the ESD, relative to 2005 emissions levels**




Source: EU Decision No 406/2009/EC, Annex 2

The target levels have been set on the basis of Member States' relative Gross Domestic Product per capita. In addition, different levels of development in the EU-28 are taken into account by the provision of several flexibility options. Up to certain limitations, the ESD allows Member States to make use of flexibility provisions for meeting their annual targets: carry-over of over-achievements to subsequent years within each Member State, transfers of AEAs between Member States and the use of international credits (credits from Joint Implementation and the Clean Development Mechanism). MS exceeding their annual AEA, even after taking into account the flexibility provisions and the use of JI/CDM credits, will face inter alia a penalty – a deduction from their emission allocation of the following year (excess emissions, multiplied by 1.08).

For additional information on recent changes related to the ESD see section 4.2.2.

### 3.2.2. *Monitoring on progress to 2020 targets*

For the monitoring of GHG emissions at the EU and the Member State level, the Monitoring Mechanism Regulation has been adopted, see section 2.2.2.1 of the EU's second Biennial Report. Also for the effective operation of the EU ETS, robust, transparent, consistent and accurate monitoring and reporting of greenhouse gas emissions are essential, therefore an annual procedure of monitoring, reporting and verification (MRV) at the installation level is implemented. For a description of the requirements contained therein, please refer to section 2.2.2.1 of the EU's second Biennial Report. Installation and aircraft operators have to monitor, report and verify their annual emissions in accordance with two EU Regulations, the

Monitoring and Reporting Regulation (MRR) and the Accreditation and Verification Regulation (AVR). For a description of the requirements contained therein, please refer to in section 2.2.2.2 of the EU's second Biennial Report.

Monitoring, reporting and verification of the ESD targets mainly takes place through the submission of the national GHG inventories by MS. Chapter III of the Commission Implementing Regulation 749/2014 sets out strict criteria by which MS national GHG inventories GHG emissions are reviewed annually at the EU-level. Based on this review, the European Commission issues an implementing decision on MS ESD emissions in the given year, which might lead to MS inter alia facing penalties as described above.

#### 3.2.2.1. Accounting for Flexible Mechanisms under the 2020 target

In general, in the EU the use of flexible mechanisms can take place on the one hand by operators in the EU ETS, on the other hand by governments for the achievement of ESD targets.

The amended EU ETS Directive 2009/29/EC (Article 11a(8)) sets the upper limit for credit use for the period from 2008 to 2020 at a maximum of 50 % of the reduction effort below 2005 levels. This is further specified into installation-level limits in the Commission Regulation on international credit entitlements (RICE) (EU No 1123/2013). Since some entitlements are expressed as a percentage of verified emissions over the entire period, the overall maximum amount will only be known at the end of the third trading period.

Since 2013 it is no longer possible to track the use of flexible mechanisms in the EU ETS directly via information on the EUTL public website because CERs and ERUs are no longer surrendered directly but are exchanged into EUAs. These exchanges will become public on an installation level after three years[13]; however aggregated data at EU-level is available earlier.

The ESD allows Member States to make use of flexibility provisions for meeting their annual targets, with certain limitations. In the ESD sectors, the annual use of carbon credits is limited to up to 3 % of each Member State's ESD emissions in 2005. Member States that do not use their 3 % limit for the use of international credits in any specific year can transfer the unused part of their limit to another Member State or bank it for their own use until 2020. Member States fulfilling additional criteria (Austria, Belgium, Cyprus, Denmark, Finland, Ireland, Italy, Luxembourg, Portugal, Slovenia, Spain and Sweden) may use credits from projects in Least Developed Countries (LDCs) and Small Island Developing States (SIDS) up to an additional 1 % of their verified emissions in 2005. These credits are not bankable and transferable. Approximately 750 Mt of international credits can be used during the period from 2013 to 2020 in the ESD.

[13] Annex XIV of European Commission. Commission Regulation (EU) No 389/2013. 2013. http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32013R0389

## 3.3. **Other EU emission reduction targets**

In addition to the EU target under the Convention, the EU also committed to a legally binding quantified emission limitation reduction commitment for the second commitment period of the Kyoto Protocol (2013 - 2020). In Table 3-2 all relevant GHG reduction targets for the EU and their key facts are displayed in an overview. On the left, the table includes the international commitments under the Kyoto Protocol and the UNFCCC. On the right, the EU commitments under the Climate and Energy Package are included.

**Table 3-2 Overview of EU targets**

| | International commitments | | | EU domestic legislation | |
|---|---|---|---|---|---|
| | Kyoto Protocol | | UNFCCC | Climate and Energy Package | |
| | | | | EU ETS | ESD |
| **Target year of period** | First commitment period (2008-2012) | Second commitment period (2013-2020) | 2020 | 2013-2020 | 2013-2020 |
| **Emission reduction target** | -8 % | -20 % | -20 % | -21 % compared to 2005 for ETS emissions | Annual targets by MS. In 2020 -10 % compared to 2005 for non-ETS emissions |
| **Further targets** | - | - | Conditional target of -30 % if other Parties take on adequate commitments | Renewable Energy Directive: 20 % share of renewable energy of gross final energy consumption; Energy Efficiency Directive : Increase energy efficiency by 20 % | |
| **Base year** | 1990<br>KP Flexibility rules (Art 3(5)) regarding F-Gases and Economies in Transition | 1990, but subject to flexibility rules. 1995 or 2000 may be used as the base year for $NF_3$ | 1990 | 1990 for overall emission reduction target; 2005 for renewable energy and energy efficiency target; as well as for targets broken down into ETS and non-ETS emissions | |
| **LULUCF** | Included ARD and other activities if elected | Includes ARD and forest management, other activities if elected (new accounting rules) | Excluded | Excluded | |
| **Aviation** | Domestic aviation included. International aviation excluded | Domestic aviation included. International aviation excluded | Aviation in the scope of the EU ETS included. In practice total aviation emissions considered | Domestic and international aviation included, as in the scope of EU ETS | Aviation generally excluded, some domestic aviation included (operators below ETS de minimis thresholds) |

| | International commitments | | | EU domestic legislation | |
|---|---|---|---|---|---|
| | Kyoto Protocol | | UNFCCC | Climate and Energy Package | |
| | | | | EU ETS | ESD |
| **Use of international credits** | Use of KP flexible mechanisms subject to KP rules | Use of KP flexible mechanisms subject to KP rules | Subject to quantitative and qualitative limits | Subject to quantitative and qualitative limits, see section 3.2.2.1 | Subject to quantitative and qualitative limits, see section 3.2.2.1 |
| **Carry-over of units from preceding periods** | Not applicable | Subject to KP rules including those agreed in the Doha Amendment | Not applicable | EU ETS allowances can be banked into subsequent ETS trading periods since the second trading period | No carry-over from previous period |
| **Gases covered** | $CO_2$, $CH_4$, $N_2O$, HFCs, PFCs, $SF_6$ | $CO_2$, $CH_4$, $N_2O$, HFCs, PFCs, $SF_6$, $NF_3$ | $CO_2$, $CH_4$, $N_2O$, HFCs, PFCs, $SF_6$ | $CO_2$, $CH_4$, $N_2O$, HFCs, PFCs, $SF_6$[14] | |
| **Sectors included** | Annex A of KP (Energy, IPPU, agriculture, waste), LULUCF according to KP accounting rules for CP1 | Annex A of KP (Energy, IPPU, agriculture, waste), LULUCF according to KP accounting rules for CP2 | Energy, IPPU, agriculture, waste, aviation in the scope of the EU ETS | Power & heat generation, energy-intensive industry sectors, aviation (Annex 1 of ETS directive) | Transport (except aviation), buildings, non-ETS industry, agriculture (except forestry) and waste |
| **GWPs used** | IPCC SAR | IPCC AR4 | IPCC AR4 | IPCC AR4 | |

14 In its third trading period, the EU ETS however only covers the gases $CO_2$, $N_2O$, $CH_4$ and $C_2F_6$.

# 4. PROGRESS IN ACHIEVEMENT OF QUANTIFIED ECONOMY-WIDE EMISSION REDUCTION TARGETS AND RELEVANT INFORMATION

## 4.1. Introduction

As outlined in Chapter 4 of the EU's 7NC this chapter in the EU's 3BR provides an overview of the EU policies which contribute to meeting the EU emission reduction target as explained in section 4.3 of the EU's 7NC. Wider information on the overarching climate change policy landscape in the EU, along with other issues such as assessments of economic or social consequences, and the monitoring and evaluation of progress, are covered in the EU's Seventh NC.

As explained in the EU's 7NC, there are two distinct levels of policies in the EU that have an impact on greenhouse gas emissions:

- European Union policies, which are proposed by the Commission and subsequently approved, amended or rejected by the Council of the European Union and the European Parliament. These EU policies are applicable to all Member States, though Member States may implement Directives at different points in time;
- National policies developed and implemented by Member States themselves.

The reporting in this BR concentrates on the EU policies; national policies and measures are outside the scope of the report.

This report focuses in particular on updates or changes to the policies and measures at the EU level, and does not attempt to include a comprehensive background to each Policy. If more background is required, links are provided or the reader can refer to the EU's Second BR.

Quantifications of the policy impacts on GHG emission reduction are attached in Table 3 of the Common Tabular Format (CTF). These (mostly) ex-ante estimates are produced by the European Commission as part of the impact assessments of the individual policies. The estimates are for the EU as a whole, and assume full implementation of the policies. However, estimates are not available for all EU policies and all years covered in CTF Table 3. Some older estimates refer to the EU-15 while more recent estimates are for the EU-27 or the EU-28.

## 4.2. Cross-cutting policies and measures

This section focuses on two key cross-cutting policies and measures, the EU Emissions Trading System and the Effort Sharing Decision. It then goes on to look at some key cross-cutting funding mechanisms, such as Horizon 2020 and the European Structural and Investment Funds.

The two main overarching policies are the EU Emissions Trading System (EU ETS) and the Effort Sharing Decision (ESD), both establishing EU internal rules under the "2020 climate and energy package" which underpin the implementation of the target under the Convention.

The main elements of the EU ETS, the ESD and the EU monitoring system are presented in section 2. Details on the EU ETS and ESD were reported in sections 4.2.2 and 4.2.3 of the first biennial report from the European Union under the UNFCCC (1BR), and relevant updates were described in Section 3.1 of the 2BR. Changes and updates compared to the information provided in the 2BR are explained in the following two sections.

### 4.2.1. *The EU Emissions Trading System (EU ETS)*

The EU ETS is based on the 'cap and trade' principle, and has been operational since 2005. It limits emissions from nearly 11,000 heavy energy-using installations (power stations & industrial plants) and slightly over 500 aircraft operators operating between EEA countries, and covers around 45 % of the EU's greenhouse gas emissions.

As described in the EU's 2BR, on 15 July 2015, the Commission presented a legislative proposal on the revision of the EU ETS for Phase 4 in line with the 2030 Climate and Energy policy Framework.

The legislative proposal included:

- An aim of achieving a 43 % reduction in emissions of installations in energy production, industry and aviation by 2030 compared to 2005 levels;
- An increase in the annual reduction in the overall number of allowances from the current 1.74 % to 2.2 % from 2021 onwards in order to provide the emissions reductions and thus deliver the underlying environmental objective;
- The continued free allocation after 2021, including elements such as the necessary updates to the relevant benchmarks to reflect technological progress, the criteria for the future inclusion of sectors in the carbon leakage list and procedures to account for changes in production levels;
- The creation of several low carbon funding mechanisms, in particular an Innovation Fund (to support demonstration of innovative renewable energy and low-carbon innovation in industry, as well as carbon capture, use and storage) and a Modernisation Fund (to contribute to modernising the energy systems of 10 EU Member States with lower GDP).

Since then, the following activities have taken place as part of the process leading up to the Phase 4 revision:

- An expert meeting was hosted by the European Commission in April 2016, to discuss technical aspects of the proposed free allocation and carbon leakage rules for Phase 4 of the EU ETS;
- At the start of 2017, the Commission, through DG CLIMA, launched a consultation period with EU ETS stakeholders and financiers to ensure a quick start of the Innovation Fund. The consultation process was initiated with a high level conference on 20$^{th}$ January to be followed by a number of expert roundtables in the following months to discuss the way forward for the Fund;
- In November 2017, the European Parliament and the Council agreed on a common position, and legislation would be adopted before end 2017.

### 4.2.2. *The Effort Sharing Decision*

The EU **Effort Sharing Decision** (2013-2020) covers emissions from the non-ETS sectors such as buildings, transport and agriculture. It sets national emission targets for 2020, expressed as percentage changes from 2005 levels. By 2020, these national targets will collectively deliver a reduction of around 10 % in total EU emissions from the sectors covered compared with 2005 levels.

Emissions not covered by the EU ETS decreased by 11 % in 2016 compared to 2005, i.e. below the 2020 target of -10 %. However, they increased for the second year in a row by 0.8 % compared to 2015, although less than the increase in GDP. This is at least partly explained by the low oil prices and higher needs for heating due to weather conditions in both 2015 and 2016.

The progress of Member States in meeting the emission reduction targets set in the Effort Sharing Decision (ESD) for the period 2013-2020 is assessed under the Monitoring Mechanism Regulation (Regulation No 525/2013), and also as part of the European Semester[15].

The ESD and the MMR introduced an annual compliance cycle requiring a review of Member States' greenhouse gas inventories for the purpose of compliance with their obligations under the ESD in the period 2013-2020. These reviews are carried out within a shorter time frame than the current UNFCCC inventory review to enable the use of flexibilities and the application of corrective action, where necessary, at the end of each relevant year. The following progress has been made with the reviews:

- In 2016 a comprehensive review was completed, establishing the GHG emission levels for the compliance years 2013 and 2014 in the ESD;
- A further review was completed in 2017, to establish the emission levels for the compliance year 2015.

As part of the flexibilities allowed under the Decision, Member States are able to transfer part of their Annual Emission Allocation (AEA) that exceeds its greenhouse gas emissions for that year. The first transfers were concluded in 2017 for compliance with the year 2013.

In accordance with Article 14 of the Decision, the European Commission prepared an evaluation[16] of the implementation of the Effort Sharing Decision 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 Member States 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 two legislative proposals setting out how EU Member States should implement their commitment to reduce

15 The European Semester is the EU's annual cycle of economic policy guidance and surveillance:
http://ec.europa.eu/economy_finance/economic_governance/the_european_semester/index_en.htm

16 REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL on evaluating the implementation of Decision No. 406/2009/EC pursuant to its Article 14 http://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:52016DC0483

its non-ETS emissions by 30 % by 2030 compared to 2005. The proposals were tabled on 20 July 2016[17,18].

First, for sectors outside the ETS and Land Use, Land Use Change and Forestry (LULUCF), each Member State would be subject to a binding annual greenhouse gas emission limits for the period 2021–2030. Member States agreed to share the relevant efforts on the basis of fairness, solidarity, cost-effectiveness and environmental integrity. The proposal thus recognises Member States' varying capacities to take action by differentiating 2030 targets primarily based on 2013 GDP per capita. The proposed 2030 targets range from 0 % to -40 % compared to 2005 levels.

Secondly, Member States would be required to balance greenhouse gas emissions and removals from land use, land use change and forestry under the 'no debit rule'. It is proposed that greenhouse gas emissions from land use would have to be entirely compensated by an equivalent removal of $CO_2$ from the atmosphere through action in this sector or alternatively in the effort sharing sectors.

For example, if a Member State cuts down its forests, it must compensate for the resulting emissions by planting new forest, by improving the sustainable management of its existing forests, croplands and grasslands, or alternatively by further reductions in the Effort Sharing sectors. In addition, Member States will also have the possibility to trade LULUCF credits. If implemented, this accounting system will help Member States to incentivise farmers and foresters to move towards climate-smart agriculture and forest management.

The European Parliament adopted its position with respect to the proposed regulation on 14 June 2017, and the European Council adopted its position later in 2017, enabling the start of trilogue negotiations.

### 4.2.3. *Other cross-cutting policies and measures*

Climate action is a key priority for the EU. To respond to challenges and investment needs related to climate change, the EU has agreed that at least 20 % of its budget for 2014-2020 – as much as € 180 billion − should be spent on climate change-related action. To achieve this increase, mitigation and adaptation actions are integrated into all major EU spending programmes.

Current estimates show that the EU budget annual allocation to climate action has exceeded the 20 % target in 2016 and will remain close to it over 2017-2020. It is set to deliver slightly above EUR 200 billion[19].

The key developments in cross cutting funding policies include:

#### 4.2.3.1. European Structural and Investment Funds (ESIF)

Climate change mitigation and adaptation receives significant support from ESI Funds amounting to more than EUR 114 billion of which almost half – about EUR 56 billion –

17 http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52016PC0482

18 http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52016PC0479

19 Mid-term review/revision of the multiannual financial framework 2014-2020 An EU budget focused on results. COM(2016) 603 final

comes from the European Agricultural Fund for Rural Development (EAFRD). The European Regional Development Fund (ERDF) and the Cohesion Fund also have a significant contribution of about EUR 55 billion collectively.

#### 4.2.3.2. Horizon 2020

Horizon 2020 is the biggest EU Research and Innovation (R&I) programme ever with nearly € 80 billion of funding available over 7 years (2014 to 2020), in addition to private and national domestic investment. The EU aims to spend 35 % of the overall Horizon 2020 budget on climate relevant R&I, including physical and socio-economic sciences, Earth observations, technology research and innovation and climate policy analysis. Horizon 2020 is explained in more detail in Section 8.2.2.1 of the EU's 7NC.

The key developments in cross cutting regulatory policies include:

#### 4.2.3.3. Energy Taxation Directive

There have been no further updates since the EU's 2BR. Please see the 2BR for details.

#### 4.2.3.4. Covenant of Mayors for Climate and Energy

In 2015, Commissioner Miguel Arias Cañete launched the integrated Covenant of Mayors for Climate and Energy, extending the initiative to 2030 and incorporating adaptation into existing climate change and energy requirements (thus merging with the initiative Mayors Adapt). Since 2015, Covenant signatories have voluntarily pledged action to support the implementation of the EU's 40 % greenhouse gas reduction target by 2030 and have adopted a joint approach to tackling climate change mitigation and adaptation. More than 800 cities have committed to the new targets outlined since December 2015.

## 4.3. **Sectoral policies and measures**

### 4.3.1. *Energy*

#### 4.3.1.1. Overview

The Commission adopted the Clean Energy for All Europeans Package[20] on 30 November 2016 to keep the European Union competitive as the clean energy transition is changing global energy markets. In this way, the EU can lead the clean energy transition, not only adapt to it. The eight legislative proposals, which are part of the Package, aim at three main goals: putting energy efficiency first, achieving global leadership in renewable energies and providing a fair deal for consumers. These proposals also include three directives amending, respectively, the directives on energy efficiency, the Directive on the energy performance of buildings and the Directive on renewable energy. On the same day, the Commission adopted measures in relation to eco-design and energy labelling, as well as an overarching strategy on Accelerating Clean Energy Innovation[21]. The strategy recognises the central role played by

20 https://ec.europa.eu/energy/en/news/commission-proposes-new-rules-consumer-centred-clean-energy-transition; http://eur-lex.europa.eu/resource.html?uri=cellar:fa6ea15b-b7b0-11e6-9e3c-01aa75ed71a1.0001.02/DOC_1&format=PDF

21 European Commission. Accelerating Clean Energy Innovation. COM(2016)763final. 2016. http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52016DC0763

innovation and the importance of a regulatory framework that is conducive to innovation. This strategy sets 20 different actions to boost research and innovation in clean energy solutions and to bring results to the market quickly and successfully.
More information on these policy proposals, and progress with current policies, can be found in the section below.

#### 4.3.1.2. Promotion of renewable energy

As outlined in Section 3.2.1, the EU has renewable energy targets for 2020 (20 % share of energy) and 2030 (at least a 27 % share of energy). Every two years, the EU publishes a renewable energy progress report. The 2017 report[22], published in February 2017, shows that the EU as a whole achieved a 16 % share of renewable energy in 2014 and an estimated 16.4 % share in 2015.

The vast majority of EU countries are well on track to reach their 2020 binding targets for renewable energy but the report did note that countries cannot be complacent and will have to continue their efforts on renewable energy to meet the 2020 target and to lay the foundations for achieving the 2030 target. The report also showed how the increasing levels of renewable energy was helping to drive other benefits, including:

- A € 16 billion saving in fossil fuel imports in 2015 (projected to rise to € 58 billion in 2030);
- Improvement in energy performance of buildings by reducing primary energy consumption;
- Turnover of € 144 billion in 2014 from the renewables industry;
- Job creation;
- Improved air quality.

The Commission's proposal[23] for an amended Renewable Energy Directive aims to make the EU a global leader in renewable energy. It also ensures the collective EU achievement of the 2030 renewable energy target in a cost-effective manner across the three renewable energy sectors of electricity (RES-E), heating and cooling (RES-H&C) and transport (RES-T), taking into account certain key objectives, including cost-effectiveness and addressing investment uncertainty. The specific elements of the proposal are set out below in Table 4-1.

**Table 4-1 Key elements in the proposal for a revised Renewable Energy Directive**

| Renewable energy sector | Proposal |
|---|---|
| RES-E | Introduction of design principles for Member State renewable energy support schemes, to encourage greater consistency, thus increasing investor confidence. |
| | A more coordinated regional approach to Member State renewable energy support schemes, to lower overall system costs and support costs by ensuring that investments are increasingly located where potential and other conditions are most |

22 http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52017DC0057&qid=1488449105433&from=EN

23 http://eur-lex.europa.eu/resource.html?uri=cellar:3eb9ae57-faa6-11e6-8a35-01aa75ed71a1.0007.02/DOC_1&format=PDF

| | |
|---|---|
| | favourable. |
| | A renewable-focused financial instrument, to enhance the use of funds under existing or new financial instruments to support the high ambition of Member States in deploying renewables. |
| | Administrative simplification, such as "one-stop-shop" and/or time-limited permitting processes. |
| RES-H&C | Mainstream renewables in the heating and cooling supply, by introducing a RES H&C obligation for fuel suppliers. |
| | Facilitate the uptake of renewable energy and waste heat in District Heating and Cooling (DHC) systems, e.g. through sharing of best practice, energy performance certificates and opening access to local H&C and an additional reinforced consumer rights framework. |
| RES-T | Incorporation of an obligation for advanced renewable transport fuels (including advanced biofuels), alongside a reduction of food-based biofuels. |

The proposal also puts forward options to empower and inform consumers of renewable energy and to strengthen the EU sustainability framework for bioenergy. To specifically support on RES-H&C, the European Commission launched an EU heating and cooling strategy[24] in February 2016. This covers the heating and cooling sector's contribution to both renewable energy and energy efficiency targets. More information on this strategy is set out in Box 4-1 below.

**Box 4-1 EU heating and cooling strategy**

Heating and cooling accounts for half of the EU's annual overall energy consumption and 68 % of all its gas imports. However, renewables only account for 18 % of energy in this sector and a large amount of energy is wasted by industry. Taking action to curb energy use and boost renewables in the heating and cooling sector would therefore have numerous benefits – reducing energy costs, helping to reduce dependence on imported fossil fuels and reducing carbon emissions, and will help with meeting both the renewable energy and energy efficiency targets for 2020 and 2030.

The strategy has a number of key elements – energy efficiency in buildings, energy efficiency guidelines for public schools and hospitals, better integration of the electricity system with district heating and cooling systems and cutting energy waste in industry.

#### 4.3.1.3. Increase of energy efficiency

As outlined in Section 3.2.1, the EU has energy efficiency targets for 2020 (20 % improvement in energy efficiency). As regards 2030, the Commission proposed a 30 % energy efficiency target for 2030 in the Clean Energy for All Europeans Package.

Meeting the EU energy efficiency targets will not just help to lower GHG emissions, but will also have numerous other benefits, including:

24 https://ec.europa.eu/energy/en/news/commission-launches-plans-curb-energy-use-heating-and-cooling

- Lower demand for EU gas imports;
- Lower energy costs for people who live and work in energy efficient buildings, as well as additional benefits such as improved air quality and protection from external noise provided by energy efficient windows;
- Targeted energy efficiency measures in buildings can help households with lower incomes to improve their living conditions;
- Lower energy costs for companies, in particular energy-intensive industries;
- Less need for additional generation and grid capacities with higher energy efficiency levels;
- Boosting domestic energy efficiency investments will bring new business opportunities for European companies such as construction firms and manufacturers of energy-using or transport equipment, which is likely to have a positive impact on economic growth in Europe;
- New jobs in construction, manufacturing, research, and other industries investing in energy efficiency.

The most recent EU progress report on energy efficiency, published in 2016, found that in 2014, primary energy consumption was already only 1.6 % above its 2020 primary energy consumption target and was already 2.2 % below the 2020 final energy consumption target[25]. On this basis, the European Commission is optimistic that the 2020 energy efficiency target will be met, provided that Member States continue to successfully implement their energy efficiency policies.

In order to ensure the 2030 target is met the Clean Energy for All Europeans Package included proposals for amending the Energy Efficiency Directive and the Energy Performance of Buildings Directive.

The main elements of the proposed revisions of the Energy Efficiency Directive (EED) are:

- Extension of the energy savings requirement to 2030 (specified in Article 7);
- Streamlining of the report requirements;
- Strengthening of the provisions relating the social requirements.

The proposal for the revised Energy Performance of Buildings Directive (EPBD) aim to:

- Incorporate the provisions on long-term renovation strategies (Article 4 of the EED) also in the EPBD, in view of obtaining a decarbonised building stock by 2050;
- Provide clearer requirements for feasibility studies before buildings are commissioned (Article 6);

25 Primary energy consumption measures the total energy demand of a country, covering consumption of the energy sector itself, losses during transformation (for example, from oil or gas into electricity) and distribution of energy, and the final consumption by end users. Final energy consumption is the total energy consumed by end users, such as households, industry and agriculture.

- Streamline provisions on inspections of heating systems and air-conditioning systems (Articles 14, 15, 16), while enhancing the use of building automation and control to ensure continuous buildings' performance;
- Promote e-mobility, by boosting the installation of recharging points for electric vehicles where they are most needed, i.e. in private spaces;
- Define smart buildings, by introducing a smartness indicator that assesses the technological ability of the building to interact with the occupants and with the grid;
- Link policy and financing to results through the use of the energy performance certificates;
- Making more and better data on buildings available to market actors, through collecting actual energy consumption data and more robust Energy Performance Contracting (EPC) databases.

Alongside the above proposals, the Commission also adopted a number of measures that will improve the energy efficiency of products, in particular a new Ecodesign Working Plan for the 2016-2019. The Plan sets out the Commission's priorities for the next three years, including reviews of existing product specific measures to keep them up-to-date with new technological developments as well as new products to be studied with a view to possible regulation to reap untapped potential. Taken together, all measures identified in the Ecodesign Working Plan have a potential to deliver a total of more than 600 TWh of annual primary energy savings in 2030, which is comparable to the annual primary energy consumption of a mid-sized Member State. This will ensure that Europe maintains its global leadership with regard to product efficiency standards and continues to deliver economic and environmental benefits for consumers and businesses[26][27].

Finally, the Clean Energy for All Europeans package also included revised rules for the design of the electricity market[28].

A voluntary industry agreement has also been made to improve the energy consumption of games consoles within the EU[29].

### 4.3.2. *Transport*

EU-level transport policies that can support climate action are a key element of the 2020, 2030 and 2050 GHG targets set out in Section4.3. The 2011 White Paper on Transport put forward a goal of reducing EU transport GHG emissions by at least 60 % by 2050 relative to 1990. This target was reiterated by the EU low-emission mobility strategy, adopted in 2016, which additionally set the ambition of drastically reducing without delay the emissions of air pollutants from transport. The analytical work underpinning the strategy showed that cost-

26 Ecodesign measures include standards for heating and cooling products, solid fuel boilers, refrigerated storage cabinets, blast cabinets, condensing units and process chillers. See regulations 2016/2281, 2015/1189, 2015/1188 and 2015/1095 implementing Directive 2009/125/EC.

27 COM(2016) 860 final, pg6 see also: COM(2016) 766, COM(2016) 773; C(2016) 7764, 7765, 7767, 7769, 7770 and 7772.

28 http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1490867812536&uri=CELEX:52016SC0410

29 https://ec.europa.eu/docsroom/documents/9932/attachments/1/translations/en/renditions/native

effective $CO_2$ emissions reductions of 18-19 % are needed by 2030 for transport, relative to 2005 [30].

This is in the context of the transport sector being the only major sector in the EU where emissions are still much above their 1990 levels[31], see Chapter 2 of this report.

#### 4.3.2.1. Optimising the transport system and improving its efficiency

To optimise the transport system and improving its efficiency, the Commission has adopted a European Strategy for Low-emission mobility and an agenda for a socially fair transition towards clean, competitive and connected mobility for all. The Commission also adopted a European strategy on Cooperative Intelligent Transport Systems, a milestone towards cooperative, connected and automated mobility.

The proposed revision for EU rules on buses and coaches targets a level playing field for all operators and better travel options for consumers. The proposed revision on combined transport will promote cleaner freight transport.

#### 4.3.2.2. Efficiency and technical standards

Section 3.4.1 of the EU's 2BR gives background on the key policies and measures that aim to improve vehicle efficiency across the EU, including the $CO_2$ and Cars Regulation (EC 443/2009), the $CO_2$ and Vans Regulation (EC 510/2011), car and tyre labelling (1999/94/EC and EC 1222/2009 respectively) and other fuel efficiency-related legislation (e.g. Regulation 661/2009 on tyre pressure monitoring systems and gear shift indicators).

Passenger car and light duty vehicle fuel efficiency: Provisional data published by the European Environment Agency showed that good progress continues to be made on fuel efficiency of new cars, with the average emissions level of a new car sold in 2016 at 118.1 grams of $CO_2$ per kilometre, significantly below the 2015 target of 130 g[32].

The $CO_2$ and Cars Regulation requests the Commission to review the legislation by 2015 and if appropriate make proposals for $CO_2$ emission targets for new cars for the period beyond 2020, including possibly setting a 2025 target. A public consultation on the revision of the cars and vans regulations ran between July 2016 and October 2016. Issues covered included whether the regulatory approach should be extended to cover heavier (N2) vehicles, what the basis for target-setting should be whether there should continue to be a parameter in the targets that reflects vehicle utility, whether derogations for small volume and niche manufacturers should be continued, whether there should be specific incentives for low and zero emission vehicles and whether there should be flexibilities for vehicle manufacturers in meeting the targets. A summary report of responses has been published[33] and more extensive analysis of the replies will be included in a future impact assessment.

The Commission has made proposals for certifying, monitoring and reporting data on fuel consumption from heavy duty vehicles

30 http://ec.europa.eu/transport/sites/transport/files/themes/strategies/doc/2011_white_paper/white-paper-illustrated-brochure_en.pdf

31 https://ec.europa.eu/clima/policies/transport/vehicles_en

32 https://ec.europa.eu/clima/news/new-cars-sold-europe-fuel-efficiency-improvements-continued-2016_en

33 https://ec.europa.eu/clima/sites/clima/files/consultations/docs/0030/summary_report_en.pdf

Car and tyre labelling: the Car Labelling Directive and the Regulation on Tyre Labelling are described in Section 3.4.1 of the EU's Second BR. A public consultation on an evaluation of the car labelling directive ran until January 2016[34]. The evaluation[35] found that the Car Labelling Directive continues to be relevant given the need to further reduce greenhouse gas emissions from road transport. However further clarification and simplification of the car labelling Directive could increase its relevance, effectiveness, efficiency, and coherence. This could involve a common methodology for labelling, specific requirements for alternatively-fuelled vehicles, increasing scope of the Car labelling Directive and including information on air pollutant emissions.

Other fuel efficiency-related legislation: There are no updates to report on Regulation 661/2009 on tyre pressure monitoring systems and gear shift indicators.

In terms of aviation technologies, Horizon 2020 the EU Research and Innovation Programme contributes to substantially lowering the environmental impact of aviation by decreasing aviation emissions from all market segments (short and long haul as well as regional and general aviation). The EU Aviation research budget within Horizon 2020 weights € 2.72 billion of investment in research and innovation projects at different Technology Readiness Levels that contribute to lowering approximately 1.5 % aviation emissions year-on-year, with advancements in lighter aerostructures, efficient propulsion systems, advancements in aerodynamics, electric aircraft systems, design, manufacturing and recycling.

#### 4.3.2.3. Fuels from renewable energy sources

The main EU-wide policies and measures that influence GHG emissions from transport fuels are the Renewable Energy Directive (2009/28/EC) and the Fuel Quality Directive (2009/30/EC)[36].

The Renewable Energy Directive aims to mainstream renewable energy consumed in the transport sector (which can include biofuels (including biogas), renewable electricity or hydrogen originating from renewable sources).

As explained in Section 4.3.1.2, in November 2016, the Commission published a proposal for a revised Renewable Energy Directive. This looked at four options for increasing low-carbon and renewable energy in the transport sector:

1. EU incorporation obligation for advanced renewable fuels;
2. EU incorporation obligation for advanced renewable transport fuels (including advanced biofuels), alongside a reduction of food-based biofuels with a range of variants covering the speed and extent of reduction;
3. A dedicated EU incorporation obligation for aviation and maritime renewable fuels; and;
4. GHG emission reduction obligation (continuation of the Fuel Quality Directive).

The Commission preferred approach is option 2, since it builds on the practice of 25 Member States, which have introduced biofuel blending mandates, and provides industry with greater

34 https://ec.europa.eu/clima/clima/consultations/articles/0027_en

35 https://ec.europa.eu/transparency/regdoc/rep/10102/2016/EN/10102-2016-270-EN-F1-1.PDF

36 2009/30/EC, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0088:0113:EN:PDF

certainty about future market demand/volumes for advanced biofuels[37]. It will also allow for a gradual reduction of food-based biofuels, as indicated in the July 2016 Strategy on Low Emission Mobility[38].

A description of the Fuel Quality Directive can be found in Section 3.4.2 of the EU's 2BR. The Commission has published a consultation on the implementation of various issues relating to Article 7a, which introduces a Low Carbon Fuel Standard on fuel suppliers. The consultation sought views on a methodology for calculating the life-cycle GHG intensity of fuels, other than biofuels. The Commission also carried out a pre-consultation exercise in relation to policy options for addressing indirect land use change from biofuels.

New rules came into force in 2015 which amend the current legislation on biofuels – specifically the Renewable Energy Directive and the Fuel Quality Directive - to reduce the risk of indirect land use change and to prepare the transition towards advanced biofuels.

#### 4.3.2.4. Infrastructure

The completion of the TEN-T core network, including the nine corridors stimulates modal shift, especially through the implementation of major rail and inland waterway projects as well as through the enhancement of a multi-modal transport network. The development of the core network corridors also includes, as integral part, components such as alternative fuels infrastructure, intelligent and innovative transport systems. Thereby, it plays an indispensable role as enabler for the decarbonisation of the transport system as a whole.

Preliminary estimates show that the completion of the Core Network Corridors in accordance with the latest work plans is expected to lead to an overall reduction of $CO_2$ emissions of about 7 million tons between 2015 and 2030. These preliminary estimates draw on the 2016 EU Reference scenario assumptions (i.e. including policies related to infrastructure and other transport policy measures) and will be deepened in an ongoing study, the results of which will become available in 2018.

Information on the Directives on road user charges (Directives 1999/62/EC, 2006/38/EC, 2011/76/EC) and on Directive 2014/94/EU on Deployment of Alternative Fuels Infrastructure, can be found in Section 3.4.3 of the EU's 2BR.

In May 2017 the Commission made a proposal for revised rules on road user charges[39] that aims at providing for fairer pricing, rewarding environmentally-friendly vehicles and contributing to sustainable infrastructure funding. Road-charging is a national competence. Member States are and will remain free to introduce or not road-charging on their territory. Should they decide to do so, the Commission proposes that they follow certain rules for all categories of vehicles. To reward environmental-friendly vehicles, in line with the "polluter-pays" principle, Member States should vary the level of the charge based on the $CO_2$ performance of vehicles.

37 http://eur-lex.europa.eu/resource.html?uri=cellar:3eb9ae57-faa6-11e6-8a35-01aa75ed71a1.0007.02/DOC_1&format=PDF

38 "A European Strategy for Low-Emission Mobility" (COM(2016) 501 final).

39 http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52017PC0275

The Commission has adopted an Alternative Fuels Infrastructure Action Plan, including the report on the implementation of Directive 2014/94/EU, to support the deployment of an EU backbone charging infrastructure.

#### 4.3.2.5. Other relevant policies and measures

There are a range of other relevant policies and measures that support moves at the EU level towards low-emission mobility. The proposed revision of the Clean Vehicle Directive will better promote the use of public procurement to incentivise the creation of markets for innovative and low-emitting vehicles.

Action is also being taken to support electric and hydrogen-fuelled vehicles.

The European Green Vehicles Initiative (EGVI) is a contractual Public Private Partnership launched in 2014 with an estimated budget of EUR 1.5 billion (Horizon 2020 contribution: around EUR 750 million; matching amount from industrial partners). The expected impact is to improve transport system efficiency, develop alternative powertrains and improve batteries. EGVI is included in the Horizon 2020 Smart, Green and Integrated Transport Challenge, allocating almost € 6.4 billion for the period 2014-2020.

On hydrogen for transport, an implementation plan was published in 2007 which identified key issues and priorities for accelerating deployment of portable, stationary and transport applications. This led to the formation of a Public Private Partnership - the 'Fuel Cells and Hydrogen Joint Undertaking' (JU) - between the European Commission, industry and the research community. A main aim of the JU is to enable commercial deployment by 2020. In future, the European Commission will channel support for fuel cell and hydrogen research and demonstration through the JU. For the period 2007-2013, European Commission support amounted to EUR 470 million[40]. And work is being encouraged at local level through initiatives such as The hydrogen bus demonstration projects CUTE, its successor HyFLEET:CUTE[41], the ZERO REGIO project[42] that is demonstrating two small fuel cell car fleets in Rhein Main and Lombardia, and the HyChain Mini-Trans project[43] that is demonstrating around 50 innovative fuel cell vehicles of different types in four European regions.

In addition, a Strategic Transport Research and Innovation Agenda was adopted this year as part of the European Commission's Strategy for low emission mobility. The agenda outlines seven innovation roadmaps reflecting the 'state of the art' of technologies, identifying focus areas for Research and Innovation (R&I) to enable and deliver a systemic transformation of the transport system in the short term (2018-2020) and in the medium to long term (towards 2030 and up to 2050).

40 https://ec.europa.eu/transport/themes/urban/vehicles/road/hydrogen_en

41 https://www.global-hydrogen-bus-platform.com/

42 http://www.transport-research.info/sites/default/files/project/documents/20120508_141128_35179_Project%20Brochure.pdf

43 http://ieahia.org/Activities/National-Projects-(1)/France/08-04-18-Cessa-presentation_Hychain-Minitrans_Bese.aspx

### 4.3.3. *Industry / industrial processes*

Greenhouse gas emissions arising from industrial processes in the mineral, chemical and metal industry are controlled as part of the EU Emissions Trading System (see section 2). Further controls on emissions are applied through other sectoral policies.

To control emissions from fluorinated greenhouse gases (F-gases), including hydrofluorocarbons (HFCs), the European Union has adopted two legislative acts: the 'MAC Directive' (2006/40/EC) on air conditioning systems used in small motor vehicles, and the 'F-gas Regulation' (No 517/2014) which covers all other key applications in which F-gases are used. These policies are estimated to lead to cumulative emission savings of 1.5 Gt $CO_2$eq. by 2030 and 5 Gt $CO_2$eq. by 2050. For the first time in 13 years of increasing emissions of F-gases, the latter have declined in 2015 compared to the previous year, a clear signal that the policy measures are effective.

The action taken by the EU and its Member States under the F-gas Regulation will enable the EU to comply with the Kigali amendment to the Montreal Protocol on a global phase-down of hydrofluorocarbons (HFCs).

Further controls on emissions from industrial activities in the EU are applied through the Industrial Emissions Directive 2010/75/EU (IED). The IED regulated greenhouse gases ($CO_2$, $CH_4$, $N_2O$, fluorinated gases) to the extent they are not covered by the ETS or where this would be necessary to prevent significant local pollution, and by regulating indirect greenhouse gases such as $NO_x$ and $SO_x$ and short-lived climate forcers such as black carbon. Furthermore, the IED promotes energy efficiency and makes fuel switching more attractive. Further details on the IED are provided in Section 3.5.3 of the EU's 2BR.

### 4.3.4. *Agriculture*

Agricultural activities can result in methane emissions from livestock digestion processes and storage of animal manure and the use of organic and mineral nitrogen fertilisers can lead to nitrous oxide emissions. On the other hand, products of agricultural activities can be a renewable energy source and can contribute to $CO_2$ savings. These are allocated to the energy sector (see Section 4.3.1 for more details).

A study was made in January 2015 titled "An economic assessment of GHG mitigation policy options for EU agriculture (EcAMPA)"[44]. This gave an overview of the historical and projected development of agricultural GHG emissions in the EU, as well as a quantitative assessment of illustrative GHG mitigation policy options in the agricultural sector, and their production and economic implications. Importantly this showed that implementing mitigation options in the agriculture sector in a more flexible manner could minimise effects on agricultural production. This was followed up by a further study in 2016 (EcAMPA 2[45]), which assessed the possible inclusion of the agriculture sector in the EU 2030 Climate and Energy Framework. The study found that without further policy action, agricultural GHG emissions in the EU-28 are projected to decrease by 2.3 % by 2030 compared to 2005. It also found that potential adverse effects on EU agricultural production and emission leakage are

44 http://publications.jrc.ec.europa.eu/repository/bitstream/JRC93434/jrc90788_ecampa_final.pdf

45 http://publications.jrc.ec.europa.eu/repository/bitstream/JRC101396/jrc101396_ecampa2_final_report.pdf

significantly reduced if subsidies are paid for the application of technological emission mitigation options. However, this comes along with considerable budgetary costs, as farmers are projected to widely adopt the technologies.

#### 4.3.4.1. Common Agricultural Policy

Section 3.6.1 of the EU's 2BR describes the key elements of the Common Agricultural Policy and how these relate to climate action.

Implementation of the new Common Agricultural Policy (CAP) regulations started only in 2015 (with 2014 being a transitional year). For direct payments, implementation choices by Member States were finalised and notified to the European Commission during 2014, with the rules coming into force on 1 January 2015. An initial analysis of implementation choices taken by Member States suggests that in most cases the choices made are relevant to the GHG emission reduction/ climate needs and priorities identified . Contribution to climate action will be achieved through the combined effects of a number of different CAP measures, encompassing cross-compliance The 'Fuel Cells and Hydrogen Joint Undertaking' standards, direct payments under the EAGF and rural development policy under the European Agricultural Fund for Rural Development (EAFRD) and accompanied by support from the Farm Advisory Service, and the activities of the European Innovation Partnership for Agriculture and the national Operational Groups.

In relation to direct payments, the 'greening' rules within CAP mean that 30 % of the payments going directly to farmers are linked to improving the environmental performance, for example to adopt practices beneficial for the climate. Some 30 % of rural development funds are also aimed at specific regional environmental priorities. In 2015, € 13.6bn of the committed allocations under the CAP budget were climate relevant; this value rose to € 18.7bn in 2016.

### 4.3.5. *Forestry / LULUCF*

For background on the land use, land use change and forestry (LULUCF) policy framework, see Section 3.7 of the EU's 2BR.

In July 2016 the European Commission presented a legislative proposal to integrate greenhouse gas emissions and removals from LULUCF into the 2030 climate and energy framework[46]. The proposal follows the agreement with EU leaders in October 2014 that all sectors should contribute to the EU's 2030 emission reduction target, including the land use sector. It is also in line with the Paris Agreement, which points out to the critical role of the land use sector in reaching our long-term climate mitigation objectives. The proposal sets a binding commitment for each Member State to ensure that accounted emissions from land use are entirely compensated by an equivalent removal of $CO_2$ from the atmosphere through action in the sector, this being known as the "no debit rule." Member States already include accounted emissions and removals from land use, with similar rules, under the Kyoto Protocol up to 2020; the proposal extends this for the period 2021-2030.

46 http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52016PC0479

Forest management is the main source of biomass for energy and wood production and hence has a pivotal role to play in EU renewable energy policy. The proposal calls for emissions of biomass used in energy to be recorded and counted towards each Member State's 2030 climate commitments, meaning that emissions from biomass in energy production will be accounted for under EU law.

The proposal simplifies and upgrades the current LULUCF accounting methodology under the Kyoto Protocol, and establishes a new EU governance process for monitoring how Member States calculate emissions and removals from actions in their forests and agricultural land use. It also introduces flexibilities so that a Member State that has net emissions from land use and forestry can use allocations from the Effort Sharing Regulation to satisfy its "no debit" commitment, and a Member State that has net removals can use the corresponding credits for compliance under the Effort Sharing Regulation (with some limitations).

#### 4.3.6. *Waste management / waste*

Policies and measures relating to solid waste disposal, biological treatment of waste, waste incineration and open burning of waste, as well as wastewater treatment and discharge, are climate relevant. Important GHGs in this sector are methane ($CH_4$), which mainly arises from the treatment and disposal of solid waste, and nitrous oxide ($N_2O$) originating from waste water. In addition, a substitution of primary raw materials by secondary raw materials coming from recycling allow for significant GHG savings due to lower demand for energy needed to extract raw materials and turn them into products.

##### 4.3.6.1. Circular economy

The circular economy will boost the EU's competitiveness by protecting businesses against scarcity of resources and volatile prices, helping to create new business opportunities and innovative, more efficient ways of producing and consuming. It will create local jobs at all skills levels and opportunities for social integration and cohesion. At the same time, it will save energy and help avoid the irreversible damages caused by using up resources at a rate that exceeds the Earth's capacity to renew them in terms of climate and biodiversity, air, soil and water pollution.

The EU's Circular Economy Action Package[47] was adopted in December 2015. It puts forward a number of actions and commitments, with clear timetables, for all phases of the circular economy, including production (product design and production processes), consumption, waste management, and for boosting the market for secondary raw materials and water reuse. The strategy set out a number of priority issues, including plastics, food waste, critical raw materials, construction and demolition, biomass and bio-based products, innovation and investment and monitoring progress.

At the same time, the Commission also published revised legislative proposals. The key elements of these proposals are set out below and feature in a number of different proposals covering the Directive on Waste, the Directive on Packaging Waste, the Landfill Directive and Directives on End-of-Life Vehicles, on Batteries and Accumulators and Waste Batteries and Accumulators, and on Waste Electrical and Electronic Equipment.

47 http://eur-lex.europa.eu/resource.html?uri=cellar:8a8ef5e8-99a0-11e5-b3b7-01aa75ed71a1.0012.02/DOC_1&format=PDF

- A common EU target for recycling 65 % of municipal waste by 2030;
- A common EU target for recycling 75 % of packaging waste by 2030;
- A binding landfill target to reduce landfill to maximum of 10 % of municipal waste by 2030;
- A ban on landfilling of separately collected waste;
- Promotion of economic instruments to discourage landfilling;
- Simplified and improved definitions and harmonised calculation methods for recycling rates throughout the EU;
- Concrete 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 (e.g. for packaging, batteries, electric and electronic equipment, vehicles).

In January 2017, the Commission published a report on implementation of the Circular Economy Action Package[48]. The report provides an overview of the action taken to develop the circular economy in the EU since December 2015 when it was adopted. Key deliverables included:

- A legislative proposal on online sales of goods (December 2015);
- A legislative proposal on fertilisers (March 2016);
- Launch of the Innovation Deals for a circular economy (May 2016);
- An Ecodesign Working Plan 2016-2019 as part of the Clean Energy for All Europeans package (November 2016);
- Establishment of the EU Platform on Food Losses and Food Waste (August 2016);
- A Communication on waste-to-energy processes and their role in the circular economy (January 2017);
- A proposal to amend the Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment (January 2017);
- The launch of a platform to support the financing of circular economy (January 2017).

#### 4.3.6.2. Waste to landfill

Where waste needs to be landfilled, it must be sent to landfills which comply with the requirements of Directive 1999/31/EC on the landfill of waste. As outlined above, one of the proposals published alongside the Circular Economy Action Package was a proposal to amend the Landfill Directive[49]. The proposal includes a gradual limitation of the landfilling of municipal waste to 10 % by 2030. It also promoted the use of economic instruments to

48 http://ec.europa.eu/environment/circular-economy/implementation_report.pdf

49 http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52015PC0594&from=EN

discourage landfilling, for example landfill charges or pay-as-you-throw schemes. The legislative proposals set out provisions to promote greater use of economic instruments.

#### 4.3.6.3. Management of biodegradable waste

Management of biodegradable waste is mainly done through three EU directives – the Landfill Directive (see above), the Waste Framework Directive[50] (provides for a general framework of waste management requirements and sets the basic waste management definitions for the EU) and the Industrial Emissions Directive[51], which is the main EU instrument regulating pollutant emissions from industrial installations.

#### 4.3.6.4. EU policies targeting waste streams

This section groups together various different policies which target other specific waste streams.

Plastics: An amendment made to the Packaging and Packaging Waste Directive[52] in April 2015 requires EU Member States to either reduce annual average consumption of lightweight plastic bags per citizen, or to ban the giving out of free bags.

Addressing plastic waste is a key component of the Circular Economy Action Package. It proposes raising the recycling target for plastic packaging to 55 %, and reducing landfilling to no more than 10 % by 2030. In January 2017, the Commission published the roadmap of the Communication on Plastics in a Circular Economy[53] (including action on marine litter). A new dedicated plastics strategy is now being prepared, to help Europe improve recycling, cut marine litter, and remove potentially dangerous chemicals.

Electrical and Electronic Equipment: Section 3.8.4 of the EU's 2BR describes the Directive on Waste of Electrical and Electronic Equipment[54], with the new WEEE Directive 2012/19/EU becoming effective in February 2014.

In February 2017, the Commission published proposals[55] for further revisions to the WEEE Directive, as well as to Directive 2006/66/EC on batteries and accumulators and waste batteries and accumulators[56], amending, improving and simplifying the reporting process for Member States.

End-of life vehicles: Dealing with waste streams from motor vehicles is governed at the EU level by the End-of-Life Vehicles (ELV) Directive 2000/53/EC[57], which aims to increase re-use, recycling and other forms of recovery of end-of-life vehicles and their components, and

50 http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0098&from=EN

51 http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010L0075&from=EN

52 http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015L0720&from=EN

53 http://ec.europa.eu/smart-regulation/roadmaps/docs/plan_2016_39_plastic_strategy_en.pdf

54 http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32012L0019&from=EN

55 http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52015PC0593&from=EN

56 http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02006L0066-20131230&rid=1

57 http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02000L0053-20130611&qid=1405610569066&from=EN

the Motor Vehicles Directive 2005/64/EC[58], which sets targets for re-use, recycling and other forms of recovery of end-of-life vehicles and their components.

The proposal mentioned above that addressed the WEEE Directive and batteries also covered the ELV Directive, again amending, improving and simplifying the reporting process for Member States.

#### 4.3.6.5. Reduction of GHG Emissions from Urban Waste Water Treatment

Information on the Urban Waste Water Directive 91/271/EEC[59] can be found in Section 3.8.5 of the EU's 2BR. In March 2016, the eighth implementation report[60] was published by the Commission which showed high compliance rates in the EU-15, and that the implementation of the Directive has significantly reduced organic and nutrient pollution load discharges in the EU. That said, some gaps in compliance were found, in particular on treatment. It concludes that reinforced action and investments are needed to reach full compliance within reasonable time delays.

### 4.4. Assessment of the economic and social consequences of response measures

To ensure that all relevant possible impacts are taken into account, the EU has established processes that assess the economic and social consequences of climate policy measures.

For the development of new policy initiatives through legislative proposals by the European Commission, an impact assessment system has been established in which all proposals are examined before any legislation is passed. It is based on an integrated approach which analyses both benefits and costs, and addresses all significant economic, social and environmental impacts of possible new initiatives (for details please refer to Section 4.10 of the EU 1BR as well as Chapter 15 of the EU National Inventory Report 2017).

Beyond this internal impact assessment system, procedures for assessing the impacts of EU (climate change) policies on external countries have also been established. Even though there is no explicit dialogue on response measures, the impacts of policy measures implemented by the EU are naturally being discussed within the framework of bilateral and regional cooperation. Such processes are included in various EU cooperation policies and agreements with third countries on a sectoral level, such as for trade agreements, as well as on an overarching political level in regional cooperation with Africa, Asia and Latin America as well as in bilateral relations. This way, it is ensured that the effects of such policies on non-EU countries are taken into account.

The free Trade Agreements that have been concluded between the EU and third countries provide pertinent examples. For instance, the Deep and Comprehensive Free Trade Area (DCFTA) signed between the EU and Ukraine on 27 June 2014, which came into force on 1 September 2017, sets out various processes which enable concerned stakeholders to get in contact with the EU on potential impacts of policies and regulations under the Trade Agreement.[61] These include provisions that allow interested parties to comment on proposed

58 http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32005L0064&from=EN

59 http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31991L0271&from=EN

60 http://ec.europa.eu/environment/water/water-urbanwaste/implementation/implementationreports_en.htm

61 For more information see http://ec.europa.eu/trade/policy/countries-and-regions/countries/ukraine/.

regulations under the agreement. Furthermore, enquiry or contact points are established to respond to questions arising from the application of regulations included in the agreement. Negotiations of similar agreements are taking place between the EU and Morocco, Tunisia and Jordan, among others.

Furthermore, dialogues on impacts of EU policies on third countries take place in the context of the European Neighbourhood Policy (ENP). As the basis for cooperation between the EU and a neighbouring country an Association Agreement is negotiated bilaterally between the two partners. In such an agreement, specific political priorities are set for the country concerned. Following the agreement, actions plans are negotiated between the EU and the respective neighbouring country which include priority areas for cooperation and a specific focus of action for each of these areas for three to five years. In the negotiations of an action plan, the country is able to raise specific issues of concern with the EU. Additionally, in technical discussions within sub-committees established through the Association Agreement (particularly on energy, transport and the environment), targeted exchanges on policy issues and directions for future cooperation at bilateral level take place. Partner countries can ask questions about planned EU initiatives and legislatives at such meetings to technical experts.[62]

The EU is also supporting third countries to effectively implement the Paris Agreement in a manner that unlocks socio-economic opportunities and supports climate objectives, by providing capacity building for partner countries across all regions. For examples, the Africa LEDS project is supporting Low Emissions Development in nine African countries in the context of socio-economic development priorities as stipulated in countries' development visions and strategies. One of the two components of the project focuses on technical capacity building for a strong analytical framework, including modelling, for long-term policy decision making.

62 For further information on the ENP see http://eeas.europa.eu/enp/.

# 5. PROJECTIONS

- The GHG projections prepared by EU Member States and aggregated at EU-level (which take into account the implementation of the 2020 Climate and Energy Package) show that the EU-28 is on track to achieve its 2020 target. Under the "With Existing Measures" (WEM) scenario, total GHG emissions (including international aviation, excluding LULUCF) are projected to be 26.2 % lower in 2020 than in 1990 and 30.2 % lower in 2030 compared to 1990.
- Under the "With Additional Measures" (WAM) scenario, as reported by Member States, the projected GHG emissions compared to 1990 would decrease by 26.8 % in 2020, and 32.2 % in 2030.
- The most significant sectoral contribution in absolute GHG emission reductions in the EU-28 WEM scenario from 1990 to 2020 is projected to stem from the energy sector (without transport) where emissions are projected to decrease by 36.5 % compared to 1990 in 2020 and by 41.8 % up to 2030 under the WEM, and 37.1 % in 2020 and 44.0 % in 2030 under the WAM scenario. The energy sector is followed by agriculture, industry and the waste sector.
- The transport sector is the only sector where emissions would still be higher by 2030 relative to 1990, due to high emissions growth during the '90s. Under the WEM scenario GHG emissions from the transport sector are projected to be 13.8 % higher than 1990 levels in 2020 and 13.4 % higher in 2030, under the WAM scenario 12.7 % higher in 2020 and 9.9 % higher in 2030.
- Reductions in $CO_2$ emissions are expected to contribute most to overall emission reductions in the EU-28. Throughout the two scenarios and the timeline from 2020-2025, $CO_2$ contributes between 85-90 % to total emissions, followed by $N_2O$ with roughly 4-8 % and $CH_4$ with roughly 4-6 %.

## 5.1. Projections of EU GHG emissions

### 5.1.1. *Summary*

Figure 5-1 presents total aggregate GHG emission trends and the With Existing Measures (WEM) projection for EU-28 (including international aviation, excluding LULUCF). The figure includes historical values (solid lines) and projected values (dotted line). In the WEM scenario, total EU-28 GHG in 2020 are projected to be 26.2 % below 1990 GHG emissions in 2020 and 30.2 % in 2030. Considering also planned measures (With Additional Measures – WAM - scenario), GHG emission are projected to be 26.8 % below 1990 levels in 2020 and 32.2 % below 1990 levels in 2030.

Figure 5-1 Total, aggregate, absolute historic and projected EU-28 GHG emissions

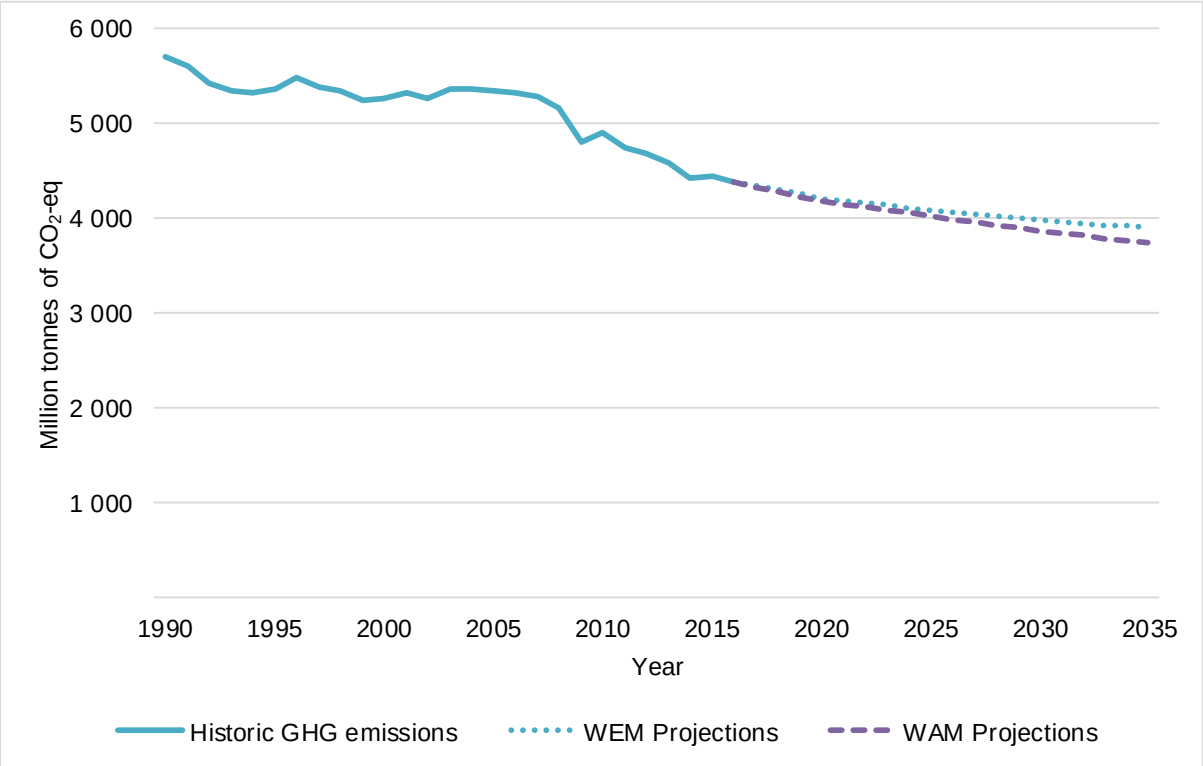



Table 5-1 summarises historical and projected greenhouse gas emissions as totals, by sector and by gas for the WEM and WAM scenario.

Aviation emissions between the EU and three countries not belonging to the EU (Norway, Iceland and Liechtenstein) are included under the EU ETS, though some of these flights are considered international aviation in terms of GHG accounting rules. The UNFCCC reporting guidelines for national GHG inventories requires that Parties present the contribution of emissions from international aviation separately. EU-28 emissions from all international aviation activities are included separately; a further split to deduct the ETS countries is however not possible. This would require high effort (and thus costs) while achieving a very limited increase in accuracy.

**Table 5-1 Historical greenhouse gas emissions and greenhouse gas emission projections in the 'with existing measures' scenario**

| | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Historical emissions (Mt $CO_2$equivalent)** | | | | | | | | | | |
| **Total GHG emissions** (excluding LULUCF; indirect $CO_2$. Including international aviation.) | 5 712 | 5 378 | 5 268 | 5 343 | 4 908 | 4 450 | | | | |
| **By sector** | | | | | | | | | | |
| Energy | 3 555 | 3 233 | 3 087 | 3 138 | 2 859 | 2 452 | | | | |
| Transport | 782 | 837 | 918 | 971 | 931 | 906 | | | | |
| Industrial processes and product use | 517 | 497 | 452 | 460 | 390 | 374 | | | | |
| Agriculture | 548 | 478 | 464 | 440 | 426 | 437 | | | | |
| Waste management/waste | 241 | 245 | 231 | 203 | 170 | 139 | | | | |
| **By gas** | | | | | | | | | | |
| $CO_2$ emissions excluding net $CO_2$ from LULUCF | 4 526 | 4 285 | 4 277 | 4 421 | 4 062 | 3 639 | | | | |
| $CH_4$ emissions excluding $CH_4$ from LULUCF | 728 | 663 | 606 | 547 | 492 | 456 | | | | |
| $N_2O$ emissions excluding $N_2O$ from LULUCF | 386 | 348 | 306 | 286 | 240 | 237 | | | | |
| HFCs | 35 | 49 | 55 | 74 | 103 | 108 | | | | |
| PFCs | 26 | 17 | 12 | 7 | 4 | 4 | | | | |
| $SF_6$ | 11 | 15 | 11 | 8 | 6 | 6 | | | | |
| Other ($NF_3$) | 0.0 | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 | | | | |
| **Memo items** | | | | | | | | | | |
| *Memo item: international aviation* | 69 | 86 | 116 | 132 | 132 | 142 | | | | |
| *Memo item: international navigation* | 110 | 111 | 135 | 161 | 159 | 135 | | | | |
| | | | | | | | | | | |
| **With Existing Measures' scenario (Mt $CO_2$ equivalent)** | | | | | | | | | | |
| **Total GHG emissions** (excluding LULUCF; indirect $CO_2$. Including | | | | | | | 4 213 | 4 089 | 3 988 | 3 901 |

| | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|---|---|---|---|
| international aviation.) | | | | | | | | | | |
| **By sector** | | | | | | | | | | |
| Energy | | | | | | | 2 256 | 2 163 | 2 069 | 1 984 |
| Transport | | | | | | | 890 | 882 | 886 | 889 |
| Industrial processes and product use | | | | | | | 373 | 353 | 340 | 336 |
| Agriculture | | | | | | | 431 | 431 | 431 | 430 |
| Waste management/waste | | | | | | | 118 | 106 | 99 | 91 |
| **By gas** | | | | | | | | | | |
| $CO_2$ emissions excluding $CO_2$ from LULUCF | | | | | | | 3 463 | 3 374 | 3 299 | 3 231 |
| $CH_4$ emissions excluding net $CH_4$ from LULUCF | | | | | | | 418 | 405 | 395 | 386 |
| $N_2O$ emissions excluding $N_2O$ from LULUCF | | | | | | | 231 | 232 | 233 | 233 |
| HFCs | | | | | | | 91 | 69 | 54 | 45 |
| PFCs | | | | | | | 3 | 3 | 3 | 3 |
| $SF_6$ | | | | | | | 7 | 5 | 4 | 4 |
| Other ($NF_3$) | | | | | | | 0.1 | 0.1 | 0.1 | 0.1 |
| Memo items | | | | | | | | | | |
| *Memo item: international aviation* | | | | | | | 145 | 154 | 163 | 171 |
| *Memo item: international navigation* | | | | | | | 171 | 181 | 190 | 199 |
| **With Additional Measures' scenario (Mt $CO_2$ equivalent)** | | | | | | | | | | |
| **Total GHG emissions** (excluding LULUCF; indirect $CO_2$. Including international aviation.) | | | | | | | 4 179 | 4 020 | 3 872 | 3 741 |
| **By sector** | | | | | | | | | | |
| Energy | | | | | | | 2 236 | 2 119 | 1 990 | 1 875 |
| Transport | | | | | | | 881 | 866 | 859 | 849 |
| Industrial processes and product use | | | | | | | 372 | 350 | 337 | 334 |

| | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|---|---|---|---|---|---|
| Agriculture | | | | | | | 428 | 427 | 425 | 424 |
| Waste management/waste | | | | | | | 117 | 104 | 96 | 88 |
| **By gas** | | | | | | | | | | |
| $CO_2$ emissions excluding $CO_2$ from LULUCF | | | | | | | 3 435 | 3 315 | 3 193 | 3 083 |
| $CH_4$ emissions excluding net $CH_4$ from LULUCF | | | | | | | 415 | 402 | 390 | 379 |
| $N_2O$ emissions excluding $N_2O$ from LULUCF | | | | | | | 228 | 229 | 229 | 229 |
| HFCs | | | | | | | 90 | 66 | 53 | 44 |
| PFCs | | | | | | | 3 | 3 | 3 | 3 |
| $SF_6$ | | | | | | | 7 | 5 | 4 | 4 |
| Other ($NF_3$) | | | | | | | 0.1 | 0.1 | 0.1 | 0.1 |
| **Memo items** | | | | | | | | | | |
| *Memo item: international aviation* | | | | | | | 146 | 155 | 163 | 171 |
| *Memo item: international navigation* | | | | | | | 151 | 159 | 167 | 174 |

Notes

1. The EU's greenhouse gas projection is the result of an aggregation of Member States individual GHG projections. Member States had to submit these projections under the MMR in March 2015.
2. The preparation of the projections takes considerable time. It is therefore likely that the F-Gas Regulation which was adopted in 2014 could not be considered within individual greenhouse gas projections. Therefore its anticipated effects are not completely reflected in the EU's greenhouse gas projection.

### 5.1.2. *Total aggregate GHG emission projections per sector*

From a sectoral perspective, Figure 5-2 shows that the largest share of GHG emission reductions are from the energy sector. The emissions from the energy sector shown in Figure 5-2 do not include emissions from the transport sector. The energy sector also contributes the most to aggregate GHG emissions. The transport sector makes the second largest contribution to aggregate GHG emissions, followed by agriculture, industrial processes and product use (IPPU) and waste. This is the same for both WEM and WAM.

Energy sector (without transport) emissions are projected to decrease by 36.5 % compared to 1990 in 2020 and by 41.8 % up to 2030 under the WEM, and 37.1 % in 2020 and 44.0 % in 2030 under the WAM scenario. In general, EU-28 GHG emissions from the energy sector show a gradual downward trend from 1990 to the present day, with a short and steep decrease during the financial crisis (2008-2009), after which they increased again somewhat and then continue with the downward trend also in projections. These decreases can be explained by a variety of factors but are mainly due to increased use of renewables, fuel switching to gas (which also has reduced fugitive $CH_4$ emissions from coal mining), increased energy and technical efficiency and decreases in fuel combustion in manufacturing industries. In the Eastern Member States, construction and restructuring of industry have also played a role in reducing emissions. However, such reductions have been counteracted by increased housing stock and growth in the services sector, resulting in increased demand for energy services in buildings and homes, and in particular, strong growth in demand for electricity to provide these. Recent economic growth in the Eastern Member States is reflected in increased demand for energy services. Projections for the sector anticipate that emissions from energy will further decrease due to the effects of existing policies and measures.

The only sector which is projected to exhibit 2020 GHG emissions larger than 1990 is the transport sector. After 2007 a slow but steady decline in transport emissions is visible, due to a combination of higher fuel prices and more stringent policies, such as stricter $CO_2$ emission standards for cars and vans. Under the WEM scenario GHG emissions from the transport sector[63] are projected to be 13.8 % higher than 1990 levels in 2020 and 13.4 % higher in 2030, under the WAM scenario 12.7 % higher in 2020 and 9.9 % higher in 2030.

Process and product related GHG emissions from the industry sector are projected to decrease by approximately 27.8 % in 2020 compared to 1990, and decrease by 34.3 % by 2030 under the WEM scenario. Under the WAM scenario this would be 28.0 % in 2020 and 34.7 % in 2030.

GHG emissions are projected to steadily decline in the agriculture sector. Compared to 1990, emissions in 2020 are projected to have declined by 21.3 % in 2020 and by 21.5 % in 2030 under the WEM scenario, by 22.0 % in 2020 and 22.4 % in 2030 under the WAM scenario. Changes in agricultural policy and farming subsidies as well as increased productivity have driven reduced animal numbers, reduced nitrogen fertiliser production and use and improved manure management resulting in reduced emissions from agricultural soils and livestock.

63 The transport sector as reported here does not include international aviation. According to the IPCC 2006 Guidelines for national GHG inventories, international aviation is to be reported as memo item. We therefore present the GHG emission development in the international aviation sector individually further below.i

GHG emissions are projected to steadily decline in the waste sector. Compared to 1990, emissions in 2020 are projected to have declined by 51.2 % and declined by 58.9 % in 2030 under the WEM scenario and by 51.4 % in 2020 and 60.0 % in 2030 under the WAM scenario. Past and future emission decreases can largely be attributed to successful waste legislation. Examples of this include increased recycling, bans on landfilling, landfill taxes and methane recovery from treated wastewater and landfill. In particular, the Landfill Directive (see Section 4.8.3) has established objectives for the progressive reduction of biodegradable waste to landfill by 25 % within five years of Member State implementation of the Directive, by 50 % within eight years, and by 65 % within fifteen years, compared to 1995 levels.

Emissions from international aviation are projected to continue to increase, reaching 109.7 % above 1990 levels by 2020, and 135.1 % above 1990 levels by 2030 under the WEM scenario and 110.2 % in 2020 and 135.6 % in 2030 under the WAM scenario.

Emissions from international shipping are projected to increase as well, however far less steeply than for international aviation. In 2020 levels are projected to 55.0 % above 1990 levels, and in 2030 72.1 % above 1990 levels under the WEM scenario. Under the WAM scenario emission levels are projected to be 37.0 % above 1990 levels in 2020 and 51.2 % in 2030.

**Figure 5-2 EU-28 GHG emissions per sector in the WEM scenario**

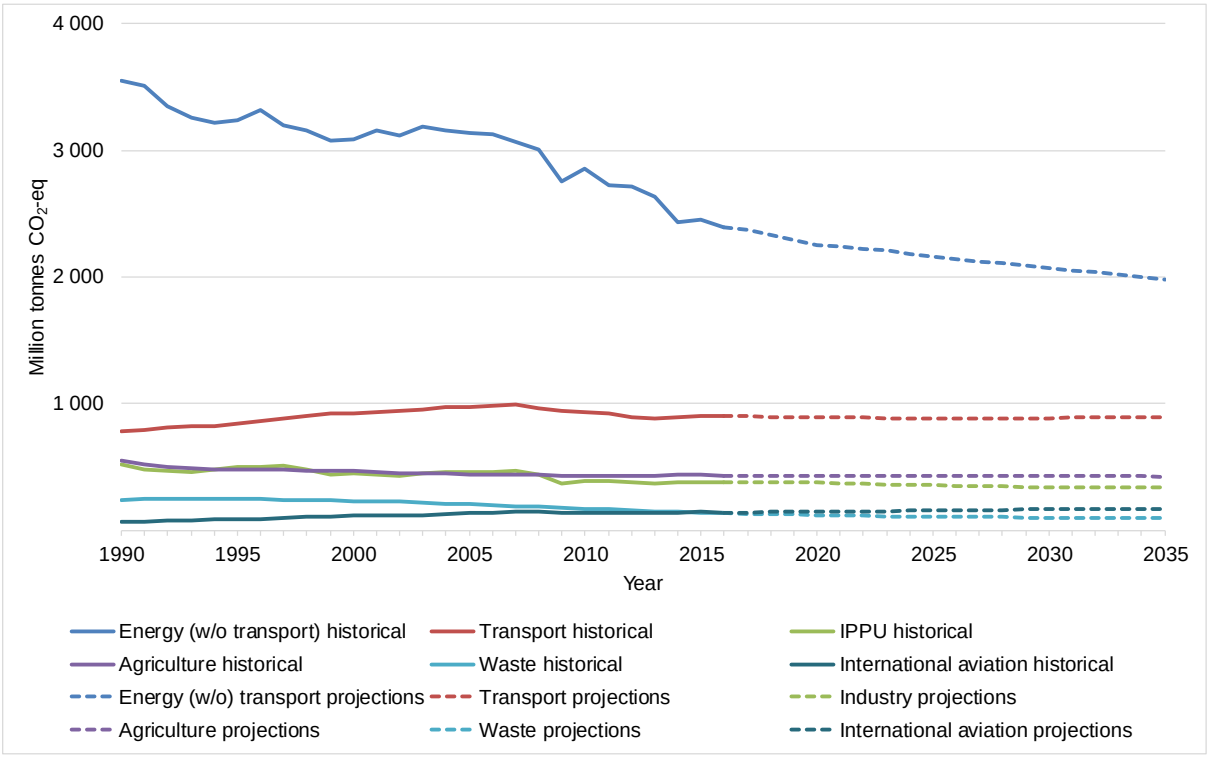
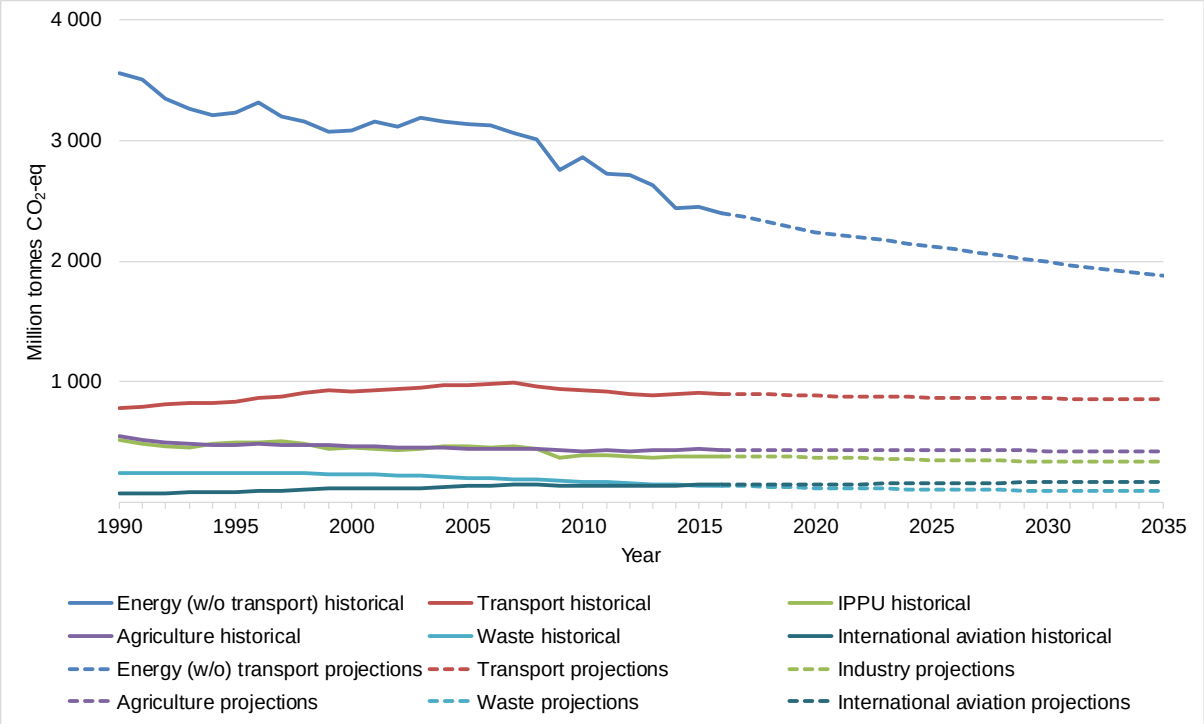


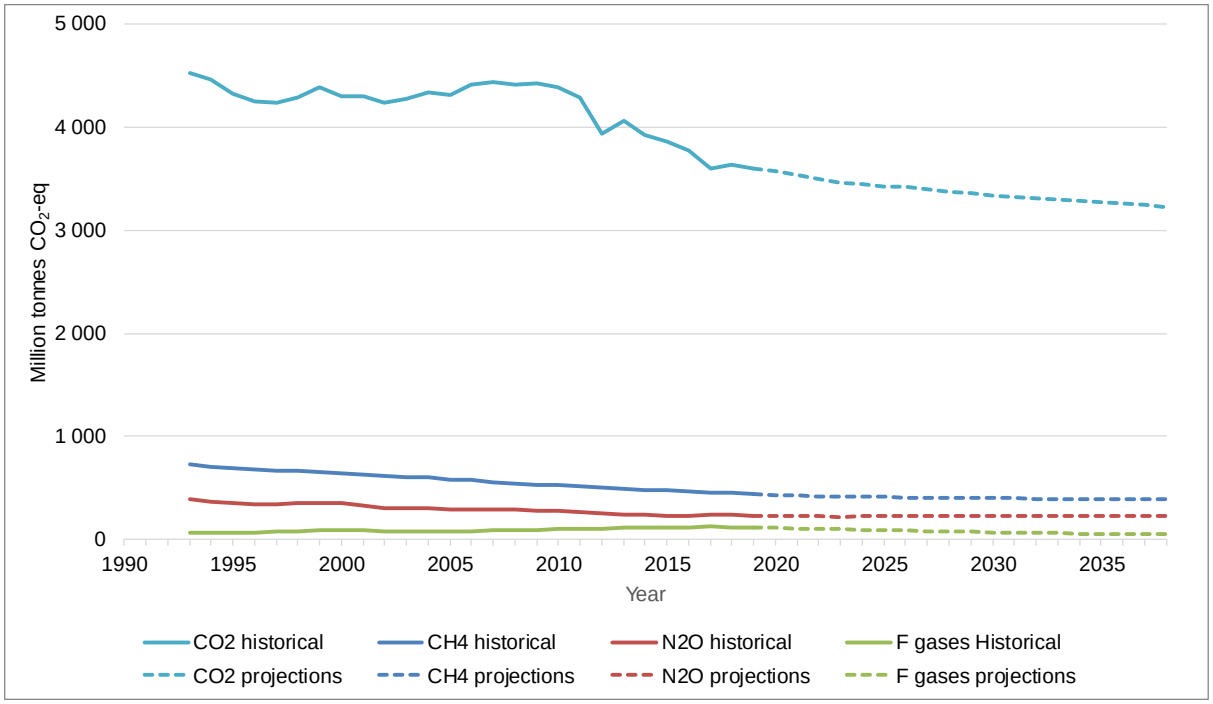
**Figure 5-3 EU-28 GHG emissions per sector in the WAM scenario**

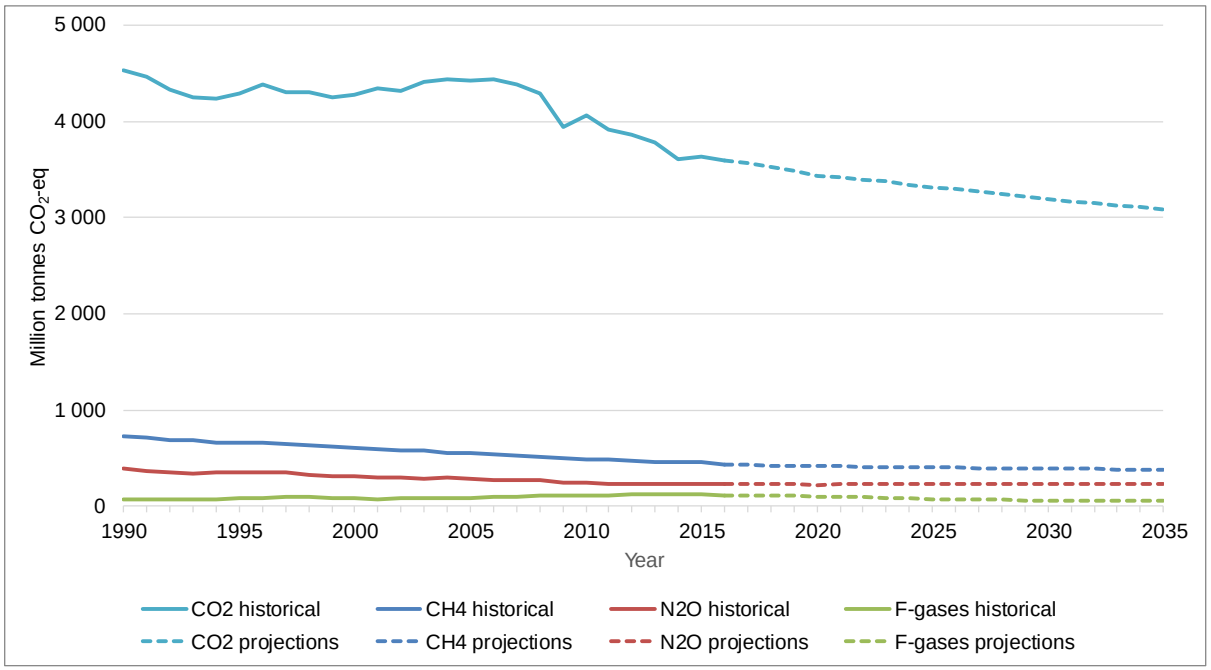



### 5.1.3. *Total aggregate GHG emission projections per gas*

Figure 5-4 below illustrates the expected change in emissions from individual greenhouse gases between 1990 and 2030 under the WEM scenario. F-gases are presented as a group, the development for individual F-gases is presented in Table 5-1 above.

**Figure 5-4 EU-28 GHG emissions per gas in the WEM and WAM scenario**




The major contributor to current GHG emissions in the EU-28 is $CO_2$ with around 82.2 % of total emissions in 2020 under the WEM scenario, followed by emissions of $CH_4$ with 9.9 %, $N_2O$ with 5.5 % and F-gases 2.4 % for the same year and scenario. These shares remain roughly the same over the timeline in both the WEM and WAM scenario.

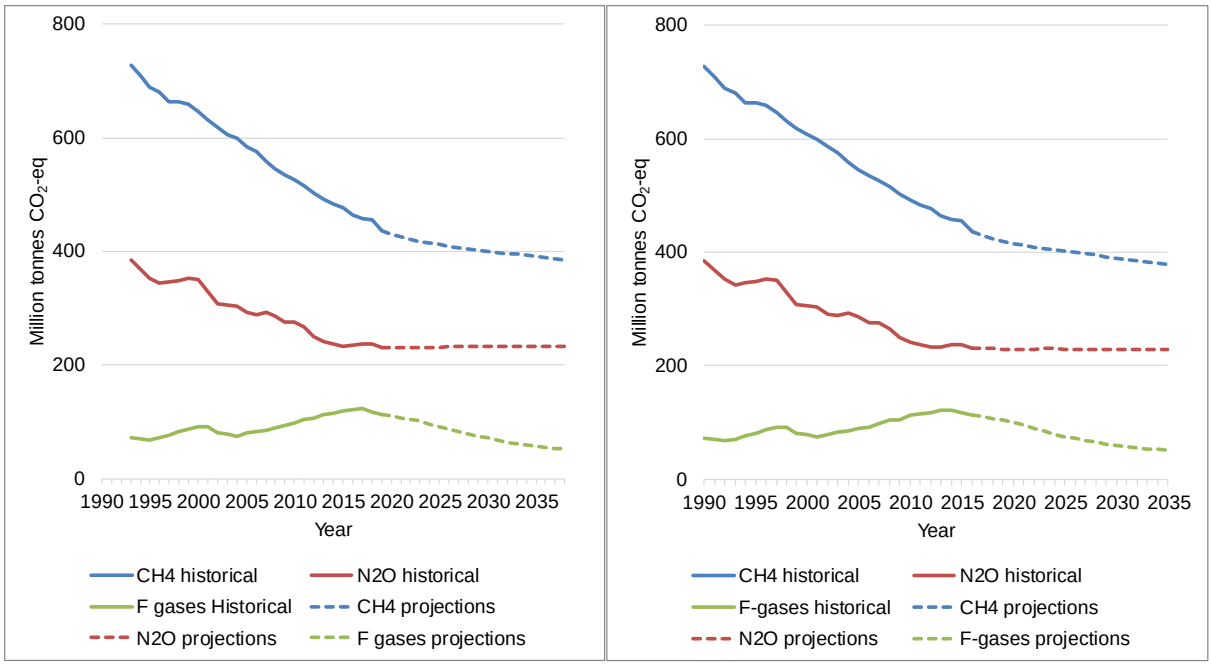
$CO_2$ emissions are projected to decline by approximately 23.5 % compared to 1990 in 2020 and by about 27.1 % by 2030 under the WEM scenario and by approximately 24.1 % compared to 1990 in 2020 and by about 29.5 % by 2030 under the WAM scenario.

Emissions of $CH_4$ steadily declined in the past and are projected to do so in the future, although at a slightly slower pace. Emissions will be 42.7 % below 1990 in 2020 and 45.8 % in 2030 under the WEM scenario and 43.0 % below 1990 in 2020 and 46.4 % in 2030 under the WAM scenario.

Emissions of $N_2O$ are projected to stabilise with an indication of a very slight increase by 2030. Emissions will be 40.1 % above below 1990 in 2020 and 39,5 % in 2030 under the WEM scenario and 40.8 % below 1990 in 2020 and 40.5 % in 2030 under the WAM scenario.

F-gas emissions have been steadily rising between 2000-2014, driven mainly by the use of HFCs in refrigeration and air conditioning. However, the projections indicate F-gas emissions will steadily decrease up to 2030 due to the implementation of EU F-Gas legislation, achieving a level of 41.2 % above 1990 levels under the WEM scenario in 2020 and a level of 14.9 % under the same scenario in 2030. For the WAM scenario emissions fall only slightly quicker with 40.5 % above 1990 levels in 2020 and 17.0 % below 1990 levels in 2030. The contributions of the various F-gases to these overall developments differ. As contribution of F-gases to the 2020 EU GHG emission total is relatively small at 2.4 % in 2020 under the WAM scenario and the contribution is projected to remain roughly at this level over time in both scenarios, the projected decline in F-gas emissions will have only a small effect on the projected decline in total GHG emissions at EU level.

**Figure 5-5 EU-28 GHG emissions per gas in the WEM and WAM scenario – $CH_4$, $N_2O$ and F-gases only**



## 5.2. **Supplementarity**

As an additional means of meeting commitments under the Kyoto Protocol (KP), Parties may use three market-based mechanisms to lower the overall costs of achieving emission targets for the commitment period: project-based mechanisms in industrialised countries (Joint Implementation - JI); the Clean Development Mechanism (CDM) in developing countries; and international emissions trading IET, which allows countries that have achieved emission reductions beyond those required by the KP to sell their surplus Kyoto units to countries finding it more difficult or expensive to meet their commitments. Use of these mechanisms must be 'supplemental to domestic action' to achieve KP targets. The three mechanisms are often referred to as flexible mechanisms.

For the EU-28 the maximum use of flexible mechanisms in the framework of the two most important cross-sector measures, the Emission Trading Scheme (ETS) and Effort Sharing Decision (ESD) is described in Section 2.2.2.3.

As the chapter on projections only focuses on the development of GHG emissions until 2030, the question of supplementarity cannot be raised for this time horizon as no targets are finally defined and no final decisions are taken with regard to the (supplementary) use of Kyoto mechanisms.

## 5.3. **Methodology**

### 5.3.1. *Compilation of the EU projections*

The projections of GHG emissions for EU-28 are based on individual national projections of Member States' submissions to the European Commission under Regulation 525/2013/EU in 2015. The EEA's European Topic Centre on Air Pollution and Climate Change Mitigation (ETC/ACM) has compiled the national projections and applied QA/QC procedures to ensure consistency of the data reported by Member States (see Section 5.3.4). The reported scenario is documented in Section 5.1. The following points apply to the projections:

- Projections unless otherwise noted are reported excluding governmental use of Kyoto mechanisms and carbon sinks;
- The sector breakdown reported follows the structure of the CTF tables and includes: Energy (without transport), transport, industry/industrial processes and product use, Agriculture, Forestry and Other Land Use (AFOLU) (without FOLU), and waste;
- The gases which are covered are: $CH_4$ emissions excluding FOLU, $CO_2$ emissions excluding FOLU, $N_2O$ emissions excluding FOLU, and total F-Gases;
- Figures represent historic GHG emissions up to 2014, projections are represented starting 2015.

### 5.3.2. *Projection methodology*

Information presented in Section 5.1 for the EU-28 is derived through an aggregation of individual Member State projections. Detailed descriptions of the methodologies used to generate individual Member State projections, further information on their sensitivity

analyses and their key parameters and assumptions are presented in individual Member State Biennial Reports. The EU-28 GHG projection has been aggregated using Member States' submissions to the European Commission under Regulation 525/2013/EU in 2015.

### 5.3.3. *Key parameters and assumptions*

The key parameter assumptions of individual Member States are documented in their national projection methodologies, and reported in their biennial reports. Where appropriate, the information has been aggregated to create information for the EU-28. To improve the consistency of Member State projections, the Commission provided Member States with recommended values for the evolution of the EU ETS $CO_2$ price, and, for international fuel import prices.[64] It also provided default values for GDP growth rates and population. The use of these parameters and assumptions by EU Member States is voluntary. These values as well as weighted averages of the assumptions used by the EU Member States are presented and compared in section 5.3.8.

### 5.3.4. *QA/QC procedure*

The QA/QC procedures applied to the projections data follow a clear and thorough EU QA/QC procedure. These procedures follow the core IPCC principles of QA/QC that apply to historical inventories. The procedures are required under Regulation (EU) No 525/2013 and are set out in "Elements of the Union System for Policies and Measures and Projections and the Quality Assurance and Control (QA/QC) Programme"[65]. The procedures are also described in the 2015 ETC technical report "Quality assurance and quality control procedure for national and Union GHG projections". A summary is provided in the paragraphs below.

The EEA's European Topic Centre for Air Pollution and Climate Change Mitigation (ETC/ACM) has compiled the national projections as submitted by the EU Member States under the MMR and applied quality assurance and quality control (QA/QC) procedures. These procedures consist of a number of checks against quality criteria such as completeness, consistency, comparability, accuracy and transparency of reported data.

A number of qualified ETC/ACM reviewers are used to review the projections. If the quality checks showed that the submission did not follow the quality criteria, the ETC/ACM reviewer sought explanation in the accompanying documents submitted by Member States. If no explanations could be found, the reviewers asked Member States projection experts to provide clarification or correct the dataset as necessary. If Member States did not provide the requested information, the ETC/ACM proceeded with corrective actions which consist of filling identified data gaps and performing error corrections and the reference year calibration. Such corrective actions are essential to ensure the quality of projections data used in the annual reports of the Commission and the EEA. The EU-28 emission projections presented here conform to the EEA's and European Commission's 2017 reports on progress towards the 2020 GHG target[6667].

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64 European Commission. Recommended parameters for reporting on GHG projections in 2017. *Final, 14/06/2016*.

65 https://ec.europa.eu/clima/sites/clima/files/strategies/progress/monitoring/docs/union_pams_projections_en.pdf

66 European Environment Agency. Trends and projections in Europe 2016 - Tracking progress towards Europe's climate and energy targets. 2016.

### 5.3.5. Changes in methodologies

The methodologies to report on greenhouse gas projections remained unchanged to the second Biennial Report from the European Union under the UNFCCC (see EU 2BR, Section 4.1.4.2). The QA/QC procedure remains unchanged as well.

### 5.3.6. *Sensitivity Analysis*

Under Article 14 of Regulation 525/2013/EU Member States are required to report on results of a sensitivity analysis of their greenhouse gas projections. This is a mandatory reporting requirement, and EC recommended MS which used different assumptions for key parameters than those recommended by EC (see above) to use the latter for sensitivity analysis. However, this is voluntary and the divergence only applies to some MS. As a consequence, Member States' sensitivity analyses are based on different assumptions and methodologies, and take into account different national circumstances and structures. It is thus not meaningful to aggregate the results of individual Member State sensitivities into an EU-28 sensitivity projection scenario. Information about sensitivity analyses at Member State level is reported in individual Biennial Reports of the Member States. Thus, instead of a sensitivity analysis for the aggregate projections, a cross-check or benchmarking with an alternative modelling exercise seems to be more useful for the EU projections.

A Reference Scenario has been developed by the EC in consultation with the Member States, to provide insights about how current trends and existing policies translate into EU-28 projections. This was published by the Directorates-General Energy, Climate Action and Mobility and Transport in 2016[68]. The EU Reference Scenario 2016 is comparable with the projection for the WEM scenario.

A comparison of key parameters used is shown in section 5.3.3 and results between the two different approaches are shown in section 5.3.9.

### 5.3.7. *The EU Reference Scenario 2016*

The EU Reference Scenario 2016 (Reference Scenario) covers the EU energy system, transport and GHG emission developments from all sectors. It includes specific sections on emission trends not related to energy, and on the various interactions among policies in these sectors.

The time horizon is up to 2050, based on five year steps. The Reference Scenario includes all EU-28 Member States individually. Similar as the national WEM projections the policies agreed at EU and Member State level will be implemented, with December 2014 being used as cut-off date for adopted policies. This includes the assumption that legally binding targets for 2020 will be achieved, i.e. the national renewable energy targets (unless indicated otherwise by the MS) and the 2020 GHG target for the non-ETS sectors at EU level (given national flexibilities), which turned out to be the case with adopted policies.

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67 European Commission. Implementing the Paris Agreement - Progress of the EU towards the at least -40% target. (COM(2016) 707 final). 2016. http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52016DC0707&from=EN

68 European Commission. EU Reference Scenario 2016: Energy, transport and GHG emissions - Trends to 2050. 2016. https://ec.europa.eu/energy/sites/ener/files/documents/20160713%20draft_publication_REF2016_v13.pdf

The Reference Scenario is based on the latest available statistical data from Eurostat at the time of the modelling. The "2015 Ageing Report" has been the starting point of this exercise giving long term population and GDP growth trends while the short and medium term GDP growth projections were taken from DG ECFIN. Fuel price and technology trends have been updated as necessary based on more recent evidence.

The development of the Reference Scenario involved interactions with Member State experts at various stages of the process, organised via a specific European Commission Reference Scenario expert group. The work started from a detailed policy questionnaire. Consultation with experts from the Member States on draft outcomes of the core modelling and projections was conducted and written replies were provided by the vast majority of Member States.

The modelling suite used for the Reference Scenario is based on a series of interlinked models which combine technical and economic methodologies (as shown in Figure 5-6). The models have been peer-reviewed and/or have been used for numerous publications in peer-reviewed journals. The models produce detailed projections per sector and per country and use updated databases. Calibration ensures continuity between historical data and projections.

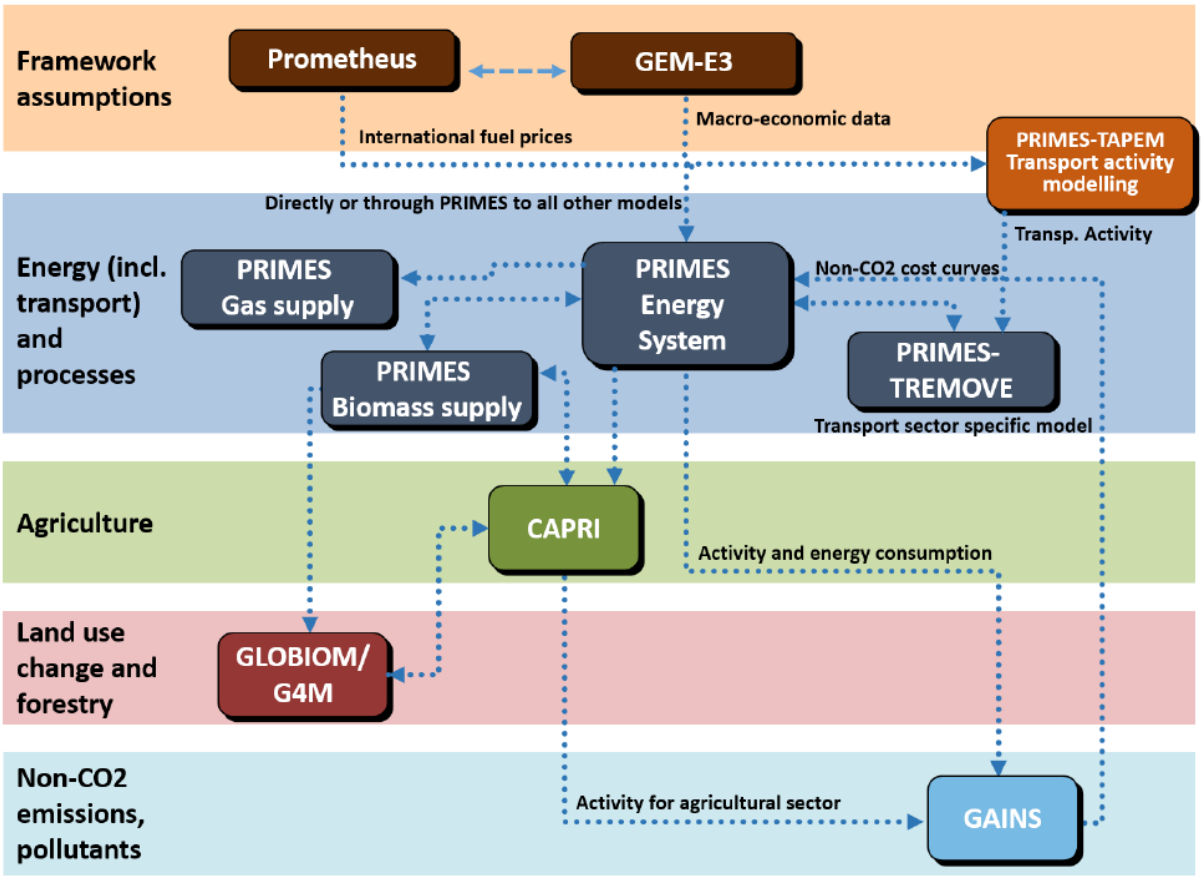
#### 5.3.7.1. The Models

Models only represent the real world as defined in the respective simplifying assumptions. Moreover, each projection into the future is subject to significant uncertainties.

The PRIMES modelling suite was the core element of the modelling framework for transport, energy and $CO_2$ emission projections. The GAINS model was used for non-$CO_2$ emission projections and the GLOBIOM- G4M models deployed for LULUCF emission and removal projections, further supported by some more specialised models. The GEM-E3 macroeconomic model was used for value added projections by branch of activity. In addition, the PROMETHEUS global energy model was deployed for projections of world energy prices and the CAPRI model for agricultural activity projections. For details on the latter specialised models see the referred Reference Scenario publication.

The model interactions are displayed in Figure 5-6.

**Figure 5-6 Model interactions**




**PRIMES Energy system model**

PRIMES Energy system model, operated by ICCS/E3MLab, covers in detail energy demand, energy supply, energy markets, $CO_2$ emissions from energy combustion and $CO_2$ emissions from industrial processes, and it represents policy measures, technologies, means for emission reductions in all sectors, and evaluates cost of emission reduction. PRIMES uses as inputs macroeconomic and multi-sectorial projections from GEM-E3 and projections of world energy prices from PROMETHEUS. PRIMES conveys projections to GAINS, GEM-E3 and CAPRI. Within this Reference Scenario process the PRIMES model provides the energy system projection for demand and supply side sectors including full energy balance, investment costs, prices and related $CO_2$ emissions per country. Further it calculates total GHG emissions using inputs of other models on non-$CO_2$ GHG emissions (GAINS).

**GAINS**

The GAINS model, operated by IIASA, covers projections of air pollution and non-$CO_2$ GHG, including costs of emission reductions and projections of atmospheric emissions. GAINS allows exploring trade-offs and synergies between GHG emission reductions and air pollution. The model also evaluates and projects atmospheric dispersion, air quality impacts, health impacts, impacts on ecosystems, and climate impacts. Moreover, it assesses costs of abatement strategies. The model takes inputs from PRIMES, PRIMES-TREMOVE, and

CAPRI, and produces outputs for use by other models, e.g. PRIMES. For the Reference Scenario, GAINS provides non-$CO_2$ GHG and air pollutant emissions.

**GLOBIOM/G4M**

GLOBIOM/G4M model, operated by IIASA, provides projections for EU LULUCF $CO_2$ emissions/removals. It consists of a global economic agricultural and forest sector model (GLOBIOM) linked with a detailed forest model (G4M). For the EU, GLOBIOM/G4M receives important inputs from GEM-E3, PRIMES-biomass and CAPRI models while POLES provides bioenergy demand projections for the global analysis. For the EU agricultural sector, GLOBIOM is aligned with the CAPRI model to ensure consistency in Reference scenario projections.

### 5.3.8. *Key parameters used*

The key parameters and assumptions of the EU Reference Scenario 2016 are presented in Table 5-2 below. These are the same parameters as provided to the EU Member States as recommended standardised assumptions for the projections to be submitted in March 2017.

The use of these parameters and assumptions by EU Member States is voluntary. In national projections these assumptions were used to varying extents. In cases where Member States have not used the recommended values and had used their own national assumptions, Member States were invited to use the recommended values for sensitivity analyses of their projections. For documentation of the EU-28 projection, key parameters have been derived as weighted averages or sums of the values of key parameters as reported by Member States. These are shown in CTF Table 5 as well as in below.

EU MS assumptions related to population, GDP, international gas and coal prices as well as EU ETS carbon prices are overall broadly similar to the assumptions provided by the EU Commission, with some non-systematic differences for single projection years. ETS carbon prices in 2020 are around 13 % lower and in 2030 around 7 % higher. GDP is 7 % higher in 2030 and 9 % in 2035. MS on average assume a higher international oil price, which is around 39 % higher in 2020 and 53 % higher in 2035.[69] On this basis, the EU Commission's recommendations for projection assumptions seem to generally function well as a soft coordination mechanism.

**Table 5-2 Standardised projection assumptions used for the EU Reference Scenario 2016**

| Parameter | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|
| GDP (million EUR)/2013 | 14 549 911 | 15 584 576 | 16 682 321 | 17 977 449 |
| Population (Mio.) | 510.0 | 513.2 | 516.9 | 518.4 |

69 This does not stem from the fact that EU Member States uniformly assume a higher international oil price. Instead, the assumptions used by the EU MS vary widely. Taking 2025 as an example, the lowest value assumed by EU Member States amounts to less than half and the highest value more than three times the value suggested by the EU Commission.

| Parameter | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|
| International coal price (Euro (2013)/GJ) | 2.2 | 2.6 | 3.2 | 3.4 |
| International gas price (Euro (2013)/GJ) | 7.5 | 8.1 | 8.8 | 9.4 |
| International oil price (Euro (2013)/GJ) | 11.6 | 13.2 | 14.5 | 15.1 |
| $CO_2$-price ('EUR (2013) /t$CO_2$) | 15.0 | 22.5 | 33.5 | 42.0 |

**Table 5-3 Weighted averages of projection assumptions used by the EU Member States**

| Parameter | 2020 | 2025 | 2030 | 2035 |
|---|---|---|---|---|
| GDP (million EUR)/2013 | 14 806 022 | 15 505 440 | 17 816 533 | 19 597 094 |
| Population (million) | 514.2 | 518.3 | 521.4 | 524.3 |
| International coal price ('EUR (2013) / GJ) | 2.3 | 2.8 | 3.4 | 3.5 |
| International gas price ('EUR (2013) / GJ) | 7.5 | 8.5 | 9.5 | 10.2 |
| International oil price ('EUR (2013) / GJ) | 16.1 | 19.2 | 22.2 | 23.1 |
| EU ETS price ('EUR (2013) /t$CO_2$) | 13.0 | 22.0 | 35.9 | 43.4 |

### 5.3.9. *Results*

Figure 5-7Figure 5-7 below shows a comparison of total aggregate GHG emissions on EU-28 level for the WEM and WAM projections as well as the EU Reference Scenario 2016.

The EU Reference Scenario 2016 starts in 2015, which is a projected year in this scenario, at a higher point GHG emission level than the WEM and WAM projections, roughly 130 Mt $CO_2$-eq or 3 %. Until 2020 The EU Reference Scenario 2015 and the WEM fall at a similar pace, with the WAM falling only slightly more slowly. In this timeframe emissions under the EU Reference Scenarios 2016 remain higher than under the WEM and WAM, with the difference in emission levels reduced to 1.5 % (WEM) and 2.3 % (WAM) in 2020. From 2020 onwards GHG emissions levels under the EU Reference Scenario 2016 fall more rapidly than under the WEM and WAM scenario and are thus lower than GHG emission levels under the WEM from 2023 onwards and lower than under the WAM from 2026 onwards. In 2030 emission levels under the EU Reference 2016 Scenario are projected to be 6.4 % lower than emissions under the WEM and 3.6 % lower than emissions under the WAM scenario, increasing to 9.9 % and 6.1 % respectively by 2035.

**Figure 5-7 Total aggregate EU-28 GHG emissions in the EU-reference scenario 2016[70], WEM and WAM (please note that the y-axis starts at 3000 Million t CO2-eq)**

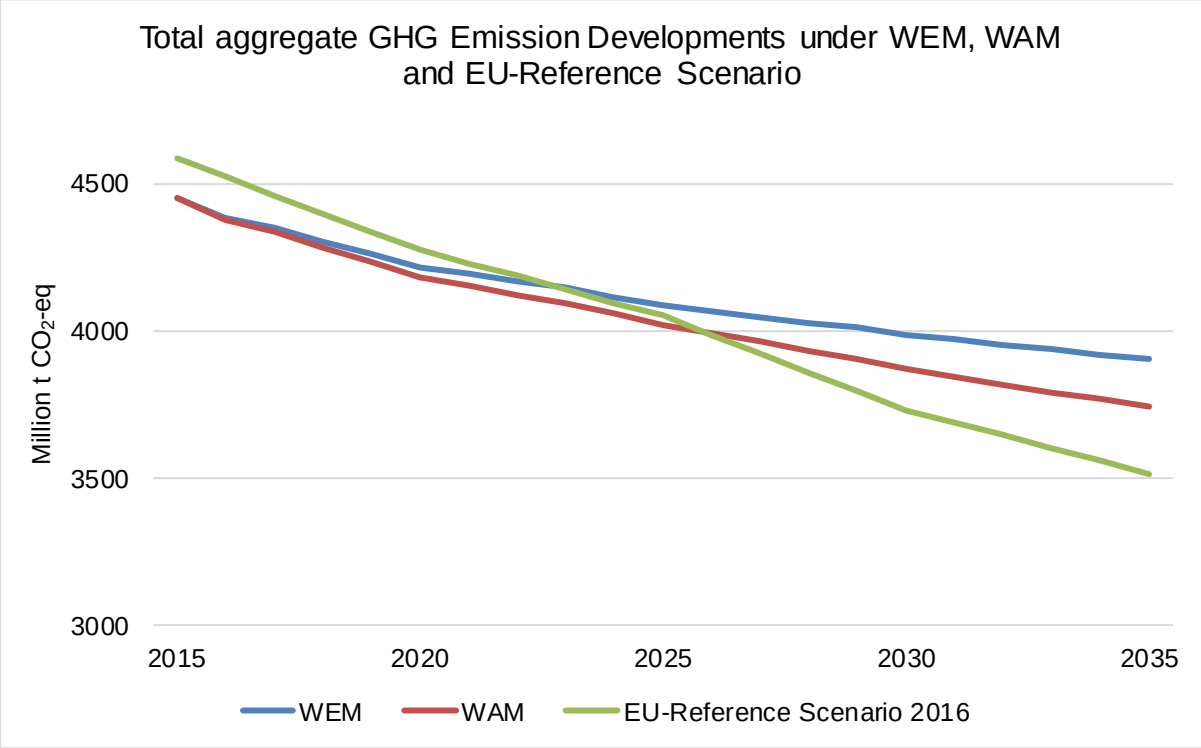



Figure 5-8 and Figure 5-9 below show a comparison of the developments per gas. The development of $CO_2$ emissions under the three scenarios is presented in Figure 5-8. The trends are nearly identical to the overall GHG emission trends in the three scenarios shown in Figure 5-7. Trends for $CH_4$, $N_2O$ and the f-gases, which are shown for the EU Reference Scenario 2016 and the WEM scenario in Figure 5-9[71] show limited GHG reductions. Total GHG trends in all three scenarios are clearly driven by the $CO_2$ trend. Trends for the other gases show strong alignment in both level and trend for the EU Reference Scenario 2015 and the WEM. $CH_4$ emissions under the EU Reference Scenario 2016 fall at a slightly quicker pace than under the WEM until 2020.

70 EEA Report No 29/2016 (2016). Trends and projections in Europe 2016 - Tracking progress towards Europe's climate and energy targets. https://www.eea.europa.eu/publications/trends-and-projections-in-europe

71 Trends for Ch4, N2O and the f-gases are not presented for the WAM, as developments for these gases are very similar for the Wem and the WAM scenario.

**Figure 5-8 EU-28 CO2 emissions under the EU Reference Scenario 2016 and the WEM scenario** (please note that the y-axis starts at 2500 million tonnes CO2-eq)

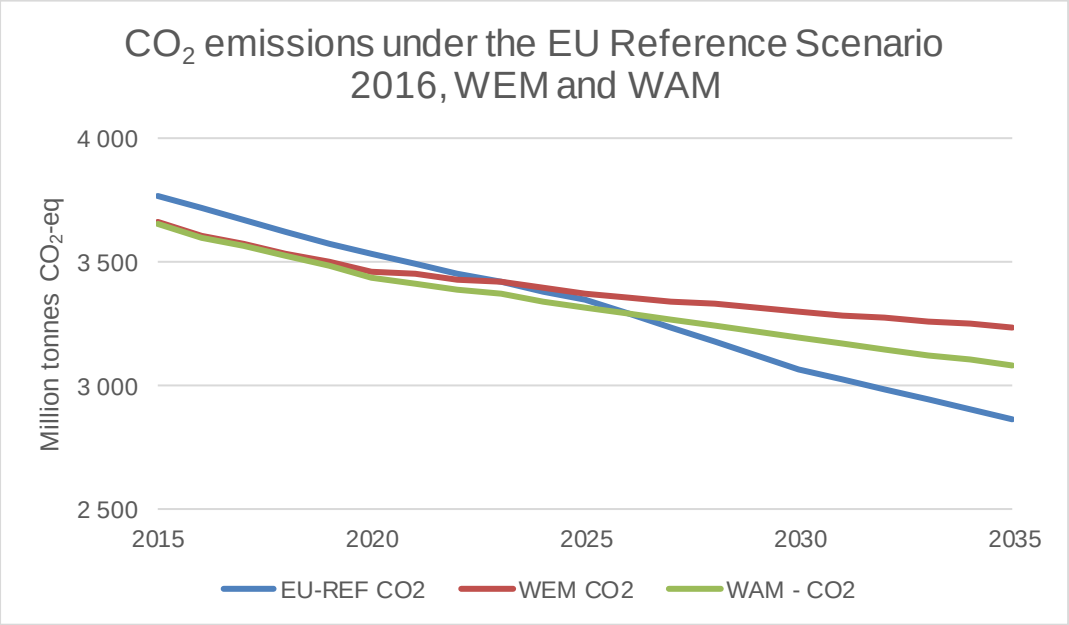
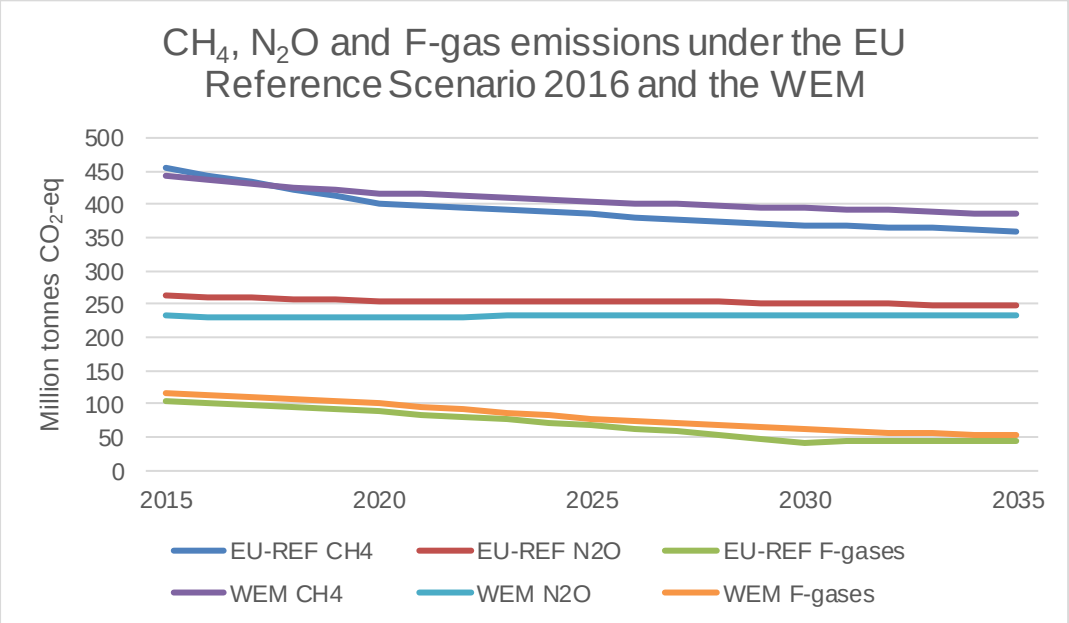



**Figure 5-9 EU-28 CH4, N2O and f-gases under the EU Reference Scenario 2016 and the WEM scenario**




The following paragraphs discuss possible reasons for the two key differences between the EU Reference Scenario 2016 and the WEM/WAM: the higher starting point and the faster pace in total GHG reduction.

Differences in the modelling approach are always likely to lead to a small level of difference in modelling results. The modelling for the EU Reference Scenario builds on a complex, highly integrated approach using a number of sub-models, while the WEM/WAM projections in many MS use a considerably less complex approach. These smaller differences might have been increased by using data from different years as the starting point for the modelling. The WEM and WAM projections build on GHG emissions levels from the most recent available national GHG inventory year (2014) as starting point. The modelling for the EU Reference Scenario was finalised roughly a year earlier than the WEM/WAM modelling and thus relies on less recent data. At the same time, GHG emissions in the EU-28 fell by 4 % in 2014 compared to 2013, a considerably larger decrease than in 2012 and 2013, where emissions fell only by 1.4 % and 2.1 % compared to the respective previous years.

The faster pace of reduction after 2020 might be attributed to a number of reasons. The EU reference scenario includes EU measures which have been adopted recently, and which might not be fully covered by all national projections, or which national projections cover in a more conservative way. This might notably be the case for revised F-gas regulation of 2014, which is expected to lead to F-gas emission reductions by 2030 of more than two thirds. For those national projections underpinning the WEM projection that focus on the 2020 time frame and project post 2020 emissions in a simplified way, effects of recent EU-regulation expected to occur only after 2020 might not be fully covered. These could include the revised Energy Performance of Buildings Directive and the $CO_2$ and Cars Regulation, both supposed to achieve their major emission impact post 2020.

The assumptions used by the EU Member States might also play a role. Higher assumptions for oil and ETS prices would likely lead to lower modelled emissions. Higher values for EU-28 were used for the later projection years, which is likely to lead to higher modelled emissions. Emission increases stemming from the higher GDP assumptions could potentially have outweighed reductions from higher ETS and oil prices.

When comparing the EU Reference Scenario to the WAM scenario it is important to consider that where EU MS have not submitted a WAM scenario, WEM data was used for gap-filling. This means that the resulting EU-level WAM scenario does not reflect the use of additional measures in all EU MS and therefore does not explore the full reduction potential for these additional measures.

## 5.4. **Quantified progress to 2020 targets**

For the quantification of the progress to the EU 2020 target under the UNFCCC, the development of GHG emissions is the key indicator. The Convention target of a reduction of emissions by 20 % from 1990 to 2020 refers to the emissions of the EU-28 as a whole. GHG emissions of the EU-28 are calculated as the sum of Member States' emissions. The trend in GHG emissions of the EU-28 is shown in Section 5.1 above. Considering the scope of the EU 2020 target (which excludes LULUCF, but includes international aviation) the 2015 emissions are at 22.1 % below the 1990 emission level, which means that EU-28 is well on track to reach its Convention target.

In the context of the EU's third Biennial report to the UNFCCC, reporting on progress on targets is standardized in the Common Tabular Format (CTF) Tables 4, 4a and 4b. **Error! Reference source not found.** below corresponds to CTF Table 5. Tables 4a and 4b are not

presented for the EU's 3BR. This is because Table 4a provides information on land-use, land-use change and forestry, which is not included in the EU's target under the Convention. Table 4b provides detailed information on the number of ERUs, CERs and other units used. The information required for Table 4b is not available at the necessary level of detail, i.e. differentiating between the amounts of certified emission reductions (CERs) and emission reduction units (ERUs) used.

**Table 5-4 EU Reporting on progress (CTF Table 4)**

| | Unit | Base Year | 2011 | 2012 | 2013 | 2014 | 2015 | Comment |
|---|---|---|---|---|---|---|---|---|
| Total (without LULUCF)[72] | Mt $CO_2$ eq | 5 716 | 4 759 | 4 693 | 4 599 | 4 424 | 4 452 | Total GHG including domestic and international aviation, indirect $CO_2$, excluding LULUCF and $NF_3$ |
| Contribution from LULUCF | Mt $CO_2$ eq | NA | NA | NA | NA | NA | NA | Not applicable: Numbers for LULUCF are not reported because this sector is not included under the Convention target |
| Market-based mechanisms under the Convention[73] | Number of units in millions / Mt $CO_2$ eq | NA | 254 | 504 | 133 | 257 | 23 | |
| Other market-based mechanisms | number of units / Mt $CO_2$ eq | NA | NA | NA | NA | NA | NA | Not applicable: No "other" market based mechanisms are in use. |

72 http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/euc-2016-nir-21jun16.zip

73 European Environment Agency. Trends and projections in the EU ETS in 2016: The EU Emissions Trading System in numbers. 2016. http://www.eea.europa.eu/publications/trends-and-projections-EU-ETS-2016. This is the total number of international credits that were used/surrendered by operators under the EU ETS during the period, hence may not reflect the EU 28 as NO, IS, LI are in EU ETS.

Emissions and sinks in the LULUCF sector are not included under the Convention target; therefore, they are not included in CTF tables related to progress to the Convention target. Emissions in this sector are only accounted under Kyoto targets. In the first Kyoto commitment period the LULUCF sector has been a net sink for the EU-28 due to a total emission removal of 381 Mt $CO_2$-equivalent (76 Mt $CO_2$-equivalent per year)[74]. It is expected that the LULUCF sector continues to remain a sink for EU-28 throughout CP2.

The use of flexible mechanisms takes place on the one hand by operators in the EU ETS, on the other hand by governments for the achievement of Effort Sharing Decision targets (see section 2.2.2.3). Under the EU ETS, since 2013, it is no longer possible to track the use of flexible mechanisms directly via information on the EU Transaction Log public website because CERs and ERUs are no longer surrendered directly. Rather they are exchanged into EUAs. These exchanges will become public on installation level after three years, with the first information reflecting the use in 2013 having become available in 2016. Aggregated data are however available for the timeframe 2013-2015. The 2016 compliance assessment under the ESD indicated that EU MS had not used any CERs or ERUs for compliance in the timeframe 2013-2015.

74 EEA 2014 Progress towards 2008-2012 Kyoto targets in Europe. http://www.eea.europa.eu/publications/progress-towards-2008-2012-kyoto

# 6. PROVISION OF FINANCIAL, TECHNOLOGICAL AND CAPACITY BUILDING SUPPORT TO DEVELOPING COUNTRIES

## 6.1. Introduction

This chapter includes information on financial, technological and capacity-building support provided by the EU to developing countries Parties to the UNFCCC Convention[75], during the period 2015 to 2016. EU support reported here comprises funds committed by EU institutions and the European Investment Bank (EIB). It does not include contributions by individual Member States, which can be found in each Member State's respective National Communication and Biennial Report. Detailed data on the support provided in 2015 and 2016 are included in the annexed Common Tabular Format (CTF) Tables 7, 8 & 9.

The methodology used to track financial support is outlined in Section 6.2. This includes details on how support has been categorised as 'new and additional', and how the purpose of the support has been defined as either mitigation, adaptation or cross-cutting.

## 6.2. The EU's approach to provision of climate finance, including the provision of new and additional resources

The EU tracks the provision of its climate finance through a project-based monitoring and reporting system. The system uses OECD Development Assistance Committee (DAC) Rio Markers to categorise and track the extent to which a project is deemed to provide climate finance, alongside more than 50 additional project markers that allow for further climate finance tracking, for instance by geographical location, economic sector, financial instrument or funding source. The financial resources reported in this Biennial Report are considered 'new and additional resources', meaning that they were committed after and not included in the previous National Communication or Biennial Report (i.e. committed in either 2015 or 2016). As EU budgets are determined on an annual basis, each annual commitment cycle represents new and additional resources.

This methodology, along with the process of allocating Rio Markers to projects and apportioning the resulting climate finance, is developed in detail in Section 6.2.3 'Methodology for tracking the provision of finance, technology and capacity building support', below.

### 6.2.1. *Addressing the needs of non-Annex I Parties*

The EU, EIB and its Member States when taken as a collective are the largest contributors of climate finance to developing countries, providing € 17.6 billion (approximately USD 20.7 billion) in 2015[76]. This figure includes climate finance sources from public budgets and other development finance institutions, € 1.5 billion from the EU budget and € 2.2 billion from the EIB[77]. This is up from € 14.5 billion in 2014 and € 9.5 billion in 2013[78]. The EU has

75 This includes non-Annex I countries as well as Annex-I countries with economies in transition (the Russian Federation, the Baltic States, and several Central and Eastern European States). Specifically, Annex-I countries with economies in transition included in the National Communication and Biennial Report are Belarus, Turkey, and Ukraine.

76 https://ec.europa.eu/clima/news/articles/news_2016102501_en

77 http://www.consilium.europa.eu/en/press/press-releases/2016/10/25-climate-change-finance/

78 https://ec.europa.eu/clima/policies/international/finance_en

established a framework of measures through which it provides climate finance to non-Annex I countries, and climate change is increasingly being integrated into the EU's broader strategy for development assistance.

In addition, as of July 2017, the EU as a collective was also the largest contributor to the Green Climate Fund (GCF) with a total of USD 4.7 billion committed (or 'signed'), accounting for almost half of the USD 10.3 billion already raised[79].

The Paris Agreement that arose from the Paris climate conference (COP21) in December 2015 established the vision for ongoing action on climate change. Prior to that, the EU played a lead role in mobilising funding and technical assistance for developing countries to support the preparation of their Intended Nationally Determined Contributions (INDCs). Following the ratification of the agreement, the EU is committed to playing its full part in an ambitious, durable and legally binding global climate agreement.

Many developing countries stress that climate finance will be vital to enable their Nationally Determined Contributions (NDC) delivery and to increase their level of ambition in the future. The Paris Agreement's objective of 'making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development' has therefore become the foundation for the EIB's contribution to low-carbon and climate-resilient development. In the lead-up to COP21, the EIB announced an increased target of 35 % of lending to developing countries by 2020[80].

The EU is committed to the Addis Ababa Action Agenda, which calls on developed countries to mobilise USD 100 billion of climate finance per year for developing countries by 2020. The Action Agenda includes measures to revise global finance practices and generate investment for tackling climate challenges. As part of the Paris Agreement, this goal was extended until 2025, prior to which a new goal will be set. The funding will come from a variety of public and private, bilateral and multilateral sources. The EU is calling for emerging economies to also contribute, in line with their respective capabilities and responsibilities, and has set out its strategy for mobilising more climate finance by 2020. To this end, at least 20 % of the EU budget will be spent on climate action by 2020. At least € 14 billion (an average of € 2 billion per year) will be public grants to support activities in developing countries between 2014 and 2020, and funding for international climate action will more than double (compared to the average level in 2012-2013).

The EU considers climate change a key point of engagement with developing countries, promoting discussion through the EU's Policy Dialogue fora and encouraging action through financial support. The EU recognises that action on climate change is most effective where support is designed and implemented in partnership with national governments. For this reason, the EU works closely with partner governments to strengthen their institutional capacity to develop climate policy, in line with their own national priorities.

The EU seeks to include national stakeholders in the design of bilateral support programmes so that they consider the partner country's or region's own development plans. This includes

79 http://www.greenclimate.fund/how-we-work/resource-mobilization

80 http://www.eib.org/infocentre/press/releases/all/2015/2015-223-eib-sets-new-35pct-target-for-climate-lending-in-developing-countries.htm

regional and sectoral plans such as National Adaptation Programmes of Action (NAPAs) and National Adaptation Plans (NAPs). The EU External Action Service (EEAS) develops strategy papers for countries (and regions), actions from which are implemented through yearly action plans. The EU also establishes and maintains strategic partnerships, such as the Africa-EU Strategic Partnership, and the Joint Declaration on Sustainable Energy (signed between the EU, EIB and CARIFORUM)[81], which have sustainable development at their heart. The Pan-African Programme constitutes one of the main EU financial instruments for the implementation of the Joint Africa-EU Strategy, it has a budget of € 845 million for the period 2014-2020 funded by the EU's Development Cooperation Instrument (DCI). The EU also participates in regional processes (e.g. African Environment Ministries (AMCEN) and supports relevant regional institutions (e.g. Caribbean Community Climate Change Centre (CCCCC).

As well as climate-specific finance, the EU understands that mainstreaming climate objectives into broader development goals will be fundamental to the transition to a low-carbon, climate-resilient world. The EU mainstreams climate change (particularly adaptation) into its own development assistance, which is distributed through multi-annual strategies and programmes which are jointly prepared by the European Action Service (EEAS) and EuropeAid. For 2013-14, the volume of EU's bilateral climate-related Official Development Assistance (ODA) had increased by more than the overall ODA volume (24 % as opposed to 1 %), which demonstrates the EU's commitment to mainstreaming climate change into its development aid. By the end of 2015, the total amount of EU's climate finance contributions of € 17.6 billion originated from a variety of sources, including public budgets and other Development Finance Institutions (DFIs). In May 2016, the DG International Cooperation & Development renewed its guidelines for integrating environment and climate change into EU international and development.

The EU has a package of instruments for the implementation of external assistance, predominantly based on three geographic and thematic instruments: DCI, European Neighbourhood and Partnership Instrument (ENPI), European Development Fund (EDF).

The DCI covers the majority of developing countries and its thematic programme on 'Global public good and challenges' has a focus on climate change. No less than 25 % of this programme will be spent on climate change and environment objectives. The DCI budget for 2014-2020 is € 19.6 billion, including € 7 billion for the thematic programmes. The ENPI supports the European Neighbourhood Policy (ENP), covering the ENP partner countries and Russia. The ENPI amongst other goals, promotes sustainable development and the UN's Millennium Development Goals, and finances actions within environmental sustainability. The European Development Fund (EDF) is the EU's main instrument for providing development aid to African, Caribbean and Pacific (ACP) countries and to overseas countries and territories (OCTs). The total financial resources of the 11$^{th}$ EDF amount to € 30.5 billion for the period 2014-2020. Funding for Climate Change, the Environment and Resilience increased 50 % under the 11$^{th}$ EDF amounting to € 475 million in the period 2014-2020.

81 The Joint Declaration on Sustainable Energy signed between the EU, EIB and CARIFORUM aims to reinforce cooperation in the field of sustainable energy with and support Caribbean, African and Pacific group of states in meeting their obligations stipulated in the Paris Agreement on Climate Change and the UN Sustainable Development Goals.

The EU's thematic development programmes and instruments seek to help developing countries meet the relevant Millennium Development Goals (MDGs) and subsequent Sustainable Development Goals (SDGs) by focussing on specific themes. Supplementing other EU aid, the EU launched in 2010 the MDG Initiative, targeting support specifically towards the goals on which progress was most off track in the ACP covered by the EDF. By the end of 2014, the Initiative already financed at least 68 projects in 46 countries focusing on hunger, maternal health, child mortality and water and sanitation, which are intertwined with the EU's endeavours to help developing countries fight against climate change. For examples, the EU launched the € 20 million Food Safety Enhancement Programme in Haiti in 2012, and backed with € 37 million to date the Farm Income Diversification Programme in Malawi. The EU had allocated € 1 billion to these projects.

The EU is also encouraging all countries to develop ambitious national responses to achieve the aims of the 2030 Agenda for Sustainable Development, which puts mainstreaming at the centre of its Sustainable Development Goals (SDGs). Goal 13 specifically addresses climate change, encouraging countries to 'Take urgent action to combat climate change and its impacts'. The strategic approach of the EU development policy to meeting the challenge of SDG 7 promotes sustainable growth through the energy sector by focusing on three priorities: (i) access to sustainable energy, (ii) renewable energy generation and energy efficiency and (iii) contribution to the fight against climate change and NDC implementation. These priorities are supported by three drivers: political ownership and partnerships on sustainable energy (e.g. 21 Joint Declarations), an adequate regulatory framework and governance of the energy sector and boosting investment through innovative financial instruments.

In addition to development assistance, the EU is also prioritising the integration of climate policy goals into Disaster Risk Reduction (DRR), supporting the adoption of the Sendai Framework for Disaster Risk Reduction (2015-2030) as well as the Joint Communication on a Strategic Approach to Resilience in the EU's external action. The EU's five-year Sendai Action Plan, is the basis for a disaster-risk-informed approach to policy making and resilient sustainable development. The Plan proposes activities covering risk knowledge, risk investments, disaster preparedness and resilience, using an all-of-society engagement approach. The Plan will create synergies between DRR and climate change strategy, and strengthen the capacity of cities to address disaster risks.

Furthermore, the EU places resilience as a central objective in its development and humanitarian assistance. As well as the Pilot Programme for Climate Resilience, it supports l'Alliance Globale pour l'Initiative Résilience (AGIR) in the Sahel and West Africa, which aims to foster the resilience of communities who are regularly affected by food insecurity and protracted conflicts. It also funds disaster risk reduction projects in Africa, the Caribbean and the Pacific. In 2015, the EU introduced the Resilience Marker in all the humanitarian projects it funds. This marker defines ways to reduce disaster risks and to strengthen people's coping capacities to minimise humanitarian needs. It also launched the Resilience Compendium — a collection of 29 practical examples of disaster risk reduction and resilience activities carried out by the EU, other donors, organisations and vulnerable communities. In December 2015, the European Commission released € 125 million to finance actions in countries affected by 'El Niño' in Africa, Central America and the Caribbean. The objective of this funding is to respond to existing situations of drought, but also allow for early pre-emptive action and preparedness.

Similarly, with regards to food security, the Pro-ACT 'Pro-Resilience Actions' is the specific DEVCO tool designed to respond – in complementarity with ECHO – to major post-food crises promoting resilience of affected communities and build capacity of public institutions, private organisations and CSO to respond to and prevent food crises (notable examples AGIR and SHARE initiatives) € 70 million available annually for PRO ACT.

The Food Security and Sustainable Agriculture (FSSA) thematic instrument under the Global Public Goods and Challenges Programme (GPGC) of the DCI contributes to this policy commitment through the component 'Supporting the poor and food insecure to react to crises and strengthen resilience'. The indicative allocation for FSSA for the period 2014–2020 is € 525 million with an annual indicative allocation of € 75 million.

The EU acknowledges the importance of financial support for adaptation, mainstreaming adaptation into development cooperation, and aiming at balancing the support for adaptation and mitigation. In recognition of the Cancun Framework Agreement and UNFCCC Nairobi Work Programme, support for adaptation is provided through a range of channels. These include bilateral agreements, as well as a range of multilateral institutions and funds such as the Adaptation Fund and the LDC Fund, and the UNFCCC mechanisms the Global Environment Facility and the Green Climate Fund.

In parallel, the EU contributes to a number of other dedicated adaptation funds and programmes. EU support builds on available vulnerability assessments and on the needs and priorities expressed by developing countries in their national development and adaptation strategies. These strategies include National Adaptation Programs of Action, National Strategies on DRR and National Action Plans on Desertification, Land Degradation and Drought (DLDD). The EU is also a strong advocate of the move towards National Adaptation Planning or equivalent strategic processes and documents. Supported actions include, among others, diversifying livelihoods, improving access to information, enhancing coastal zone management, reducing disaster risks and promoting improved agricultural techniques such as agroforestry as well as soil and water conservation.

To scale up support for the poorest and most vulnerable, the EU has launched a new phase of the EU Global Climate Change Alliance Plus (GCCA+) flagship Initiative, with a commitment of around € 432 million for 2014-2020. Further information on this important EU programme is provided in Section 6.5.

### *6.2.2 Innovating in delivering support: engaging the private sector in adaptation and mitigation in developing countries*

The EU is using innovative ways to deliver support which engages the private sector in adaptation and mitigation activities in developing countries. Private investment, alongside and attracted by public investment, is seen as crucial to scaling-up climate finance and closing current finance gaps. Private investors are increasingly willing to fund low-carbon investment, yet this significant potential capital remains relatively untapped. Removing barriers and improving the enabling conditions for attracting private investment in recipient countries is essential. The EU is developing public initiatives to mobilise private climate

finance directly, and to support the creation of appropriate enabling environments. € 3.7 billion is available for sustainable energy cooperation in 2014-2020

The EU supports middle range electrification projects through ElectriFI. The first call for applications generated 290 proposals requesting € 800 million to leverage for a total investment amount of € 8.5 billion for 3.7 GW renewable energy capacity in 55 countries. The second call generated 155 project proposals. In line with the Paris Agreement and the 'gender-responsive' approach ElectriFI supports the active role of women with initiatives such as the Gender window of ElectriFI.

The leveraging of private finance will be critical to achieving climate finance targets at the global level and the EU is prioritising actions to mobilise the private sector. Furthermore, non-annex 1 Parties need to attract additional public and private financing, to transition to a low-carbon economy and drive sustainable economic growth. The EU recognises that international climate finance should be used as a lever to incentivise climate-resilient, low-carbon investments. The EU's approach is twofold, to provide grant funding directly to the poorest and most vulnerable countries, and to use grant funding to leverage private investment, by combining grants with loans and equities from public and private sources, including bilateral and multilateral development banks.

The EU has established a number of blending facilities that combine grant funding with loans, with each facility covering different regions. Through these facilities, the EU has provided grant finance to blended projects and helped unlock investments in partner countries, by combining EU grants with public and private financing.

The key Regional Investment Facilities (blending mechanisms), have been established over the years to leverage private finance (e.g. NIF, IFCA, LAIF, AfIF, AIF, IFP). Besides traditional forms of support, the EU blending facilities mobilise additional financing from private and public sources for climate change action, complementing other aid modalities. Blending is the combination of EU grants with loans or equity from public and private financiers. EU grants can take different forms: Investment grant and interest rate subsidy, technical assistance, risk capital and guarantees. EU regional blending facilities operate in all regions of EU external cooperation and help partner countries transition to low carbon and climate resilient economies. The African Investment Facility was launched in July 2015. Newer initiatives include ARE Scale-Up (African Renewable Energy Scale-Up facility) which was launched in March 2017 by AFD Group – in partnership with the European Union – to boost private sector investment in on–grid and off-grid renewable energy production in Africa[82] and the new External Investment Plan (EIP) to encourage investment and strengthen partnerships with countries in Africa and the EU Neighbourhood region to achieve the Sustainable Development Goals, helping to address some root causes of migration.[83]

Between 2014 and 2020 the EU expects to double the volume of grant finance to € 2 billion, aiming to mobilise projects of about € 50 billion. The majority of EU blending projects are in the energy and transport sector; climate change and environmental considerations are mainstreamed in all the blending activities.

82 http://www.proparco.fr/lang/en/Accueil_PROPARCO/Actus-Events-Proparco/News_PROPARCO?actuCtnId=141660

83 https://ec.europa.eu/europeaid/eu-external-investment-plan-factsheet_en

In addition to blending facilities, the EU has also established the Global Energy Efficiency and Renewable Energy Fund (GEEREF), an innovative Fund-of-Funds, designed to catalyse private sector capital into clean energy projects in developing countries. The fund invests in private equity funds which focus on private sector renewable energy and energy efficiency projects that also deliver a strong positive environmental and economic impact. GEEREF successfully concluded its fundraising from private sector investors in May 2015, which brought the total funds under management to € 222 million. It is estimated that over € 10 billion could be mobilised through this initiative.

Insurance coverage, is another finance model which can be harnessed to reduce the risks faced by low-income populations due to climate change. G7 leaders have agreed to increase by up to 400 million the number of people in the most vulnerable developing countries who have access to direct or indirect insurance coverage against the negative impact of climate-change-related hazards by 2020. This will build on existing risk insurance facilities such as the African Risk Capacity and the Caribbean Catastrophe Risk Insurance Facility.

The EU has also devised numerous innovative or regional initiatives for the provision of climate finance, including:

- **B4Life**[84] — The Biodiversity for Life is a flagship initiative of the European Commission Development and Cooperation - EuropeAid, for the period 2014-2020. It responds to global threats to biodiversity as part of efforts to conserve ecosystems in the world's most deprived areas. Critical ecosystems and biodiversity hotspots, weak institutions, food insecurity and illegal wildlife trafficking will be addressed in cooperation and coordination with the EU's partners worldwide;
- **SWITCH to Green**[85] — SWITCH to Green is a flagship initiative that facilitates the transition to an inclusive green economy that generates growth, creates decent jobs, and helps reduce poverty. It links complementary programmes to improve the overall coherence, coordination and visibility of existing and future EU-funded international cooperation initiatives on green economy. Among others, it aims to strengthen the linkages between macro-level initiatives -such as the UN Partnership for Action on Green Economy (PAGE) – and micro-level interventions -such as the green business components of the SWITCH regional programmes in order to reinforce synergies and create stronger enabling environments for green economies;
- **ECCM Facility**[86] — The Environment & Climate Change Mainstreaming Facility aims to improve the effectiveness of EU interventions that have effects on or are affected by environment and climate change, throughout EU thematic and geographic programmes, thereby contributing to poverty eradication, sustainable development and green growth. To this end, it provides training and capacity building support to EU and partner country staff. The Facility also systematically provides inputs into the Quality Support Groups (QSG) process from an environment, climate change and biodiversity perspective in priority sectors: agriculture, economic development, energy, transport and infrastructure; and,

84 https://publications.europa.eu/en/publication-detail/-/publication/2e26b18c-82a4-4275-b23f-bc1c601e2853

85 http://www.switchtogreen.eu/?p=128

86 https://europa.eu/capacity4dev/public-environment-climate/blog/eccm-facility-supporting-delegation-eu-haiti-mainstreaming-environment-and-climate-change

- **EUROCLIMA**[87] — EUROCLIMA is a regional cooperation programme between the European Union and Latin America, focused on climate change. The Programme is to facilitate the integration of climate change mitigation and adaptation strategies and measures into Latin American public development policies and plans with a view to contributing to poverty alleviation and reinforcing resilience of the region. It improves the exchange of experiences and information on climate change; helps identify and prioritise "no regrets" adaptation and mitigation measures; and reinforces countries' food security with sustainable agriculture.

In parallel with numerous climate initiatives, the GCCA+ aims to assist developing countries to tackle climate change alongside broader development objectives. It employs a range of innovative delivery measures designed to reflect the principles of aid effectiveness established by the Paris Declaration on Aid Effectiveness and the Accra Agenda for Action. These include joint programming and financing, sector policy support programmes, climate change mainstreaming into planning and budgeting, and a focus on dialogue, institutional strengthening and capacity building.

The Forest Law Enforcement, Governance and Trade (FLEGT) takes a multidimensional approach to overcoming the complex drivers of illegal logging. The facility contributes to strengthening forest governance while encouraging sustainable economic development in timber producing countries through the review of timber legislation, promotion of legal trade, support of private-sector initiatives and encouragement of better public procurement policy.

The EU continues to support the programme to Reduce Emissions from Deforestation and forest Degradation (REDD+), including the role of conservation, sustainable management of forests and enhancement of forest carbon stocks. REDD+ aims to preserve and strengthen the role of tropical forests in mitigating and adapting to climate change, and in sustainable development.

The EIB is the largest multilateral provider of climate finance worldwide. Over the last two years, the EIB has invested over € 40 billion in climate change mitigation and adaptation projects worldwide, most of which is in the EU, but with over € 4 billion in developing countries. EIB funding acts as a catalyst to mobilise finance for climate action by encouraging others to co-finance with its long-term lending.

The EIB contributes to the EU's climate and energy objectives by supporting a range of mitigation projects, for example in renewable energy, energy efficiency and low-carbon transport, as well as investing in adaptation measures. The EIB has a target of ensuring that at least 25 % of the bank's activity is for climate action, and all EIB-financed projects, regardless of sector, must comply with EIB environmental standards that reflect EU climate objectives. The EIB Climate Strategy announced in September 2015 further reinforces the bank's support for low-carbon and climate-resilient development.

87 http://www.euroclima.org/en/euroclima

### 6.2.3 *Methodology for tracking the provision of finance, technology and capacity building support*

**Definition of climate finance:** Climate finance aims at reducing emissions, and enhancing sinks of greenhouse gases and aims at reducing the vulnerability of, and maintaining and increasing the resilience of, human and ecological systems to negative climate change impacts (adapted from the UNFCCC Standing Committee on Finance's definition of climate finance).[88]

- **Definition of mitigation activities:** An activity should be considered as climate change mitigation related if it contributes to the objective of stabilisation of GHG concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system by promoting efforts to reduce or limit GHG emissions or to enhance GHG sequestration (adapted from the operational definition and criteria for eligibility used in the OECD-DAC Policy Markers)[89];
- **Definition of adaptation activities:** An activity should be considered as adaptation related if it intends to reduce the vulnerability of human or natural systems to the impacts of climate change and climate-related risks, by maintaining or increasing adaptive capacity and resilience. This encompasses a range of activities from information and knowledge generation, to capacity development, planning and the implementation of climate change adaptation actions (adapted from the operational definition and criteria for eligibility used in the OECD-DAC Policy Markers);
- **Definition of climate relevant technology development and transfer:** a broad set of processes covering the flows of know-how, experience and equipment for mitigating and adapting to climate change amongst different stakeholders such as governments, private sector entities, financial institutions, non-governmental organizations (NGOs) and research/education institutions. The broad and inclusive term 'transfer' comprises the process of learning to understand, utilize and replicate the technology, including the capacity to choose and adapt to local conditions and integrate it with indigenous technologies (adapted from the IPCC definition of climate relevant technology transfer);
- **Definition of climate relevant capacity building:** capacity-building is a process which seeks to build, develop, strengthen, enhance and improve existing scientific and technical skills, capabilities and institutions particularly in developing countries, to enable them to assess, adapt, manage and develop technologies. Capacity building must be country-driven, addressing specific needs and conditions of developing countries and reflecting their national sustainable development strategies, priorities and initiatives (adapted from the UNFCCC definition of capacity building activities).

The Rio markers are policy indicators and were not originally intended to accurately quantify climate finance. Therefore, an activity can have more than one principal or significant policy objective (i.e. it can be marked for several Rio markers; mitigation, adaptation and other Rio conventions such as Biodiversity and Desertification). The EU has adopted the following approach to 'translate' the Rio marked data into estimated flows of climate finance:

88 https://unfccc.int/files/cooperation_and_support/financial_mechanism/standing_committee/application/pdf/2014_biennial_assessment_and_overview_of_climate_finance_flows_report_web.pdf

89 https://www.oecd.org/dac/stats/48785310.pdf

**Table 6.1 Rio marker approach**

| Markers | Mitigation | Adaptation | Cross-cutting | Total |
|---|---|---|---|---|
| 2 M & 0 A | 100 % | 0 % | 0 % | 100 % |
| 1 M & 0 A | 40 % | 0 % | 0 % | 40 % |
| 0 M & 2 A | 0 % | 100 % | 0 % | 100 % |
| 0 M & 1 A | 0 % | 40 % | 0 % | 40 % |
| 2 M & 1 A | 100 % | 0 % | 0 % | 100 % |
| 1 M & 2 A | 0 % | 100 % | 0 % | 100 % |
| 2 M & 2 A | 0 % | 0 % | 100 % | 100 % |
| 1 M & 1 A | 0 % | 0 % | 40 % | 40 % |

For example, if an EU commitment of € 1 million was made to a project going to a developing country Party that was marked as 'Principal' for mitigation ( '2 M' in the above table) and 'Significant' for adaptation ( '1 A' in the above table), then 100 % of that € 1 million would be categorised as mitigation and 0 % as adaptation.

Similarly, if the above project was not marked for mitigation but was marked as 'Significant' for adaptation, 40 % of that € 1 million would be categorised adaptation, and 0 % as mitigation.

This approach differs slightly from that used in the EU's previous Biennial Report (2BR), in allowing for climate finance to be considered as cross-cutting (i.e. for projects that are equally Rio marked for mitigation and adaptation). Climate finance figures using the previous approach have been provided in a footnote to Table 6.2. The difference between the two approaches is that under the previous approach, climate finance wasn't considered as cross-cutting, resulting in climate finance only being counted as mitigation or adaptation. For this approach, when calculating total climate finance, double counting was avoided by taking only the highest amount to be reported as 'climate finance' in line with OECD guidelines.

This biennial report covers support that has been committed in 2015 and 2016. A commitment requires that a final decision has been taken on the allocation of the funds to a specific project and programme. In general, disbursement will follow commitment unless exceptional circumstances arise. The EU is working towards tracking climate relevant disbursements in the near future.

The EIB's climate relevant financial flows are tracked using the joint approach developed by the Multilateral Development Banks (MDBs) that does not use the Rio markers. In 2015, Common Principles for tracking mitigation and adaptation activities were developed together with the International Development Finance Club (IDFC), and a set of guidelines was established and applied to set a common approach for reporting on climate co-financing flows that are invested alongside MDBs' climate finance activities. Climate co-finance is defined as the amount of financial resources contributed by external entities alongside climate finance invested by MDBs. This encompasses financial resource providers that are government or government-affiliated, as well as those that are private. The MDBs' methodologies for climate finance tracking are aligned with the Common Principles, and are

detailed in their latest 'Joint report on multilateral development banks' climate finance 2016', published in September 2017.[90]

## 6.3 Financial Resources

This section provides information on the total support provided through multilateral and bilateral channels.

### 6.3.1 *Provision of financial support through multilateral channels*

The EU supports a variety of global programmes and Trust Funds managed by multilateral organisations, including the UNDP, UNEP, FAO and the World Bank. The EU also provides support to the operating entities of the financial mechanism of UNFCCC, the Global Environment Facility (GEF) and the Green Climate Fund (GCF). However, the EU's statistical system categorises all climate finance support as bilateral with multiple recipients, even where the finance is delivered through a multilateral organisation, with the exception of core contributions to the UNFCCC, which are reported in CTF Table 7(a). Therefore, all other finance provided through a multilateral organisation is reported in CTF 7(b).

### 6.3.2 *Provision of financial support through bilateral channels*

All the EU's climate finance provided to developing country Parties to the UNFCCC (provision of financial support through bilateral channels) in 2015 and 2016 was in the form of grants, and classified as Official Development Assistance (ODA). This climate finance was marked by the Rio markers, as described in Section 6.2.3, and is summarised below by spend per year since the last National Communication, amount marked for mitigation, adaptation or cross-cutting activities, and how much of this finance went to Least Developed Countries (LDCs).

Total climate finance provided by the EU to developing country Parties to the UNFCCC in 2015 and 2016 was € 4.2 billion. Climate finance provided by the EU continued to increase in 2015 and 2016 on 2014. Of the total climate finance provided in 2015 and 2016, € 1.4 billion was marked for mitigation, € 1.7 billion for adaptation, and € 1.1 billion as cross-cutting.

**Table 6.2 Provision of EU financial support in 2015-2016[91]**
*Figures provided are to the factor of one thousand ('000)*

| | Mitigation | | Adaptation | | Cross-cutting | | Total | |
|---|---|---|---|---|---|---|---|---|
| | EUR | USD | EUR | USD | EUR | USD | EUR | USD |
| **2015** | 525 200 | 580 973 | 537 076 | 595 428 | 454 503 | 503 883 | **1 516 778** | 1 681 573 |
| **2016** | 891 673 | 986 364 | 1 189 718 | 1 316 060 | 648 781 | 717 679 | **2 730 172** | 3 020 102 |

90 http://www.eib.org/attachments/press/2016-joint-report-on-mdbs-climate-finance.pdf

91 Using the approach under the EU 2BR to calculate climate finance, the figures for 2015 and 2016 would have read as follows (in EUR, to the factor of one thousand ('000)): 2015 (Mitigation 1 011 702, Adaptation 1 059 539, Cross-cutting 0, Total 1 516 778)
2016 (Mitigation 1 591 874, Adaptation 1 871 060, Cross-cutting 0, Total 2 730 172)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Total** | **1 416 873** | 1 567 337 | **1 726 794** | 1 911 488 | **1 103 284** | 1 221 652 | **4 246 950** | 4 701 674 |

Of total climate finance provided by the EU in 2015 and 2016, at least € 1.4 billion (33 %) was provided to LDCs. The reason this reads 'at least' is because the EU marks its funding by country and by region, but in some cases climate finance goes to a collection of countries, and only a regional marker is used as a result, rendering it not possible to assign specific amounts to the individual countries in this regional group. However, of the total climate finance provided in 2015 and 2016 to LDCs, at least € 407 million was marked for mitigation, € 823 million for adaptation and € 143 million for cross-cutting.

Further disaggregation of the climate finance provided by the EU in 2015 and 2016 is available in [3BR] Tables 6.4 and 6.5, categorised by sector and by region.

In addition to the EU, the EIB also channels significant climate finance to developing country Parties to the UNFCCC. All EIB funds which are reported here are provided in the form of loans alongside several equity investments. In line with the MDBs' joint approach to tracking climate finance[92], the relevant share for mitigation or adaptation is specified for each project. The Rio markers are not applied to funding provided by the EIB.

Total climate finance provided by the EIB to developing country Parties to the UNFCCC in 2015 and 2016 was € 4.2 billion. In 2015, total climate finance provided was € 2.3 billion and in 2016, € 1.9 billion was provided. This information is provided in Table 6.3 which is based on the EIB's established procedure for tracking its climate finance, which is based on signed finance contracts in the given financial year.

**Table 6.3 Provision of EIB financial support in 2015-2016**
*Figures provided are to the factor of one thousand ('000)*

| | **Mitigation** | | **Adaptation** | | **Total** | |
|---|---|---|---|---|---|---|
| | EUR | USD | EUR | USD | EUR | USD |
| **2015** | 2 091 721 | 2 318 981 | 184 125 | 204 129 | 2 275 845 | 2 523 110 |
| **2016** | 1 867 997 | 2 066 368 | 79 718 | 88 183 | 1 947 715 | 2 154 552 |
| **Total** | **3 959 718** | 4 385 349 | **263 843** | 292 313 | **4 223 560** | 4 677 662 |

Of total climate finance provided by the EIB in 2015, € 0.6 billion was channelled to developing countries as ODA and was € 13 million was delivered as Other Official Flows (OOF). For the remaining € 1.7 billion, this information is not available because at the time of signature, the interest rate of the loan is not known, as this is first set at disbursement. It is

92 See http://wwwwds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2015/06/16/090224b082f3a601/2_0/Rendered/PDF/20140joint0rep0nks00climate0finance.pdf.

therefore not possible to establish whether a given loan is concessional or not at the time of signature, and therefore whether it is classified as ODA or OOF, and as a result they are classified as 'other' in CTF Table 7(b). Once loans are classified, the data is submitted to the EU (DEVCO R1), who then submit the consolidated EU ODA/DAC data to the OECD.

Similarly, of total climate finance provided by the EIB in 2016, € 122 million are known to be channelled to developing countries as ODA and € 27 million were delivered as OOF (for € 1.8 billion, this information is not available).

For more detailed information on the all bilateral provision of support by the EU and the EIB, please see CTF Table 7(b) in the CTF Appendix.

**Table 6.4 Provision of EU financial support for mitigation and adaptation by sector 2015-2016**

*Figures provided are to the factor of one thousand ('000)*

| Sector | Mitigation | | Adaptation | | Cross-cutting | | Total | | % |
|---|---|---|---|---|---|---|---|---|---|
| | EUR | USD | EUR | USD | EUR | USD | EUR | USD | |
| **2015** | | | | | | | | | |
| Energy | 197 467 | 218 437 | 0 | 0 | 28 589 | 31 695 | 226 056 | 250 617 | 15 |
| Transport | 88 126 | 97 484 | 0 | 0 | 0 | 0 | 88 126 | 97 700 | 6 |
| Industry | 16 632 | 18 398 | 0 | 0 | 0 | 0 | 16 632 | 18 439 | 1 |
| Agriculture | 0 | 0 | 145 162 | 160 934 | 112 842 | 125 102 | 258 004 | 286 036 | 17 |
| Forestry | 35 700 | 39 491 | 0 | 0 | 2 | 3 | 35 702 | 39 581 | 2 |
| Water & sanitation | 0 | 0 | 58 736 | 65 118 | 4 400 | 4 878 | 63 136 | 69 996 | 4 |
| Cross-cutting | 18 245 | 20 182 | 97 160 | 107 716 | 190 080 | 210 732 | 305 485 | 338 675 | 20 |
| Other | 169 030 | 186 980 | 236 018 | 261 661 | 118 589 | 131 473 | 523 636 | 580 528 | 35 |
| **Total** | **525 200** | 580 973 | **537 076** | 595 428 | **454 503** | 503 883 | **1 516 778** | 1 681 573 | 100 |
| **2016** | | | | | | | | | |
| Energy | 429 702 | 475 334 | 0 | 0 | 20 117 | 22 253 | 449 819 | 497 587 | 16 |
| Transport | 122 040 | 135 000 | 0 | 0 | 6 800 | 7 522 | 128 840 | 142 522 | 5 |
| Industry | 30 232 | 33 442 | 0 | 0 | 0 | 0 | 30 232 | 33 442 | 1 |
| Agriculture | 7 600 | 8 407 | 431 800 | 477 655 | 192 363 | 212 791 | 631 763 | 698 853 | 23 |
| Forestry | 60 000 | 66 372 | 0 | 0 | 5 000 | 5 531 | 65 000 | 71 903 | 2 |
| Water & sanitation | 28 000 | 30 973 | 90 512 | 100 124 | 21 816 | 24 133 | 140 328 | 155 230 | 5 |
| Cross-cutting | 170 400 | 188 496 | 109 547 | 121 180 | 219 173 | 242 448 | 499 120 | 552 124 | 18 |
| Other | 43 699 | 48 339 | 557 859 | 617 100 | 183 512 | 203 000 | 785 069 | 868 440 | 29 |
| **Total** | **891 673** | 986 364 | **1 189 718** | 1 316 060 | **648 781** | 717 679 | **2 730 172** | 3 020 102 | 100 |

**Table 6.5 Provision of EU financial support for mitigation and adaptation by region 2015**

*Figures provided are to the factor of one thousand ('000)*

| Region | Mitigation | | Adaptation | | Cross-cutting | | Total | | % |
|---|---|---|---|---|---|---|---|---|---|
| | EUR | USD | EUR | USD | EUR | USD | EUR | USD | |
| **Europe** | **115 356** | 127 889 | **17 716** | 19 641 | **100 517** | 111 438 | **233 589** | 258 968 | 15 |
| **Africa** | **296 190** | 328 370 | **271 200** | 300 665 | **69 203** | 76 721 | **636 592** | 705 756 | 42 |
| North of Sahara | 0 | 0 | 0 | 0 | 45 200 | 50 111 | 45 200 | 50 111 | |
| South of Sahara | 234 894 | 260 415 | 240 700 | 266 851 | 24 000 | 26 608 | 499 594 | 553 874 | |
| Regional | 61 295 | 67 955 | 30 500 | 33 814 | 2 | 3 | 91 798 | 101 771 | |
| **America** | **1 320** | 1 463 | **108 095** | 119 839 | **20 837** | 23 101 | **130 252** | 144 404 | 9 |
| North & Central | 0 | 0 | 63 475 | 70 371 | 3 900 | 4 324 | 67 375 | 74 695 | |
| South | 1 320 | 1 463 | 36 120 | 40 044 | 0 | 0 | 37 440 | 41 508 | |
| Regional | 0 | 0 | 8 500 | 9 424 | 16 937 | 18 777 | 25 437 | 28 201 | |
| **Asia** | **37 203** | 41 245 | **53 224** | 59 007 | **100 600** | 111 530 | **191 026** | 211 781 | 13 |
| Middle East | 0 | 0 | 0 | 0 | 21 600 | 23 947 | 21 600 | 23 947 | |
| South & Central | 24 802 | 27 497 | 49 223 | 54 571 | 69 000 | 76 497 | 143 025 | 158 565 | |
| Far East | 1 | 1 | 4 000 | 4 435 | 0 | 0 | 4 001 | 4 436 | |
| Regional | 12 400 | 13 747 | 0 | 0 | 10 000 | 11 086 | 22 400 | 24 834 | |
| **Oceania** | **10 000** | 11 086 | **13 880** | 15 388 | **0** | 0 | **23 880** | 26 475 | 2 |
| **Bilateral unallocated** | **65 131** | 72 208 | **72 961** | 80 888 | **163 345** | 181 093 | **301 438** | 334 189 | 20 |
| **Total** | **525 200** | 580 973 | **537 076** | 595 428 | **454 503** | 503 883 | **1 516 778** | 1 681 573 | 100 |

**Table 6.6 Provision of EU financial support for mitigation and adaptation by region 2016**
*Figures provided are to the factor of one thousand ('000)*

| Region | Mitigation | | Adaptation | | Cross-cutting | | Total | | % |
|---|---|---|---|---|---|---|---|---|---|
| | EUR | USD | EUR | USD | EUR | USD | EUR | USD | |
| **Europe** | **133 672** | 147 867 | **42 856** | 47 407 | **105 411** | 116 605 | **281 939** | 311 880 | 10 |
| **Africa** | **608 290** | 672 887 | **828 263** | 916 220 | **221 336** | 244 841 | **1 657 889** | 1 833 948 | 61 |
| North of Sahara | 10 000 | 11 062 | 0 | 0 | 216 | 239 | 10 216 | 11 301 | |
| South of Sahara | 407 906 | 451 223 | 758 263 | 838 787 | 216 320 | 239 292 | 1 382 489 | 1 529 302 | |
| Regional | 190 384 | 210 602 | 70 000 | 77 434 | 4 800 | 5 310 | 265 184 | 293 345 | |
| **America** | **9 200** | 10 177 | **88 950** | 98 396 | **76 263** | 84 362 | **174 413** | 192 935 | 6 |
| North & Central | 9 200 | 10 177 | 46 750 | 51 715 | 12 000 | 13 274 | 67 950 | 75 166 | |
| South | 0 | 0 | 42 200 | 46 681 | 3 200 | 3 540 | 45 400 | 50 221 | |
| Regional | 0 | 0 | 0 | 0 | 61 063 | 67 547 | 61 063 | 67 547 | |
| **Asia** | **111 812** | 123 686 | **159 009** | 175 895 | **112 000** | 123 894 | **382 821** | 423 475 | 14 |
| Middle East | 28 000 | 30 973 | 8 000 | 8 850 | 20 000 | 22 124 | 56 000 | 61 947 | |
| South & Central | 12 | 13 | 129 009 | 142 709 | 59 000 | 65 265 | 188 021 | 207 988 | |
| Far East | 70 200 | 77 655 | 14 000 | 15 487 | 0 | 0 | 84 200 | 93 142 | |
| Regional | 13 600 | 15 044 | 8 000 | 8 850 | 33 000 | 36 504 | 54 600 | 60 398 | |
| **Oceania** | **11 800** | 13 053 | **22 740** | 25 155 | **0** | 0 | **34 540** | 38 208 | 1 |
| **Bilateral unallocated** | **16 899** | 18 693 | **47 900** | 52 987 | **133 771** | 147 977 | **198 570** | 219 657 | 7 |
| **Total** | **891 673** | 986 364 | **1 189 718** | 1 316 060 | **648 781** | 717 679 | **2 730 172** | 3 020 102 | 100 |

## 6.4 Technology development and transfer

The development and deployment of new technologies has an essential role to play in meeting global climate change objectives, as well as contributing to new jobs and sustainable economic growth. The EU is a lead player in the area of low-carbon technologies, yet while emissions are falling in Europe, they are rising in the rest of the world. By 2020, around two-thirds of the world's emissions are expected to come from developing and emerging economies. Providing developing countries with greater access to sustainable technology is therefore essential to support action to reduce greenhouse gas emissions and adapt to the adverse effects of climate change.

The EU has mainstreamed technology transfer activities into all development support. Because these activities form one component of a larger project, disaggregating the finance dedicated to these activities alone is not currently possible. This section will outline the platforms and measures the EU employs to encourage the transfer of technology, and provide case studies of relevant programmes.

The EU is already contributing significantly to the transfer of technology to developing countries by financing climate action and development projects with a technology dimension, as well as through research collaboration. The EU's joint research programmes contribute to a higher level of knowledge amongst local scientists and to the sharing of the benefits of research and development. The EU's Research Framework Programme, Horizon 2020, promotes research collaboration and the mobility of researchers between the EU and third countries, including developing countries, in areas of common interest. Similarly, the Network for the Coordination and Advancement of Sub-Saharan Africa-EU Science and Technology Cooperation (CAAST-Net)[93] continues to provide local capacity building in scientific research, such as in its Intra-Africa Academic Mobility Scheme[94]. This year, following the publication of the 2017 Call for Proposals in January, 7 projects have been selected for funding which will offer 450 scholarship opportunities during a 5-year implementation period. This will include 273 Master students (61 %), 108 PhD candidates (24 %) and 69 academic and administrative staff members (15 %), with overall funding of close to € 10 million.

In addition, the African, Caribbean and Pacific (ACP) EU Technical Centre for Agricultural and Rural Cooperation (CTA)[95] also supports the development and enhancement of endogenous capacities and technologies of developing country Parties, combining this with facilitating innovation in the private sector. In 2017, finalists were rewarded with funding for agriculture innovations during the CTA's Pitch AgriHack![96] West Africa conference in the Ivory Coast, and in 2016 the CTA worked to equip over 3 000 farmers from small-scale producers or young entrepreneurs to access and profit from domestic, regional and international markets[97].

93 https://caast-net-plus.org/tag/view/Mobility

94 https://eacea.ec.europa.eu/intra-africa/news/Project_Selection_results_Intra_Africa_Academic_Mobility_Scheme_2017_en

95 http://www.cta.int/en/

96 http://www.cta.int/en/news/agrf-2017/media-room/pitch-agrihack-winners.html

97 http://www.cta.int/en/article/2016-09-21/developing-the-business-of-agriculture-in-the-caribbean.html

The EU recognises that the private sector will be critical to the successful transfer of technologies to developing countries. The private sector is able to mobilise larger amounts of capital and is also a key driver of technological innovation. The EU's Global Energy Efficiency and Renewable Energy Fund (GEEREF), for example, is designed to catalyse private sector capital into clean energy projects in developing countries. Also, the Electrification Financing Initiative (ElectriFI) that acts as a financing mechanism was created to bridge the gaps in structuring and financing, stimulate the private sector, and mobilise financiers for affordable, reliable, sustainable and modern energy in developing countries.

The EU also provides support to explore opportunities for public-private partnerships and supports innovative multi-stakeholder alliances between national or local authorities, enterprises and NGOs for skills development and the provision of basic services. These partnerships facilitate access to sustainable and affordable energy, water and agriculture. They develop synergies between public and private interests in technology transfer, and engage stakeholders in the development and diffusion of technology, particularly to and between developing countries.

Recently, DG Energy's dialogue with the private sector under the High Level Platform has passed important milestone events, such as the High Level Round Table in April 2017, which was at CEO level, and the High Level Panel during the European Development Days (EDDs) in June 2017, as well as the Green Economic Forum in Conakry in October 2017. All this is in the build-up towards the Africa- EU summit in Abidjan where the European External Investment Plan (EIP) will be presented. Also, significant efforts have been made to maintain the dialogue with the private sector in the build-up of the 5$^{th}$ Africa-EU Summit 2017 scheduled to take place in Abidjad, Ivory Coast, on 29-29 November 2017.

Some examples of these EU led partnerships, for example, include the SWITCH to Green Flagship initiative that provides technical assistance to a large number of EU actors (EU DG International Cooperation and Development (DEVCO), other DGs, and EU Delegations) aiming at improving coordination as well as building awareness and capacities on inclusive green economy. Also, the GCCA+ has enhanced cooperation with non-state actors and civil society organisations as well as new alliances with new stakeholders such as the private sector. The GCCA+ has also been recognised as a viable instrument for practical cooperation combining global, national and regional centres of interest. Inspired by the Covenant of Mayors Europe, the EU funded initiative the Covenant of mayors in Sub-Saharan Africa (CoM SSA) unites over 20 African cities to share knowledge and best practices and increase planning capacities to address the challenges of energy access, climate change mitigation and adaptation.

A selection of activities related to technology transfer, including success stories, are presented in Table 6.75 (adapted from Table 6 of the NC guidelines). For more detailed information, please see CTF 8. CTF 8 includes a non-exhaustive list of initiatives selected to represent technology transfer support provided by EU.

**Table 6.7 Examples of activities related to technology transfer**

| **Project/programme title: Horizon 2020** | | | |
|---|---|---|---|
| **Recipient country** | **Sector** | **Total funding** | **Years in operation** |
| Global | Multisector | ~€ 80 billion | 2014-2020 |
| **Purpose & Description:**<br><br>Horizon 2020 is the EU's largest research and innovation programme, with ~€ 80 billion of funding, between 2014 and 2020, under three different programmes: excellent science, industrial leadership, and societal challenges (including climate change). A significant share of this funding supports research and innovation cooperation with developing countries.<br><br>The majority of Horizon 2020 projects foster cooperation between countries, often in the form of public-private partnerships which aim to leverage public and private investments, to develop new technologies, products and services. Supporting international research and innovation is important as it not only leads to new discoveries, but also helps bring great ideas from the lab to the market. Horizon 2020 is accessible to researchers and entrepreneurs in developing countries. For the period 2014 to 2020, at least 20 % of the EU budget will be used to support climate action and the transition to a low-carbon and climate resilient world. | | | |
| **Factors which led to the project's success:** Information unavailable. | | | |
| **Technology transferred:** Funding opportunities under Horizon 2020 are set out in multiannual work programmes. Work programmes concentrate on the following topics: future and emerging technologies; research infrastructure, including e-infrastructure; nanotechnologies, advanced materials, biotechnology and advanced manufacturing and processing; information and communication technologies; innovation in SMEs; access to risk finance; societal challenge 1 (health, demographic change and wellbeing); societal challenge 2 (food security, sustainable agriculture and forestry, marine, maritime and inland water research and the bioeconomy); societal challenge 4 (smart, green and integrated transport); societal challenge 5 (climate action, environment, resource efficiency and raw materials); and spreading excellence and widening participation. | | | |
| **Impact on greenhouse gas emissions/sinks:** Data not available | | | |
| **Project/programme title: Technical Assistance Facility (TAF) for the Sustainable Energy for All (SE4ALL)** | | | |
| **Recipient country** | **Sector** | **Total funding** | **Years in operation** |
| 26 countries in East Asia-Pacific, Latin America and Caribbean, South Asia and Sub- | Energy | Unknown. Budget for Western and Central Africa contract is € 22 | Launched in 2013 |

| | | | |
|---|---|---|---|
| Saharan Africa Regions | | million | |

**Purpose & Description:**
The EU's TAF for SE4ALL is designed to deliver high level technical assistance to partner countries, to support them in improving their policy and regulatory frameworks in order to scale-up investment in their energy sector. It supports developing countries that have highlighted energy as a national priority, and that are committed to achieving the SE4ALL objectives.

The TAF supports partner countries on a demand basis through expert missions to increase their administrative and technical capacity, accelerate energy sector policy reform, and facilitate investment in access to energy. Technical assistance packages cover five key themes: policy reform, capacity building, investment, mobilising funds and partnerships, and industrial and technological cooperation.

The assistance is an inclusive process, involving national stakeholders and promoting a coherent, integrated development agenda. The EU has recognised that improving the capacity of country partners is a prerequisite for the sustainable implementation of relevant policies and regulations, and for the development of the knowledge and skills required for the adoption of renewable and efficient technologies. In order to ensure an effective knowledge exchange between stakeholders, the EU through the TAF supports the establishment of regional networks, gathering professionals at the regional and national level, to work across technologies and sectors.

Three EU Technical Assistance contracts have been signed under this Facility. The first covers Central and Western Africa, the second - Eastern and Southern Africa and the third - Asia, Neighbourhood, Latin America, Caribbean and Pacific. Projects have been carried out in 23 countries so far in Africa and Asia.

**Factors which led to the project's success:**

1. Capacity building: The TAF goes beyond addressing technical constraints on policy, regulation and engineering. It also focuses on capacity building, as a prerequisite for a sustainable implementation of such policies and regulations, and a necessary step in the development of knowledge and skills for the use of technologies.
2. Leveraging of funds: Funds from a diversity of sources, development banks, local and international private sector, public sources, are brought together to help bring selected sustainable energy projects to completion.
3. Industrial and technology cooperation: The TAF supports the establishment of regional networks gathering local and international professionals, at regional as well as country level, across the various technologies and sectors, to ensure a coherent and effective know-how exchange between the stakeholders.

**Technology transferred:** Energy efficiency, renewable energy and universal access to modern energy services

**Impact on greenhouse gas emissions/sinks:** Data not available

## 6.5 Capacity-building

Access to knowledge and technologies are not enough on their own, the right set of specific local conditions needs to be in place to attract project developers and investors. This so-called 'enabling environment' involves a set of interrelated conditions - legal, organisational, fiscal, informational, political, and cultural. A skilled workforce is also crucial to maintain know-how in the community. Therefore, the successful transfer of climate technologies to developing countries requires support to increase local administrative capacities. The EU works closely with governments in developing countries to reinforce administrative capacities and support the development of legal and regulatory frameworks which are conducive to mitigating and adapting to climate change.

The EU has mainstreamed capacity building activities into all development assistance, in line with the provisions of the Paris Declaration on Aid Effectiveness and the Accra Agenda for Action. Because these activities form one component of a larger project, disaggregating the finance dedicated to these activities alone is not currently possible. This section will outline the platforms and measures the EU employs to build capacity, and provide case studies of relevant programmes.

The EU's development activities in the field of climate change are based on, and emphasize the importance of, the principles of national ownership, stakeholder participation, country driven demand, cooperation between donors and across programmes, and impact assessment and monitoring (when appropriate). Since EU support is partner country-driven, only information from partner countries, for example through their National Communications, is the best way to get a picture of capacity building support and activities and their effectiveness.

A selection of activities related to capacity building, including success stories, are presented in Table 6.6 (adapted from Table 6 of the NC guidelines). For more detailed information, please see CTF 9.

**Table 6.8 Examples of activities related to capacity building**

| **Project/programme title:** Low Emission Capacity Building (LECB) Programme | | | |
|---|---|---|---|
| **Recipient country** | **Sector** | **Total funding** | **Years in operation** |
| 25 participating countries | Cross-sector (energy, transport, industrial processes, waste, agriculture and LULUCF) | USD 40 million | 2011-2016 |
| **Purpose & Description:**<br><br>The UNDP's LECB Programme focuses on realising climate change mitigation and sustainable development opportunities, within the context of national priorities and | | | |

planning processes. The programme includes 25 participating countries around the world, and provides direct technical and financial support, as well as peer-to-peer expert knowledge exchange and awareness building.

The programme aims to strengthen institutional capacities and promote integrated governance, to support the implementation of climate action. It provides tools and training, to identify and design relevant projects, as well as innovative policy and financing options. LECB builds on insights gained at the country-level, sharing this knowledge to stimulate discussion and strengthen technical capacities for the implementation of climate action around the world.

Projects are developed in a consensus-driven and inclusive manner, with the engagement of public and private stakeholders, to promote national ownership. The Global Support Team and in-country offices work with stakeholders, facilitating consultations and workshops, and establishing partnerships and networks at the country-level. All projects promote gender-sensitive approaches during project design and implementation, including within decision-making, institutional frameworks, and in strategies, outcomes and reporting.

Recently, the LECB has been leading support for activities related to the Paris Agreement. Prior to the Agreement in 2015, Regional Technical Dialogues benefitted more than 100 developing countries with guidance on INDC preparation, many of them among the poorest and most vulnerable. Furthermore, LECB has been working with countries to ensure that implementation plans for NDCs are linked with the achievement of the Sustainable Development Goals (SDGs).

The LECB Programme is implemented by UNDP, with generous funding from the European Commission, the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, and the Australian Government

**Factors which led to the project's success:**

1. Demand and country driven: The programme is designed to provide coordinated, expert, capacity-building support to assist participating countries in selecting the most relevant project activities to focus on. Using a menu approach, each participating country will determine, develop and execute its own project with a clear focus on one of the national priority areas.
2. Multi-stakeholder framework: The programme involves participation of two types of primary stakeholders – public sector and industry – that promotes consensus and national ownership. The public sector plays a key role in designing and implementing programmes and policies to address climate change issues. In this context, leading institutions responsible for the implementation of the programme at the national level will facilitate the necessary consultations and coordination among key stakeholders. From its inception phase, such coordination will be critical to ensure that efforts to address GHG emissions respond also to the priorities and needs of the individual sectors involved.

**Technology transferred:** Low emissions development

**Impact on greenhouse gas emissions/sinks:** No data available

**Project/programme title:** Global Climate Change Alliance *Plus* (GCCA+)

| Recipient country | Sector | Total funding | Years in operation |
|---|---|---|---|
| Focus on least developed countries (LDCs) and small island developing states (SIDS) (38 countries, 51 programmes) | Cross-sector | ~€ 350 million | 2015-2020 (GCCA ran from 2007-2014) |

**Purpose & Description:**

To scale up support for the poorest and most vulnerable, the EU has launched a new phase of the Global Climate Change Alliance (GCCA+), with a commitment of around € 350 million for 2014-2020. This will support least developed countries (LDCs) and small-island developing states (SIDS) in adapting to the impacts of climate change and integrating climate change resilience in their overall development planning and implementation. The new GCCA+ is sharper in focus and wider in outreach, being enhanced to better address the implementation of the Paris Agreement with a specific mitigation Facility approved in 2016. It will better address the new challenges, supporting country-driven processes, building capacities, enhancing climate and disaster risk reduction (DRR) integration into national planning and aligning development and climate change policies, including strong support to the implementation of the Paris Agreement. It will concentrate on three priority areas where the greatest impact is anticipated: (1) Mainstreaming climate change into poverty reduction and development efforts; (2) Increasing resilience to climate-related stresses and shocks; (3) Supporting formulation and implementation of concrete sectoral based adaptation and mitigation strategies and plans, including NDCs.

The GCCA+ aims to support a country's national priorities. Interventions at country level are designed in close collaboration between EU Delegations and national governments, and they are shaped in consultation with relevant stakeholders. Implementing partners include government departments and agencies, non-governmental organisations, academic and scientific institutions, and local representations of international organisations, multilateral and bilateral development agencies.

**Factors which led to the project's success:**

1. Existing funding structures: The GCCA+ funds have strengthened actions led by EU Member States (DFID, Danida, AFD, GIZ and others) and multilateral agencies, benefitting from existing structures and systems, which resulted in relatively quick results.
2. Low transaction costs: For the Member States that have provided Fast-Track funds, the GCCA+ has provided a good opportunity to support climate action with low transaction costs.

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| 3. Effective development partnerships: The GCCA+ responds successfully to needs at the regional level, recognising that regional-level resources and capacities, add value to national programmes and capacities. The combination of global, regional and national foci, complementing each other, adds clear value to the existing climate action landscape.<br>4. Focus on vulnerable sectors: The programme gives priority to vulnerable sectors, such as agriculture, water, forestry and natural resources in the case of LDCs and SIDS, where the effects of climate change could have critical implications for livelihoods. |
| **Technology transferred:** Climate change mainstreaming and poverty reduction, increasing resilience to climate-related stresses and shocks, and sector-based climate change adaptation and mitigation strategies. |
| **Impact on greenhouse gas emissions/sinks:** No data available |

# 7 LIST OF ABBREVIATIONS

| Abbreviation | Description |
|---|---|
| 1BR | First Biennial Report |
| 2BR | Second Biennial Report |
| 3BR | Third Biennial Report |
| 6NC | 6th National Communication |
| 7NC | Seventh National Communication |
| AAU | Assigned amount unit |
| AEAs | Annual Emission Allocations |
| AGIR | l'Alliance Globale pour l'Initiative Résilience |
| AR4 | Fourth Assessment Report |
| AR5 | Fifth Assessment Report |
| AVR | Accreditation and Verification Regulation |
| BR | Biennial Report |
| C3S | Copernicus Climate Change Service |
| CAMS | Copernicus Atmosphere Monitoring Service |
| CAP | Common Agricultural Policy |
| CB | Capacity Building |
| CCS | Carbon Capture and storage |
| CDM | Clean Development Mechanism |
| CEOS | Committee on Earth Observation Satellites |
| CER | Certified emission reduction |
| CETA | EU-Canada Comprehensive Economic and Trade Agreement |
| CFP | Common Fisheries Policy |
| $CH_4$ | Methane |
| CMEMS | Copernicus Marine Environment Monitoring Service |
| CO | Carbon monoxide |
| $CO_2$ | Carbon dioxide |
| $CO_2e$ | Carbon dioxide equivalent |
| CoM | Covenant of Mayors |
| COP21 | 21st Conference of the Parties |
| CP1 | First commitment period |
| CP2 | Second commitment period |
| CRF | Common Reporting Format |
| CTF | Common tabular format |
| DCFTA | Deep and Comprehensive Free Trade Area |
| DCI | Development Cooperation Instrument |
| DG | Directorate-General |
| DG RTD | Directorate-General for Research and Innovation |
| DLDD | Desertification, Land Degradation and Drought |
| DRR | Disaster Risk Reduction |
| DRR | Disaster Risk Reduction |
| E3P | European Energy Efficiency Platform |

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|---|---|
| EAFRD | European Agricultural Fund for Rural Development |
| EAP | Environmental Action Programme |
| EASME | Executive Agency for SMEs |
| EcAMPA | Economic assessment of GHG mitigation policy options for EU agriculture |
| ECCM | Environment & Climate Change Mainstreaming Facility |
| ECCP II | The Second European Climate Change Programme |
| ECMWF | European Centre for Medium range Weather Forecasting |
| ECU | European Currency Unit |
| ECVs | Atmospheric, Oceanic and Terrestrial Essential Climate Variables |
| EDF | European Development Fund |
| EEA | European Environment Agency |
| EEEF | European Energy Efficiency Fund |
| EIB | European Investment Bank |
| EIONET | European Environment Information and Observation Network |
| EIT | European Institute of Innovation & Technology |
| ENP | European Neighbourhood Policy |
| ENPI | European Neighbourhood Policy Instrument |
| ERA | European Research Area |
| ERC | European Research Council |
| ERDF | European Regional Development Fund |
| ERU | Emission reduction unit |
| ESA | European Space Agency |
| ESD | Effort Sharing Decision |
| ESIF | European Structural and Investment Funds |
| ESIF | European Structural and Investment Funds |
| ETC/ACM | European Topic Centre on Air Pollution and Climate Change Mitigation |
| EU | European union |
| EU ETS | EU Emission Trading System |
| EU NIR 2017 | EU national inventory report, as submitted to the UNFCCC in 2017 |
| EU-15 | Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and United Kingdom |
| EU-27 | EU-15 plus Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia |
| EU-28 | 28 Member States of the European Union. EU-27, plus Croatia |
| EUFIWACC | The European Financing Institutions Working Group on Adaptation to Climate Change |
| EUMETSAT | European Organisation for the Exploitation of Meteorological Satellites |
| EUR | Euro |
| EUSEW | EU Sustainable Energy Week |
| FACCE-JPI | Joint Programming Initiative on Agriculture, Food Security and Climate Change |
| FET | Future and Emerging Technologies |
| F-gases | Fluorinated greenhouse gases |
| FP7 | EU's Seventh Framework Programme for Research and Technological Development |
| FRL | forest reference levels |
| GAEC | Good agricultural and environmental conditions |
| GCCA+ | Global Climate Change Alliance Plus |

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|---|---|
| GCF | Green Climate Fund |
| GCOS | Global Climate Observing System |
| GCOS | Global Climate Observing System |
| GDP | Gross Domestic Product |
| GEEREF | Global Energy Efficiency and Renewable Energy Fund |
| GEEREF | Global Energy Efficiency and Renewable Energy Fund |
| GEF | Global Environment Facility |
| GEO | Group on Earth Observation |
| GEOCAB | Global Earth Observations Capacity Building |
| GEOSS | Global Earth Observation System of Systems |
| GHG | Greenhouse Gas |
| GPGC | Global Public Goods and Challenges Programme |
| GVA | Gross Value Added |
| GWP | Global Warming Potential |
| HFCs | Hydrofluorocarbons |
| ICAP | International Carbon Action Partnership |
| IDFC | International Development Finance Club |
| IED | Industrial Emissions Directive |
| IPCC | Intergovernmental Panel on Climate Change |
| ISL | Iceland |
| ITL | Independent Transaction Log |
| JPI | Joint Programming Initiatives |
| JRC | Joint Research Centre |
| JU | The 'Fuel Cells and Hydrogen Joint Undertaking' |
| KIC | Knowledge and Innovation Communities |
| Km | Kilometre |
| KP | Kyoto Protocol |
| LCER | Long-term certified emission reduction |
| LDCs | Least Developed Countries |
| LECB | Low Emission Capacity Building Programme |
| LIFE | EU financial instrument for the Environment (French: L'Instrument Financier pour l'Environnement) |
| LULUCF | Land Use, Land-Use Change and Forestry |
| M&E | Monitoring and evaluation |
| MAC | Mobile Air Conditioning Systems |
| MACC-III | Monitoring Atmospheric Composition and Climate - Interim Implementation |
| MDBs | Multilateral Development Banks |
| MMR | Monitoring Mechanism Regulation |
| MRS | Macro-regional strategy |
| MS | Member State |
| MSCA | Marie Sklodowska-Curie Action |
| Mt | Megatonnes |
| $N_2O$ | Nitrous Oxide |
| NAP | National Adaptation Plan |

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|---|---|
| NAS | National Adaptation Strategy |
| NC | National Communication |
| NCFF | Natural Capital Financing Facility |
| NDC | Nationally Determined Contribution |
| $NF_3$ | Nitrogen Trifluoride |
| NGO | Non-Government Organisation |
| NIR | National Inventory Report |
| NMVOC | Non-methane volotile organic compoud |
| NOAA | National Oceanographic and Atmospheric Administration |
| $NO_x$ | Nitrogen oxides |
| ODA | Official Development Assistance |
| PAGE | Partnership for Action on Green Economy |
| PaMs | Policies and measures |
| PDA | Project Development Assistance |
| PFCs | Perfluorocarbons |
| PMR | World Bank Partnership for Market Readiness |
| PPS | Purchasing power standards |
| QA/QC | Quality Assurance / Quality Control |
| QSG | Quality Support Groups |
| R&I | Research and innovation |
| REA | Research Executive Agency |
| REFIT | The Regulatory Fitness and Performance programme |
| RES | Renewable Energy Sources |
| RES-E | Renewable energy sectors of electricity |
| RES-H&C | Renewable energy sectors of heating and cooling |
| RES-T | Renewable energy sectors of transport |
| RMU | Removal unit |
| RSO | Research and Systematic Observations |
| S&T | scientific and technological |
| SAR | Second Assessment Report |
| SDGs | Sustainable Development Goals |
| SDS | Sustainable Development Strategy |
| SE4ALL | Sustainable Energy for All |
| SETIS | Strategic Energy Technologies Information System |
| SET Plan | Strategic Energy Technology Plan |
| $SF_6$ | Sulphur Hexafluoride |
| SFIC | Strategic Forum for International Science and Technology Cooperation |
| SHERPA | Screening for High Emission Reduction Potential on Air |
| SIDS | Small Island Developing States |
| SIDS | Small Island Developing States |
| SITC | Standard International Trade Classification |
| SLR | Sea Level Rise |
| SMEs | Small-Medium Enterprises |
| $SO_2$ | Sulphur Dioxide |

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|---|---|
| SRIA | Strategic Research and Innovation Agenda |
| SWD | Staff Working Document |
| TAF | Technical Assistance Facility |
| tCER | temporary certified emission reduction |
| TFEU | Treaty on the Functioning of the European Union |
| Toe | Tonnes of Oil Equivalent |
| TWh | Terawatt hour |
| UAA | Utilised agricultural area |
| UHI | urban heat island |
| UN | United Nations |
| UNFCCC | United Nations Framework Convention on Climate Change and the Kyoto Protocol |
| USD | US Dollars |
| WAM | With Additional Measures |
| WEEE | Waste Electricals and Electronic Equipment |
| WEM | With Existing Measures |
| WOM | Without Measures |
| WRI | World Resource Institute |

# 8 APPENDIX: CTF FOR EU 3RD BIENNIAL REPORT