

Approximated EU greenhouse gas inventory

Proxy GHG emission estimates for 2022



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Executive summary

This report provides GHG emissions estimates for the EU including LULUCF, indirect CO₂ emissions and international aviation. This Executive Summary includes an analysis of the important changes in GHG emissions across the EU, by sector and by Member State.

For EU27 the 2022 emissions are estimated to be 3 248 million tonnes of CO₂ equivalents (Mt CO₂e), which indicates a decrease from 2021 of 64 Mt CO₂e, or 1.9% (total GHG emissions including LULUCF, indirect CO₂ and international aviation).

International aviation equalled for EU27 to 103 Mt CO₂e in 2022, which is 47.1% higher than in 2021. Table ES-1 provides details on the total levels of emissions.

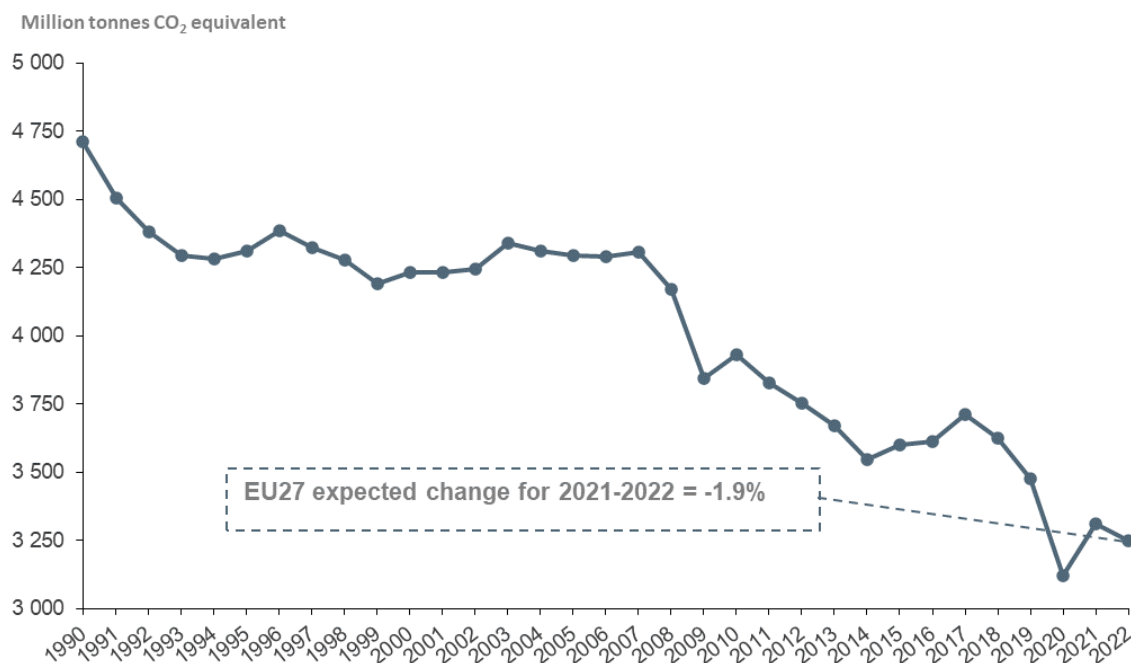
Emissions in 2022 follow the decreasing trend visible between years 2017 and 2021 which was only disrupted in 2020 by an exceptionally strong decrease caused by the COVID-19 pandemic situation (Figure ES-1).

The changes in 2022 are caused by number of reasons, whereby is important to mention decrease in total energy consumption. Changes in the fuels consumed in 2022 are mostly driven by energy crisis triggered by Russia's invasion of Ukraine and therefore don't follow the weather conditions as much as in previous years.

Table ES-1 Emissions including international aviation (kt CO₂e)

European Union (EU27)	1990	2021	2022	2022-2021	2022/2021	2022-1990	2022/1990
Total excl. LULUCF incl. indirect CO₂	4 866 998	3 471 700	3 388 659	-83 042	-2.39%	-1 478 339	-30.37%
LULUCF	-208 795	-229 985	-243 767	-13 783	5.99%	-34 972	16.75%
Total incl. LULUCF incl. indirect CO₂	4 658 202	3 241 716	3 144 891	-96 824	-2.99%	-1 513 311	-32.49%
International aviation	54 098	69 754	102 603	32 848	47.09%	48 505	89.66%
Total incl. LULUCF and international aviation	4 712 300	3 311 470	3 247 494	-63 976	-1.93%	-1 464 806	-31.08%

Figure ES-1 Trends in total GHG emissions, 1990-2022



Note: Total GHG emissions with LULUCF including indirect CO₂ and international aviation

Source: The EEA’s ETC CM, based on the 2023 Member States’ GHG inventories submitted to UNFCCC for the years 1990-2021 and proxy estimates for 2022.

Changes in EU GHG emissions by sector

On a sectoral basis, the largest absolute emission change occurred in the Energy sector (i.e., all combustion activities and fugitive emissions from energy). Energy related emissions decreased by 48 Mt CO₂e (1.8%) across the EU. The largest change in fuel combustion emissions occurred in 1.A.4 Other sectors with a decrease of 51 Mt CO₂e. The emissions reported in this category can be generally defined as heat production processes for internal consumption and includes mainly emissions from ‘small scale fuel combustion’ used for space heating and hot water production in commercial and institutional buildings, households, agriculture and forestry. The decrease in this category was affected by milder weather, changes in consumer behaviour, fuel switching, increased efficiency and heat pumps.

These changes in emissions in 2022 reflect changes in the fuel mix. Primary fossil energy consumption decreased in 2022. However, the contribution of coal and oil to the energy mix increased in 2022 while the share of gas decreased. Primary energy consumption of nuclear energy decreased as well as its contribution to the energy mix. Gross final consumption of energy (GFCoE) from renewable sources increased slightly. Solar and wind contributed the most to the increase in renewable electricity, while solid biofuels and hydro⁽¹⁾ decreased (EEA 2023 b).

Different trends in consumption for the different fossil fuel types can be seen in 2022. The consumption of gaseous fuels decreased significantly by 13.4% while consumption of liquid fuels increased by 3.6% and solid fossil fuels consumption increased by 1.6% (EEA 2023 a).

⁽¹⁾ Hydro in the report is pure hydro without pumping.

Emissions from Industrial Processes decreased by 25 Mt CO₂e in the EU27. The largest contribution to this emission decrease was from 2.C Metal Industry, which decreased by 8.2 Mt CO₂e. Emissions from Agriculture decreased by 7.8 Mt CO₂e. The decrease in agriculture sector emissions is largely driven by decreased emissions from agricultural soils. The trend in emissions from waste (-1.2 Mt CO₂e compared to previous year) continues the decrease seen in previous years with largest reduction being in emissions from solid waste disposal.

ETS emissions (mostly covering emissions from electricity and heat production) have decreased less than the Effort Sharing Regulation emissions. Between 2021 and 2022 the emissions decreased by 1.8% across stationary installations covered by the European Emissions Trading System for the EU and emissions covered by the Effort Sharing Regulation decreased by 2.9%.

Changes in member state's GHG emissions

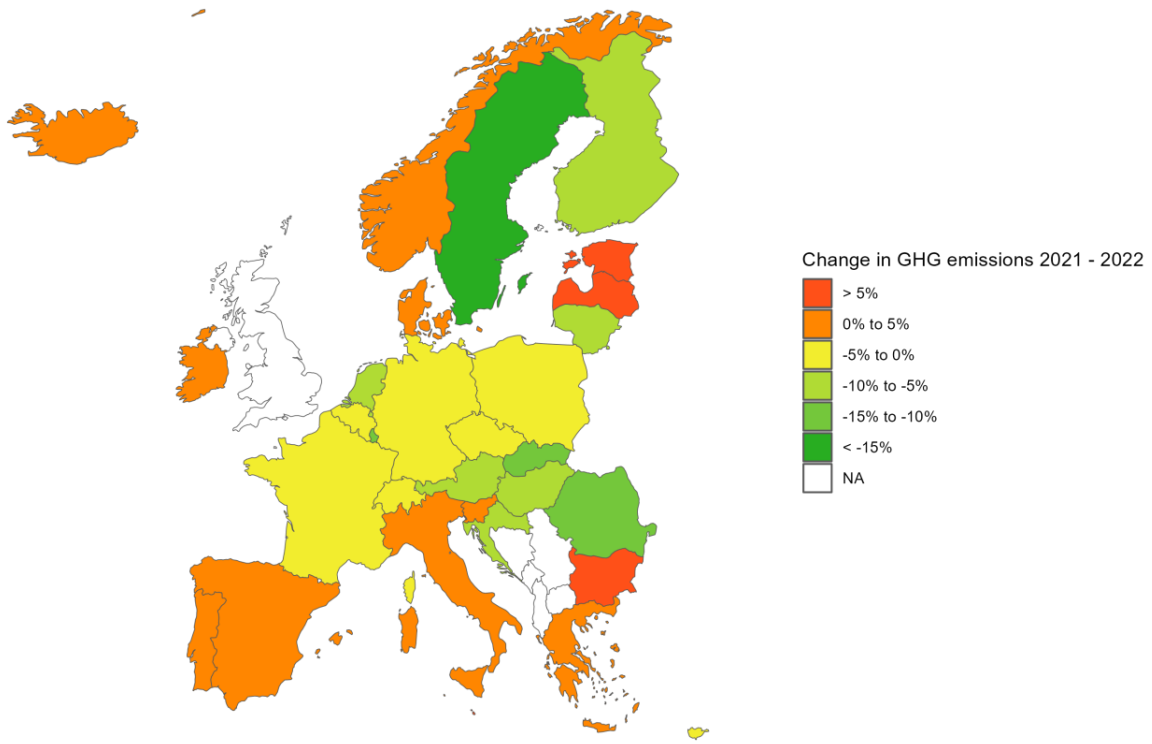
Greenhouse gas emissions decreased in sixteen EU Member States in 2022. Figure ES-2 depicts the regional distribution of these changes which differ significantly between different regions.

Comparing the changes across Member States, the largest absolute emission change occurred in Poland, where emissions decreased by 15 Mt CO₂e. Apparent decrease in emissions occurred also for Germany (-12 Mt CO₂e) and the Netherlands (-11 Mt CO₂e). The largest absolute emission increase occurred in Spain (+12 Mt CO₂e).

The largest relative declines in emissions compared to the previous year took place in Sweden (-24.7%) and Romania (-13.8%). The largest relative increases were in Estonia (+11.4%).

In the non-EU member countries of the EEA, emissions decreased in Switzerland (-3.8%, or -1.7 Mt CO₂e), whereas increased in Iceland (+2.3% or +0.3 Mt CO₂e) and Norway (+1.8% or +0.6 Mt CO₂e).

Figure ES-2 Regional trends in total GHG emissions change 2021-2022



Note: Total GHG emissions with LULUCF including indirect CO₂ and international aviation

1 Background and objective

This approximated GHG inventory is an early estimate of the GHG emissions for the preceding year. The legal basis for the approximated GHG emission estimates is Regulation (EU) 2018/1999 of the European Parliament and of the Council on the Governance of the Energy Union and Climate Action. Article 26(2) requires Member States to submit to the Commission approximated greenhouse gas inventories for the year $t-1$ by 31 July every year. The European Environment Agency (EEA) assists the Commission in the compilation of the Union approximated greenhouse gas inventory. These estimates are referred to as approximated ('proxy') estimates or inventories as they cover the year for which no official GHG inventories have been prepared. Should a Member State not provide their own proxy emission estimate, the EEA produces and uses gap-filled estimates in order to have a complete approximated GHG inventory for the European Union. Non-EU member countries of the EEA are invited to submit their proxy estimates on a voluntary basis.

The scope of the proxy estimates covers total GHG emissions, for all gases, sectors, and Member States, as reported under the UNFCCC including the land use, land-use change and forestry (LULUCF) sector, indirect CO₂ and international aviation.

Member States are responsible for the methodological choice regarding their own estimates. For gap-filling where a Member State has not provided their own estimate the EEA has used the latest Eurostat and EU ETS data to carry forward reported emissions from the energy and industrial processes sectors. These two source categories typically account for the bulk of emissions and have the largest annual change. International aviation was gap-filled in case reporting countries have not reported the data. The gap-filling procedure used flight and emission data provided by Eurocontrol.

The EU is aiming to have a leading role in the emission reduction and for this purpose a number of measures have been adopted. One of the most important measures is the Effort Sharing Regulation, which covers sectors of the economy which fall outside the scope of the EU Emission Trading Scheme. These sectors, which include transport, buildings, agriculture, non-ETS industry and waste, account up to 62% of the total EU emissions (EEA 2023).

The official submission of 2022 inventories to the United Nations Framework Convention on Climate Change (UNFCCC) will take place in 2024.

Table 1-1 provides an overview of different emission estimates by EU bodies. More information can be found on the EEA website 'Note on different emission estimates by EU institutions': www.eea.europa.eu/publications/different-emission-estimates-by-eu-bodies-2

Table 1-1 Overview of EU data sources for GHG estimates

What	Who	When	Time	Geographical scope	Sectoral Scope	Obligation
GHG inventory to UNFCCC	EEA, DG CLIMA	15 April	<i>t-2</i>	EU and its 27 Member States	All gases and sectors (100% of emissions)	EU Regulation (2018/1999)
Approximated / Proxy GHG inventory	EEA, DG CLIMA	31 October	<i>t-1</i>	EU and its 27 Member States and other EEA member countries when available	All gases and sectors (100% of emissions)	EU Regulation (2018/1999)
EU ETS	DG CLIMA, EEA	Early April, May and summer (between July and September)	<i>t-1</i>	EU27 and other EEA member countries	About 9,500 installations (~39% of total emissions)	EU ETS Directive (2003/87/EC)
CO₂ early estimates from fossil fuel combustion	Eurostat	April / May	<i>t-1</i>	EU and its 27 Member States	CO ₂ from fossil fuel combustion (~80% of total emissions)	Eurostat's work programme
Air emissions accounts, air emission intensities and air emission footprints	Eurostat	annual	<i>t-2</i>	EU27	Six greenhouse gases including CO ₂ and seven air pollutants	Regulation (EU) 691/2011 (Annex I)

2 European GHG emissions in 2022

A total of twenty-four Member States submitted preliminary 2022 GHG data to the European Commission and the EEA by 31 July 2023 and two Member States submitted after this date. Austria, Belgium, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden all submitted emissions data in the form of largely⁽²⁾ complete CRF Summary2 tables. The methodologies used for any gap-filling are described in chapter 4.4.1.

These 26 countries that submitted 2022 proxy estimates represent more than 98% of EU27 total emissions.

The EEA used gap-filled estimates for Bulgaria in order to have a complete approximated GHG inventory for the European Union (section 4.3).

Additionally, three EEA member countries submitted preliminary 2022 GHG data by 31 July 2023: Iceland, Switzerland and Norway⁽³⁾.

Approximated GHG inventories in CRF Summary2 table format are presented for the EU27 in chapter 2.1.5

⁽²⁾ Where sub-sector emissions detail was not available it was gap-filled using simple allocation based on the previous year's splits. In some instances, sub-sectors emissions needed to be summed for sectors. These minor modifications

were performed for Denmark, Germany, Greece, Hungary, Ireland, Luxembourg and Sweden.

⁽³⁾ Other non-EU Member States of the EEA are Liechtenstein and Turkey. As these countries did not submit any GHG data for 2020, they are not considered in this report.

Annex 1: Detailed results for each Member State provides the CRF Summary tables for each of the 27 EU Member States and also for Iceland, Switzerland and Norway.

2.1 Trend and overall results

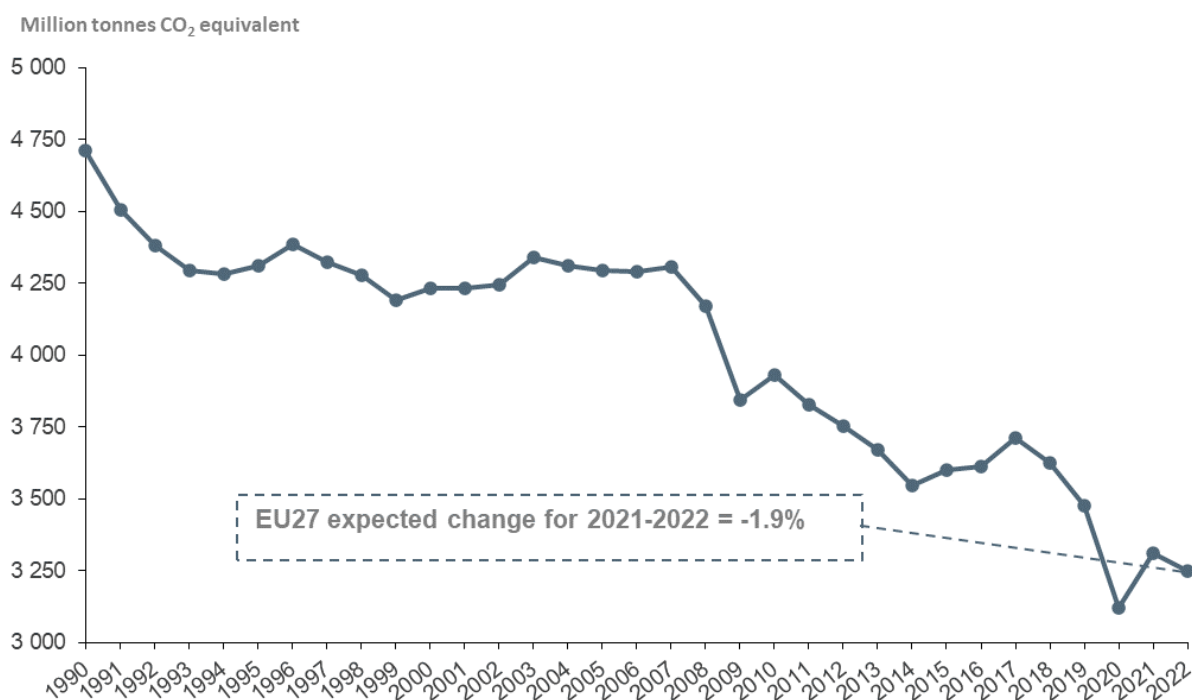
2.1.1 Changes in GHG emissions across the EU

For EU27 the 2022 GHG emissions including LULUCF, indirect CO₂ emissions and international aviation are estimated to be 3 248 million tonnes of CO₂ equivalents (Mt CO₂e), which indicates a decrease from 2021 of 64 Mt CO₂e.

The estimates for 2022 indicate the continuity in trend which was observed between 2017 and 2019. Emissions levelled off between 2014 and 2017 (Figure 2-1), then decreased between 2017 and 2021. The exceptionally strong decrease in 2020 was caused by the COVID-19 pandemic situation. The estimate for 2022 shows 1.9% decrease compared to 2021 emissions level. The decrease is mostly driven by energy crisis triggered by Russia’s invasion of Ukraine.

International aviation equalled for EU27 to 103 Mt CO₂e in 2022, which shows an increase of 47.1% in comparison to the 2021 levels.

Figure 2-1 Trends in total GHG emissions, 1990-2022

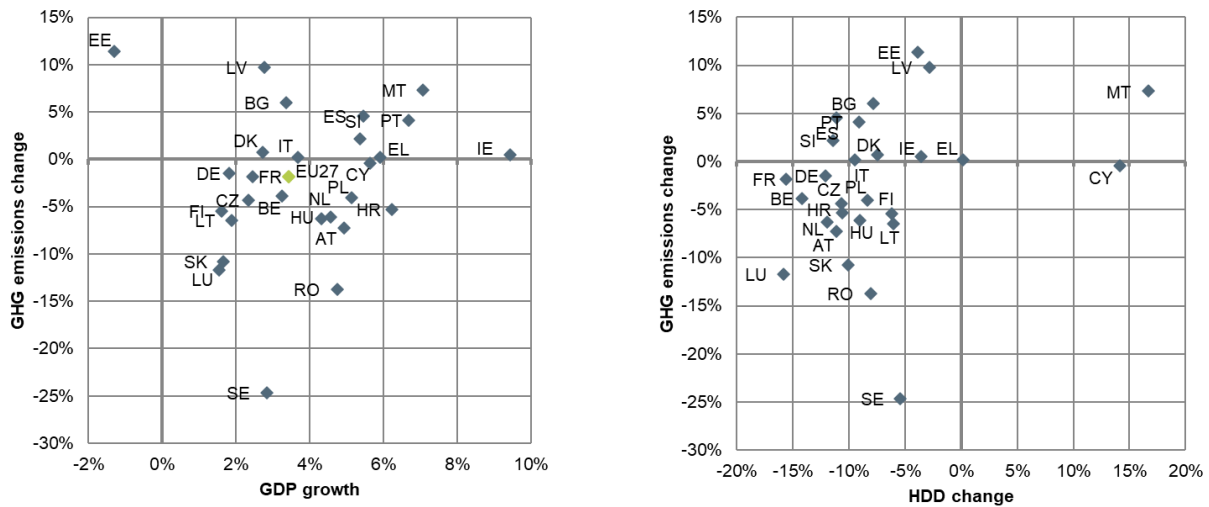


Note: Total GHG emissions with LULUCF including indirect CO₂ and international aviation

Source: The EEA’s ETC CM, based on the 2023 Member States’ GHG inventories submitted to UNFCCC for the years 1990-2021 and proxy estimates for 2022.

The trend shows 1.9% decrease in emissions for the EU27 since 2021, although the GDP growth is showing a positive trend of 3.4% in the same year (Figure 2-2). Sixteen Member States achieved decreases in emissions while only Estonia had negative GDP growth.

Figure 2-2 GHG emissions, GDP growth and heating degree days change 2021-2022



Note: Heating Degree Days (HDDs) are an indication of heat demand based on outdoor temperatures. Positive HDD change can correlate with increased heating demand.

Source: EEA’s ETC CM, based on GDP from EEA (Gross domestic product at market prices, Chain linked volumes (2015), mrd euro) and Eurostat Heating Degree Days (HDDs), an indication of heat demand based on outdoor temperatures, from Eurostat. HDD change was not available for EU27.

Climatic factors have a significant effect on energy demand and GHG emission trends. The globally exceptionally warm years were from 2015 to 2022. In Europe, the annual mean temperature in 2022 was 0.3°C lower than in 2020, the warmest year on record (Copernicus 2023). Winter in 2022 was warmer than 1991-2020 average, nevertheless the difference with reference period temperatures wasn’t exceptional. The pattern in heating degree days (a standardized measure for linking heating demand and weather conditions) confirms lower heating demand in 2022 compared to 2021 when winter was colder (although above the long-term average). The highest amount of cooling degree days in 2022 was observed for Malta, and Cyprus, as it is to be expected for these countries. Figure 2-2 also shows that in Cyprus heating degree days increased while total emissions decreased and in nine Member States heating degree days decreased while GHG emissions increased.

2.1.2 Changes in EU GHG emissions by sector

On a sectoral basis, the largest absolute emission change in the EU occurred in the energy sector (i.e., all combustion activities and fugitive emissions). Energy related emissions decreased by 48 Mt CO₂e (-1.8%) across the EU. Within the energy sector, emissions increased in energy industries (+23 Mt CO₂e), particularly in heat and electricity production, and in transport (+21 Mt CO₂e). Whereas emissions from manufacturing industries and construction decreased (-41 Mt CO₂e), as well as emissions from the residential and commercial sector (-51 Mt CO₂e) and fugitive emissions from fuels (-0.4 Mt CO₂e).

These changes in emissions in 2022 reflect changes in the fuel mix. Primary fossil energy consumption decreased in 2022, however the contribution of coal and oil to the energy mix increased while the share of gas decreased. This is because the energy crisis had two consequences, exerting two opposing impacts: restricted gas supply and higher prices caused an increase in the use of coal for power generation on the one hand, but triggered an overall reduction in industrial demand on the other. Primary energy consumption of nuclear energy decreased as well as its contribution to the energy mix. Solar (29.3%) and wind (10.1%) contributed the most to the increase in renewable electricity continuing the strong trend from the previous year, while solid biofuels (-7.4%) and hydro (-20.4%) decreased. Hydro generation

decreased significantly across the EU due to droughts and low precipitation, the most in Luxembourg (-40.4%), Portugal (-40.0%) and Italy (-37.8%). In absolute values, the fall was steepest in Italy, France and Spain.

Consumption of coal, oil, gas and nuclear energy are primary energy consumption⁴ values from the ETC energy efficiency proxy 2023 (EEA 2023 a). Renewable energy values are from the ETC RES proxy 2023 (EEA 2023 b).

Different trends in consumption for the different fossil fuel types can be seen in 2022. The consumption of gaseous fuels decreased significantly by 13.4% while consumption of liquid fuels increased by 3.6% and solid fossil fuels consumption increased by 1.6%.

The gaseous fuels consumption increased only in Ireland (+2.0%) and decreased in all the other Member States with the largest decrease in Finland (-47.9%) followed by Sweden (-30.9%).

Liquid fossil fuels consumption increased in 19 Member States with the largest increases being in Slovenia (+16.2%), Greece (+12.5%) and Croatia (+11.0%). In eight Member States liquid fossil fuels consumption decreased with the largest decrease in Estonia (-7.9%) and Luxembourg (-7.9%).

Solid fossil fuel consumption increased in twelve Member States with highest increases in Spain (+31.3%), Italy (+30.1%) and Bulgaria (+19.4%). Fourteen Member States showed decreasing solid fossil fuel consumption. The largest decreases were in Portugal (-95.4%), Slovenia (-23.1%) and Cyprus (-20.7%).

These changes in fossil fuel consumption are not only related to heating degree day (HDD) effects as described in section 2.1.1 but also strongly connected to the trends in electricity generation from fossil fuels and the war in Ukraine which affected gas prices.

Renewable electricity generation continues to play an important role in GHG mitigation efforts by the EU and its Member States. Gross final consumption of energy (GFCoE) from renewable sources increased by 0.7% despite hydroelectric generation decreased by -20.4% across the EU with twenty-two Member States experiencing lower hydro electricity production in 2022 than in 2021 due to low precipitation and droughts. Hydro production increased only in two Member States. The largest absolute decreases in pure hydro generation without pumping were in Italy, France and Spain. Increases in pure hydro generation without pumping were only in Lithuania and Latvia.

Electricity production from renewable sources increased by 5.2%. Gross electricity generation from wind energy increased by 10.1% in the EU across twenty-one Member States. The largest relative increases were in Finland (41.3%), Sweden (21.5%) and Netherlands (20.1%). The largest absolute contributions from wind energy were in Germany, Spain and France.

Increases in electricity production from photovoltaics were seen in most Member States (26) and production grew by 29.3% across Europe, with very large relative increases in Latvia (607.3%), Poland (206.8%) and Denmark (68.3%). The largest absolute generation from photovoltaics was in Germany followed by Spain and Italy.

In 2022 nuclear energy production across the EU decreased by 17.1% compared to 2021. Nuclear electricity generation increased in five Member States. The highest increase was in the Netherlands (+8.2%). Nuclear electricity generation decreased in eight Member States. The largest decreases in nuclear electricity generation occurred in Germany (-49.8%) followed by France (-22.3%) and Belgium (-12.8%).

(4) Primary energy consumption is calculated as final consumption non energy use subtracted from gross inland consumption.

The emissions from the sector Industrial Processes and Product Use decreased by 7.8% between 2021 and 2022 in the EU27. The largest contribution to this emission decrease was from metal industry, which decreased by 11.0%, followed by emission decreases in chemical and mineral industries, and by category 2. F Product uses as substitutes for ODS.

Agriculture emissions decreased by 2.1% mainly due emission decreases from agricultural soils, and also enteric fermentation and manure management.

The trend in emissions from waste (-1.3 Mt CO₂e or -1.1% compared to previous year) continues the decrease seen in previous years with largest reduction being in emissions from solid waste disposal.

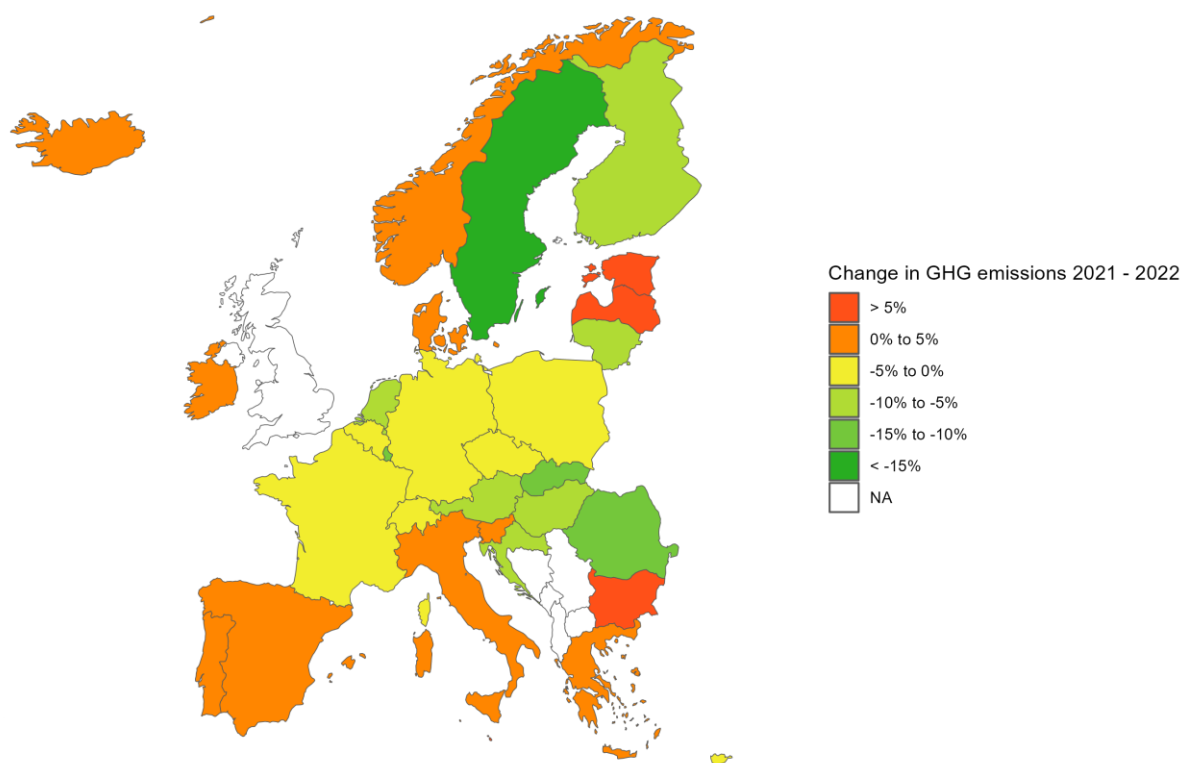
LULUCF removals increased between 2021 and 2022 (-13.8 Mt CO₂e or 6.0%). The trends of 4.A Forest land significantly dominate the sector.

Between 2021 and 2022 the emissions decreased by 1.8% across stationary installations covered by the European Emissions Trading System for the EU and emissions covered by the Effort Sharing legislation decreased by 2.9%.

2.1.3 Changes in member states GHG emissions 2021 to 2022

Total greenhouse gas emissions including LULUCF, indirect CO₂ emissions and international aviation decreased in sixteen EU Member States in 2022. Figure 2-3 depicts the regional distribution of these changes which differ significantly between different regions.

Figure 2-3 Regional trends in total GHG emissions change 2021-2022



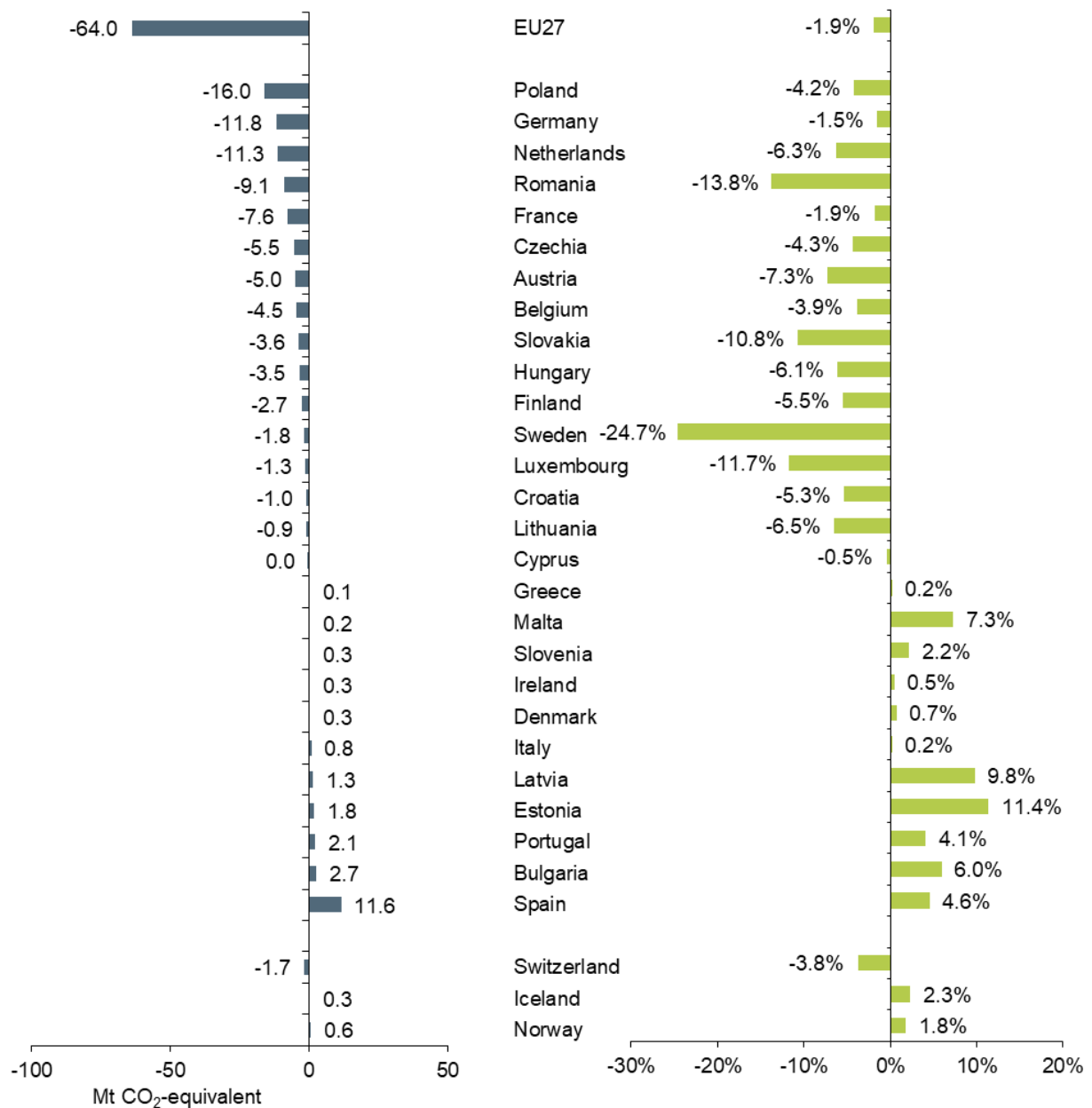
Note: Total GHG emissions with LULUCF including indirect CO₂ and international aviation

Comparing the changes across Member States (Figure 2-4), the largest absolute emission change occurred in Poland, where emissions decreased by 15 Mt CO₂e. Apparent decrease in emissions occurred also for Germany (-12 Mt CO₂e) and the Netherlands (-11 Mt CO₂e). The largest absolute emission increase occurred in Spain (+12 Mt CO₂e).

The largest relative declines in emissions compared to the previous year took place in Sweden (-24.7%) and Romania (-13.8%). The largest relative increases were in Estonia (+11.4%).

In the non-EU member countries of the EEA, emissions decreased in Switzerland (-3.8%, or -1.7 Mt CO₂e), whereas increased in Iceland (+2.3% or +0.3 Mt CO₂e) and Norway (+1.8% or +0.6 Mt CO₂e).

Figure 2-4 Member States' emissions, change 2021-2022



Note: Total GHG emissions with LULUCF including indirect CO₂ and international aviation

Members states which showed pronounced positive or negative changes in emissions compared to the previous year. Consumption of coal, oil, gas and nuclear energy in the following paragraphs are primary energy consumption⁽⁵⁾ values from the ETC energy efficiency proxy 2023 (EEA 2023 a). Renewable energy values are from the ETC RES proxy 2023. Hydro and wind are not normalised. Hydro is pure hydro without pumping (EEA 2023 b).

Member states with decreasing 2021 to 2022 emission trends

Sixteen Member States experienced emission decreases. The most apparent decrease was seen in Poland. Emissions in Poland decreased by 15.3 Mt CO₂e or 4.0%. Consumption of solid fossil fuels decreased by 5.2%, consumption of natural gas by 19.9%. On the contrary consumption of oil increased by 7.7%. Consumption of renewable energies including hydro changed by 2.2% due the changes in photovoltaics (206.8%), wind (19.8%), heat pumps for heating (40.4%) and hydro (-15.4%). Emissions from 1.A.1 Energy industries fell the most (-7.5 Mt CO₂e or -4.7%), followed by 1.A.4 Other sectors (-3.9 Mt CO₂e or -7.1%). The only energy category where emissions increased was 1.A.3 Transport (+1.8 Mt CO₂e or +2.6%). Emissions of Industrial processes and product use decreased only by 0.7 Mt CO₂e (-3.0%), the decrease is driven mainly by 2.B Chemical industry. Emissions from Agriculture decreased by 1.5 Mt CO₂e (-4.3%). Sinks in LULUCF increased very slightly (-0.2 Mt CO₂e or -0.9%). Emissions decrease in Waste is only -0.4 Mt CO₂e (-8.6%).

In Germany, emissions decreased by 11.8 Mt CO₂e or -1.5%. Consumption of solid fossil fuels increased by 4.1% and consumption of oil by 1.9% while natural gas decreased significantly by 15.7%. Consumption of renewable energy including hydro changed by 3.3% mostly due to changes in wind electricity (9.3%), photovoltaics (23.2%) heat pumps for heating (14.3%), and hydro (-10.4%). Emissions from 1.A.2 Manufacturing industries and construction decreased the most (-14.6 Mt CO₂e or -11.6%) followed by the other energy sector categories except 1.A.1 Energy industries and 1.A.3 Transport. As expected, Industrial processes and product use decreased as well (-4.5 Mt CO₂e or -7.9%). Emissions from Agriculture decreased very slightly (-0.9 Mt CO₂e or -1.5%). Sinks in LULUCF sector increased (-5.8 Mt CO₂e or -145.4%). Emission decrease in Waste sector is almost insignificant (-0.2 Mt CO₂e or -4.5%).

In the Netherlands, emissions decreased by 11.3 Mt CO₂e or -6.3%. Consumption of oil increased by 5.4% while consumption of solid fossil fuels decreased by 0.8% and consumption of gas decreased significantly by 22.2%. Consumption of renewable energy including hydro changed by 7.0% mainly due the changes in wind electricity (20.1%), photovoltaics (46.4%), heat pumps for heating (26.3%) and hydro (-43.3%). Emissions from 1.A.4 Other sectors decreased the most (-7.5 Mt CO₂e or -21.3%) followed by the other energy sector categories except 1.A.5 Other. The highest decrease among Industrial processes sector categories was observed for 2.B Chemical industry (-1.4 Mt CO₂e or -26.3%). Emission and removal changes in Agriculture and LULUCF sectors were rather insignificant (less than ±0.1 Mt CO₂e or -0.1% and 1.7% respectively). Emission decrease in Waste sector is only -0.2 Mt CO₂e (-3.3%).

The largest relative decrease was seen in Sweden. Emissions in Sweden decreased by 24.7%. On the sectoral basis, the most apparent change is noted for the Energy sector (-2.5 Mt CO₂e or -7.4%) where the biggest relative decrease of -13.2% is reported in 1.A.1 Energy industries. Consumption of energy from renewable sources including hydro changed by -1.2% in Sweden due to changes in wind electricity (21.5%), photovoltaics (28.6%) and hydro (-5.0%).

⁽⁵⁾ Primary energy consumption is calculated as final consumption non energy use subtracted from gross inland consumption.

Member states with increasing 2021 to 2022 emission trends

The largest absolute increase was seen in Spain. Emissions in Spain increased by 11.6 Mt CO₂e or 4.6%. Consumption of solid fossil fuels increased significantly by 31.3%, consumption of oil increased as well (by 9.6%) while natural gas consumption decreased by 3.6%. Consumption of renewable energy including hydro changed by 4.6% due the change in wind electricity (7.5%), photovoltaics (37.9%), heat pumps for heating (7.9%) and hydro (-36.9%). Emissions from 1.A.1 Energy industries increased the most (+14.1 Mt CO₂e or +34.1%) followed by an increase in 1.A.3 Transport (+3.8 Mt CO₂e or +4.4%). Other energy sector categories decreased except 1.B Fugitive emissions from fuels where an increase was insignificant (less than +0.01 Mt CO₂e). On the contrary, emissions from Industrial processes and product use decreased (-1.1 Mt CO₂e or -4.6%) as well as emissions from Agriculture (-2.0 Mt CO₂e or -5.9%). Emission and removal changes in LULUCF and Waste sectors were insignificant (less than 0.1 Mt CO₂e or -0.1% and 0.5% respectively).

In Bulgaria, emissions increased by 2.7 Mt CO₂e or 6.0%. Consumption of solid fossil fuels increased by 19.4%, consumption of oil increased by 9.8% and on the contrary natural gas consumption decreased by 18.1%. The consumption of solid fossil fuels increased significantly by 37.0%. Consumption of renewable energy including hydro changed by 10.4% mostly due the changes in solid biofuels in heating and cooling (15.1%), wind electricity (3.7%), photovoltaics (28.5%), heat pumps for heating (17.6%) and hydro (-21.7%). Emissions from 1.A.1 Energy industries increased the most (+3.8 Mt CO₂e or +17.0%) followed by 1.A.3 Transport. Industrial processes and product use slightly decreased (-0.4 Mt CO₂e or -8.0%). Emission changes from Agriculture, LULUCF and Waste were insignificant.

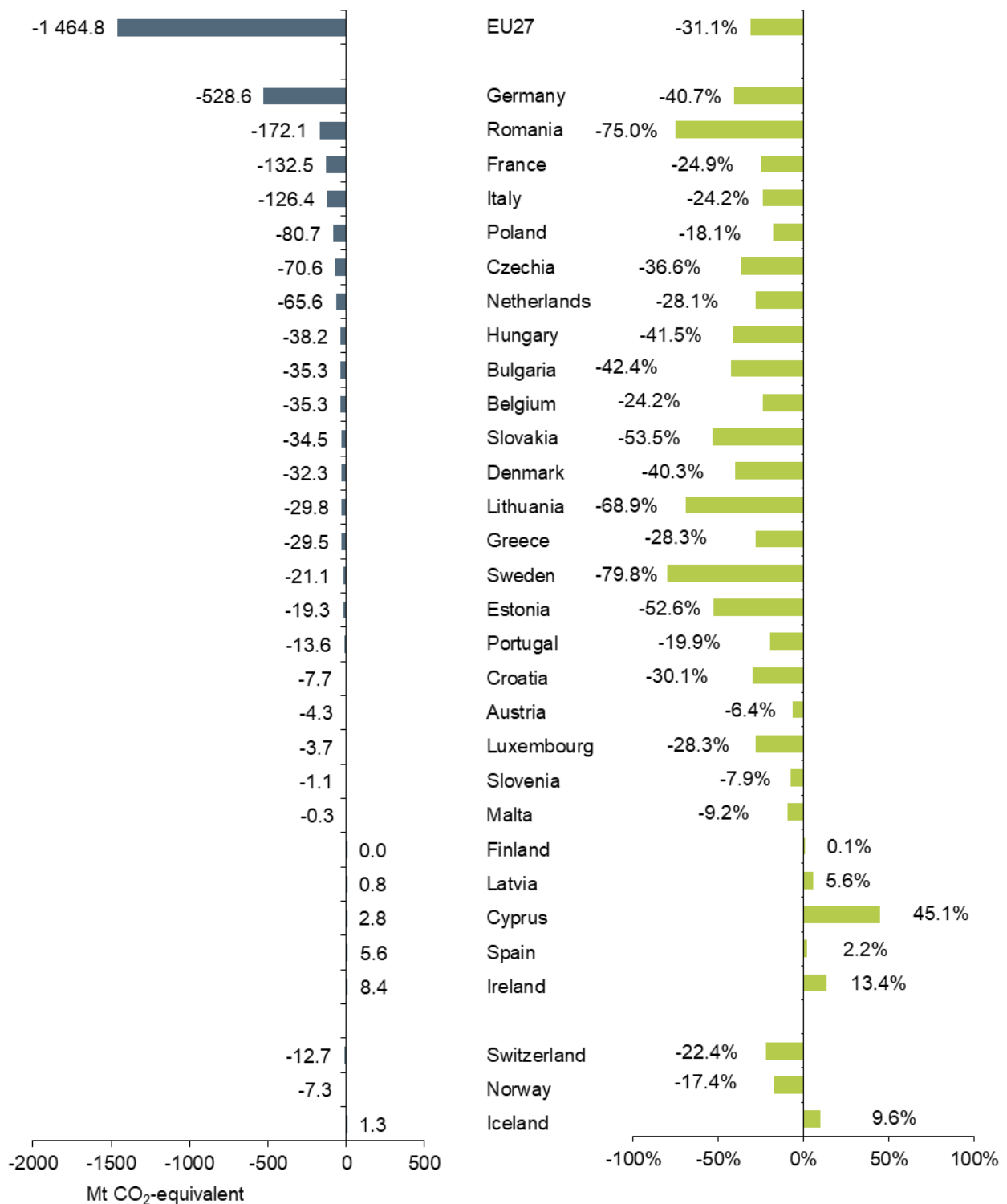
In Portugal, emissions increased by 2.1 Mt CO₂e or 4.1%. Oil consumption increased by 8.3% while solid fossil fuels consumption decreased significantly by 95.4% (it is important to note that the share of solid fossil fuels in the Portugal's energy mix was less than 2% in 2021) and natural gas consumption decreased by 3.5%. Renewables including hydro changed by 4.4%. Wind electricity stayed stagnant (0.4%), while photovoltaics (55.2%) and heat pumps for heating (14.7%) increased, but hydro decreased steeply (-40.0%). The largest increase in emissions is apparent for 1.A.3 Transport where the increase is 1.1 Mt CO₂e or 6.8%.

The largest relative increase was seen in Estonia. Emissions in Estonia increased by 11.4%. On the sectoral basis, the most apparent change is noted for the Energy sector (+1.8 Mt CO₂e or +16.8%) where the biggest relative increase of +23.2% is reported in 1.A.1 Energy industries. Consumption of energy from renewable sources including hydro decreased by -2.1% in Estonia due to changes in wind electricity (-8.9%), solid biofuels in heating and cooling (-9.2%), solid biofuels in electricity (-10.9%) but photovoltaics (58.3%) experienced a strong growth.

2.1.4 Changes in member states GHG emissions 1990 to 2022

Total EU27 GHG emissions including LULUCF, indirect CO₂ and international aviation in 2022 are estimated to be -31.1% or -1465 Mt CO₂e below 1990 levels as shown in Figure 2-5. Emissions for most EU27 Member States are lower than in 1990 while emissions in Cyprus, Finland, Ireland and Latvia are higher than in 1990.

Figure 2-5 Member States' emissions change 1990-2022



Note: Total GHG emissions with LULUCF including indirect CO₂ and international aviation

The largest absolute decrease was in Germany, followed by Romania, France and Italy which all reduced their GHG emissions by more than 100 Mt CO₂e since 1990. The largest absolute increase was experienced by Ireland with 8.4 Mt CO₂e, followed by Spain (+5.6 Mt CO₂e) and Cyprus (+2.8 Mt CO₂e).

The largest relative emission decreases were in Estonia, Lithuania, Romania, Sweden and Slovakia which all reduced their emissions by more than 50% compared to 1990. The relative emission decreases of further five Member States are stronger than the EU27 average.

Of the three non-EU member countries of the EEA considered in this report only Iceland had in 2022 higher GHG emissions compared to 1990 level.

2.1.5 Detailed results for the EU27

This section begins with a brief comparison of the effect of including emissions from international aviation and LULUCF in the totals. Table 2-1 summarises the emissions as CO₂e and percentage changes. It should be noted, that in their proxy submissions, a number of Member States used the 2021 value for emissions from international aviation as an approximated value for 2022 as well as for LULUCF sector. Flight and emissions data from Eurocontrol was used to gap-fill international aviation emissions where Member States did not include an estimate. For the EU 2022 proxy, this method was applied to four countries.

Table 2-1 Emissions including international aviation (kt CO₂e)

European Union (EU27)	1990	2021	2022	2022-2021	2022/2021	2022-1990	2022/1990
Total excl. LULUCF incl. indirect CO₂	4 866 998	3 471 700	3 388 659	-83 042	-2.39%	-1 478 339	-30.37%
LULUCF	-208 795	-229 985	-243 767	-13 783	5.99%	-34 972	16.75%
Total incl. LULUCF incl. indirect CO₂	4 658 202	3 241 716	3 144 891	-96 824	-2.99%	-1 513 311	-32.49%
International aviation	54 098	69 754	102 603	32 848	47.09%	48 505	89.66%
Total incl. LULUCF incl. international aviation	4 712 300	3 311 470	3 247 494	-63 976	-1.93%	-1 464 806	-31.08%

Table 2-2 shows the detailed results for the EU27. Summary tables for 2022 for each Member State as submitted by the Member States or gap-filled by EEA for Member States which did not submit their own approximated emissions report are provided in Annex 1.

Table 2-2 Summary table of approximated GHG emissions for 2022 for EU27 (total emissions including indirect CO₂)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories								Year	2021
Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999								Submission	2022
								Country	EU27
								Geographical scope	Sum of the 27 M
GREENHOUSE GAS SOURCE AND	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total
SINK CATEGORIES	CO ₂ equivalent (kt)								
Total (net emissions)⁽¹⁾	2484380.93	407489.26	178303.97	65512.28	1157.35	4159.21	1718.94	72.20	3142791.36
1. Energy	2525056.91	66891.85	22803.04						2614751.78
A. Fuel combustion (sectoral approach)	2506306.59	24922.64	22779.92						2554009.12
1. Energy industries	854187.52	3990.41	5413.58						863591.50
2. Manufacturing industries and construction	392416.82	2515.82	3269.68						398202.32
3. Transport (3)	794072.32	1725.18	7503.14						803300.64
4. Other sectors	458633.17	16658.07	6540.84						481832.07
5. Other	6996.75	33.16	52.68						7082.59
B. Fugitive emissions from fuels	18750.32	41969.21	23.13						60742.66
1. Solid fuels	4047.19	24721.95	1.32						28770.46
2. Oil and natural gas	14703.13	17247.26	21.80						31972.20
C. CO ₂ transport and storage	0.00								0.00
2. Industrial processes and product use	213134.34	1538.80	5833.39	65512.28	1157.35	4159.21	1718.94	72.20	293126.49
A. Mineral industry	99609.51								99609.51
B. Chemical industry	38819.30	1314.10	3170.15	512.08	96.79	167.51	38.86	4.32	44123.09
C. Metal industry	66010.80	137.69	11.39	13.60	195.39	47.69	0.00	0.00	66416.56
D. Non-energy products from fuels and solvent use	7951.49	1.34	4.21						7957.04
E. Electronic Industry				35.65	491.94	129.99	23.40	67.88	748.86
F. Product uses as ODS substitutes				64928.12	78.52	0.00	1553.36	0.00	66559.99
G. Other product manufacture and use	686.18	75.91	2571.24	18.16	293.78	3808.01	0.00	0.00	7453.27
H. Other	57.06	9.77	76.41	4.67	0.93	6.01	103.32	0.00	258.17
3. Agriculture	9778.06	229971.80	130902.38						370649.49
A. Enteric fermentation		181089.85							181089.85
B. Manure management		44078.89	17600.76						61679.65
C. Rice cultivation		2554.59							2554.59
D. Agricultural soils		0.00	112863.84						112863.84
E. Prescribed burning of savannas		2.75	0.00						0.00
F. Field burning of agricultural residues		745.53	210.40						955.93
G. Liming	5658.83								5658.83
H. Urea application	3492.97								3492.97
I. Other carbon-containing fertilizers	626.26								626.26
J. Other	0.00	1500.21	227.37						1727.58
4. Land use, land-use change and forestry⁽¹⁾	-266240.92	12457.03	10016.60						-243767.29
A. Forest land	-294164.45	3177.80	4670.42						-286316.23
B. Cropland	20940.54	752.73	1428.19						23121.47
C. Grassland	17125.89	2317.49	486.74						19930.12
D. Wetlands	14575.20	5885.29	211.45						20671.93
E. Settlements	20061.08	79.00	2970.47						23110.56
F. Other land	1129.82	0.56	78.68						1209.07
G. Harvested wood products	-46066.45	0.00							-46066.45
H. Other	157.45	244.16	0.00						401.61
5. Waste	2652.54	96629.77	8748.57						108030.89
A. Solid waste disposal	0.00	74553.27							74553.27
B. Biological treatment of solid waste		4740.08	1831.58						6571.66
C. Incineration and open burning of waste	2630.93	587.35	484.78						3703.07
D. Waste water treatment and discharge		16742.99	6403.70						23146.70
E. Other	21.61	6.08	28.50						56.19
6. Other (as specified in summary 1.A)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NO
Memo items:									
International bunkers	237360.79	726.72	2257.76						240345.27
Aviation	101533.77	64.80	1004.03						102602.59
Navigation	135827.03	661.92	1253.73						137742.68
CO ₂ emissions from biomass	429830.55								454417.23
CO ₂ captured	48.76								48.76
Indirect CO ₂ ⁽²⁾	2100.12								
Total CO₂ equivalent emissions without land use, land-use change and forestry									3386558.65
Total CO₂ equivalent emissions with land use, land-use change and forestry									3142791.36
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry									3388658.77
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry									3144891.49

2.2 Sectoral results

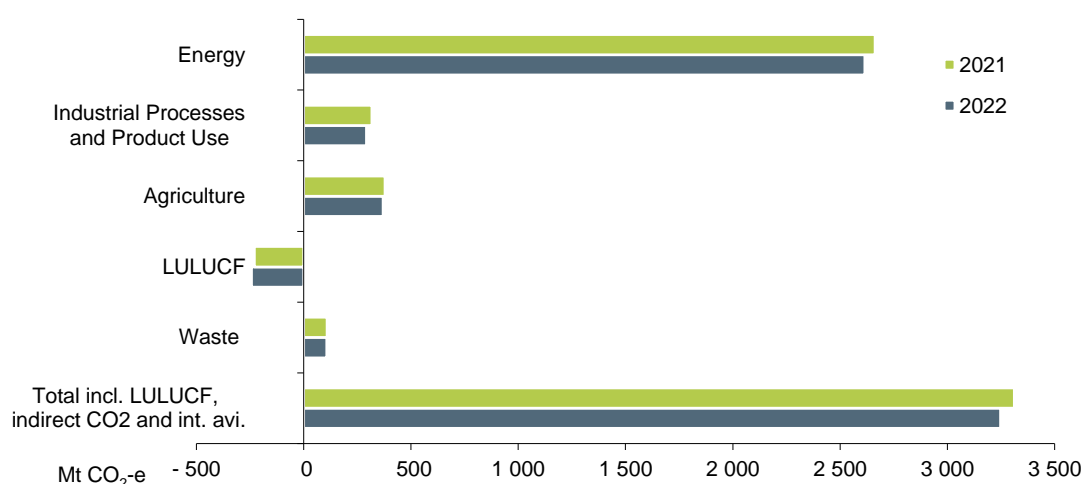
Table 2-3 and Figure 2-6 show the changes between 2021 and 2022 at the sectoral level for the EU27.

Table 2-3 Emissions by sector, change 2021-2022

Change 2021 / 2022, EU27	Mt CO ₂ e	%
Energy	-48.0	-1.8%
Industrial Processes and Product Use	-24.8	-7.8%
Agriculture	-7.8	-2.1%
LULUCF	-13.8	6.0%
Waste	-1.3	-1.1%
Total incl. LULUCF incl. indirect CO ₂ and int. aviation	-64.0	-1.9%

Source: The EEA's ETC CM, based on the 2023 Member States' GHG inventories submitted to UNFCCC for the years 1990-2021 and proxy estimates for 2022.

Figure 2-6 Emissions by sector, EU27, 2021-2022



Source: The EEA's ETC CM, based on the 2023 Member States' GHG inventories submitted to UNFCCC for the years 1990-2021 and proxy estimates for 2022.

On a sectoral basis, the largest absolute emission change occurred in the Energy sector (i.e., all combustion activities and fugitive emissions from energy). GHG emissions decreased by 48 Mt CO₂e (-1.8%) across the EU. More detailed explanations for the trends in the energy sector are provided in section 2.2.1.

The greenhouse gas emissions from Industrial Processes and Product Use decreased by 25 Mt CO₂e (-7.8%), the agricultural sector experienced a decrease of 7.8 Mt CO₂e (-2.1%), LULUCF net sink increased by 14 Mt CO₂e and the waste sector indicated a decrease of 1.3 Mt CO₂e (-1.1%).

2.2.1 Energy

Emissions from the energy sector contributed about 82% of total EU emissions in 2021 and are expected to have the share of 83% of total EU emissions for 2022. Emissions from fuel combustion saw a decrease of 48 Mt CO₂e or 1.8% compared to 2021. Table 2-4 shows that the largest change in fuel combustion

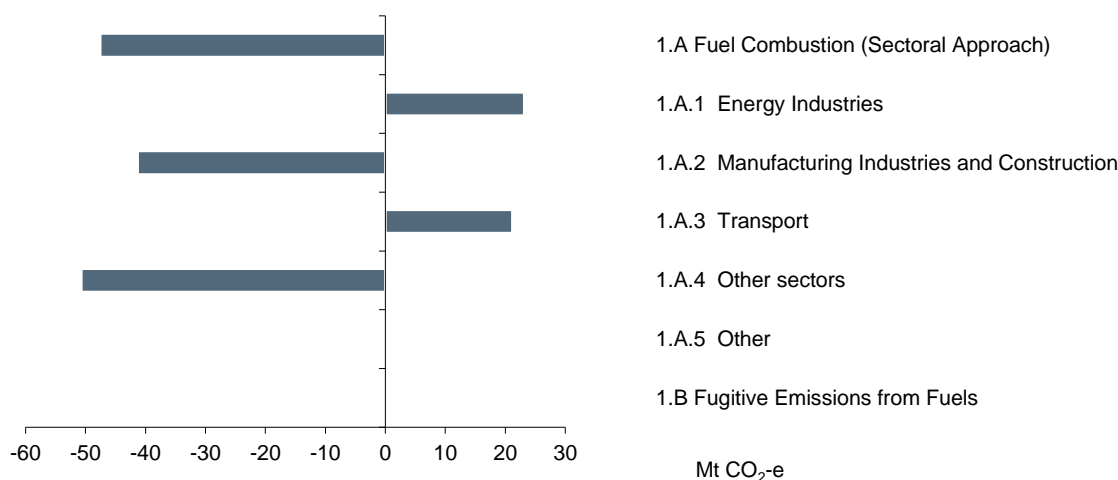
emissions occurred in 1.A.4 Other sectors with a decrease of 51 Mt CO₂e (-9.5%), followed by a decrease in the sector 1.A.2 Manufacturing industries and construction (-41 Mt CO₂e or -9.4%). A slight decrease occurred in 1.B Fugitive emissions from fuels (-0.4 Mt CO₂e or -0.7%). On the contrary, emissions increased in 1.A.1 Energy industries (+23 Mt CO₂e or +2.8%), 1.A.3 Transport (+21 Mt CO₂e or +2.7%) and 1.A.5 Other (+0.1 Mt CO₂e or +2.0%).

Table 2-4 Energy sector emissions, change 2021-2022

Change 2020 / 2021, EU27	Mt CO ₂ e	%
1.A Fuel Combustion (Sectoral Approach)	-47.6	-1.8%
1.A.1 Energy Industries	23.1	2.8%
1.A.2 Manufacturing Industries and Construction	-41.3	-9.4%
1.A.3 Transport	21.2	2.7%
1.A.4 Other sectors	-50.7	-9.5%
1.A.5 Other	0.1	2.0%
1.B. Fugitive Emissions from Fuels	-0.4	-0.7%

Source: The EEA’s ETC CM, based on the 2023 Member States’ GHG inventories submitted to UNFCCC for the years 1990-2021 and proxy estimates for 2022.

Figure 2-7 Energy sector emissions, EU27 change 2021-2022



Source: The EEA’s ETC CM, based on the 2023 Member States’ GHG inventories submitted to UNFCCC for the years 1990-2021 and proxy estimates for 2022.

The largest increase in emissions for 1.A Fuel Combustion on Member States level was noted for Spain (+8 Mt CO₂e), Bulgaria (+3 Mt CO₂e) and Italy (+2 Mt CO₂e). The largest emission decrease was in the Netherlands (-12 Mt CO₂e) followed by Poland (-12 Mt CO₂e) and Germany (-9 Mt CO₂e).

Going to more detail in the subcategory 1.A.1 Energy Industries, the largest reduction was in Poland (-8 Mt CO₂e), followed by the Netherlands (-2 Mt CO₂e), Sweden (-1.2 Mt CO₂e) and Greece (-1.1 Mt CO₂e). The increases were more significant, with the largest change noted for Spain (+14 Mt CO₂e), Germany (+11 Mt CO₂e) and Italy (+6 Mt CO₂e).

In the sector 1.A.2 Manufacturing Industries and Construction, the largest decrease was in Germany (–15 Mt CO₂e), followed by Spain (–7 Mt CO₂e). The emission increases were less significant, the largest one occurred in Estonia with less than 0.1 Mt CO₂e increase.

The largest increase in emissions from 1.A.3 Transport was in Italy (+8 Mt CO₂e), Spain (+4 Mt CO₂e) and France (+3 Mt CO₂e). The most significant decrease was in Sweden (–1.5 Mt CO₂e) and Austria (–1.2 Mt CO₂e).

In 1.A.4 Other Sectors (which include residential and commercial sectors) emissions increased only in three Member States with the highest increase in Estonia, which is smaller than 0.1 Mt CO₂e. The largest decrease occurred in France (–10 Mt CO₂e), Italy (–9 Mt CO₂e) and the Netherlands (–7 Mt CO₂e). Changes in the sector 1.A.5 Other were less than ±0.4 Mt CO₂e in all Member States.

For the subcategory 1.B Fugitive Emissions from fuels, the highest decrease was in Poland (–0.8 Mt CO₂e) and the highest increase in Sweden (+0.7 Mt CO₂e).

2.2.2 Industrial Processes and Product Use

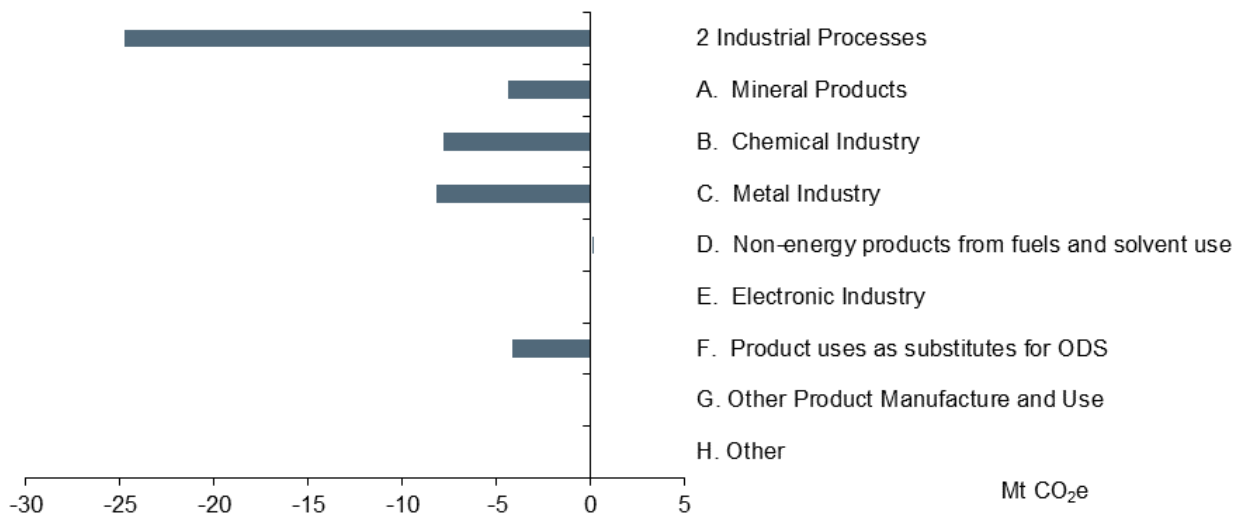
The Sector Industrial Processes and Product Use (IPPU) contributes to about 9% of total EU emissions and is the third most important source after energy and agriculture. Emissions from Industrial Processes decreased by 25 Mt CO₂e in the EU (–7.8%). Table 2-5 and Figure 2-8 show the subsector contribution to this trend in emissions. The largest emission decrease occurred in the subsector 2.C Metal Industry followed by the 2.B Chemical industry, 2.A Mineral Products and 2.F Product uses as substitutes for ODS. The only increase occurred in the subcategory 2.D Non-energy products from fuels and solvent use.

Table 2-5 Industrial Processes and Product Use emissions, change 2021-2022

Change 2021 / 2022, EU27	Mt CO ₂ e	%
2 Industrial Processes	-24.8	-7.8%
A. Mineral Products	-4.5	-4.3%
B. Chemical Industry	-7.9	-15.2%
C. Metal Industry	-8.2	-11.0%
D. Non-energy products from fuels and solvent use	0.2	3.0%
E. Electronic Industry	0.0	-2.5%
F. Product uses as substitutes for ODS	-4.3	-6.0%
G. Other Product Manufacture and Use	-0.0	-0.3%
H. Other	-0.1	-22.4%

Source: The EEA's ETC CM, based on the 2023 Member States' GHG inventories submitted to UNFCCC for the years 1990-2021 and proxy estimates for 2022.

Figure 2-8 Industrial Processes and Product Use emissions, EU27, change 2021-2022



Source: The EEA’s ETC CM, based on the 2023 Member States’ GHG inventories submitted to UNFCCC for the years 1990-2021 and proxy estimates for 2022.

In only three of the EU27 Member States emissions from IPPU increased. The largest increase of IPPU emissions was in Slovenia (less than +0.1 Mt CO₂e) while the largest decreases were in Germany (-4.5 Mt CO₂e) followed by Czechia (-3.2 Mt CO₂e) and France (-2.5 Mt CO₂e).

In the subcategory 2.A Mineral Products, emissions decreased in the EU by 4.5 Mt CO₂, the highest decrease is in Spain (-1.1 Mt CO₂) and Germany (-1.0 Mt CO₂), the largest increase in Poland is less than +0.1 Mt CO₂e.

Emissions from 2.B Chemical Products decreased in the EU (-7.9 Mt CO₂e or -15.2%). The largest decrease was in the Netherlands (-1.4 Mt CO₂e) while the largest increase was in Sweden (less than +0.1 Mt CO₂e).

Emissions from 2.C Metal Industry decreased by 8.2 Mt CO₂e or 11.0% with the largest decrease in France (-1.7 Mt CO₂e) while the largest increase occurred in Sweden (less than +0.1 Mt CO₂e).

The subsector 2.D Non-energy Products from Fuels and Solvent Use has had less significant increase in the emissions (+0.2 Mt CO₂e or +3.0%). The highest increase was in France (+0.4 Mt CO₂e) and highest decrease in Sweden (-0.2 Mt CO₂e).

The subsector 2.E Electronic Industry showed insignificant absolute emission changes for the EU (-0.0 Mt CO₂e or -2.5%). Emissions changes for all the Member States were within ±0.1 Mt CO₂e.

The subsector 2.F Product uses as substitutes for ODS saw emissions decrease by 4.3 Mt CO₂e (-6.0%). In nine Member States emissions increased in this source category, in 14 Member States emissions decreased and four Member States report no changes. The largest decrease of emissions was in Czechia, where 2.F emissions fell by 2.7 Mt CO₂e and in France (-1.4 Mt CO₂e). The increases were minor; the highest increase was in Spain (+0.7 Mt CO₂e).

Emissions from 2.G Other Product Manufacture and Use decreased very slightly for the EU (less than -0.1 Mt CO₂e or -0.3%). The greatest emission decrease is reported by Germany (-0.7 Mt CO₂e). The highest increase occurred in France (+0.5 Mt CO₂e). Emission changes of the other Member States are less than ±0.1 Mt CO₂e.

The decrease of emissions from 2.H Other is almost irrelevant by absolute terms (-0.1 Mt CO₂e) but significant in relative terms (-22.4%).

2.2.3 Agriculture

Agriculture (excluding LULUCF) contributes to 12% of European GHG emissions. Emissions from agriculture decreased by 7.8 Mt CO₂e or 2.1% since 2021. The largest greenhouse gas emitting activities within the sector are CH₄ from livestock and N₂O from soils. Enteric fermentation and soils contributed about 49% and 31% of the sector's emissions respectively. As shown in Table 2-6 and Figure 2-9 the decrease in agriculture sector emissions is largely driven by decreased emissions from agricultural soils, but enteric fermentation, manure management, rice cultivation and Other carbon-containing fertilizers contributed to this decrease as well.

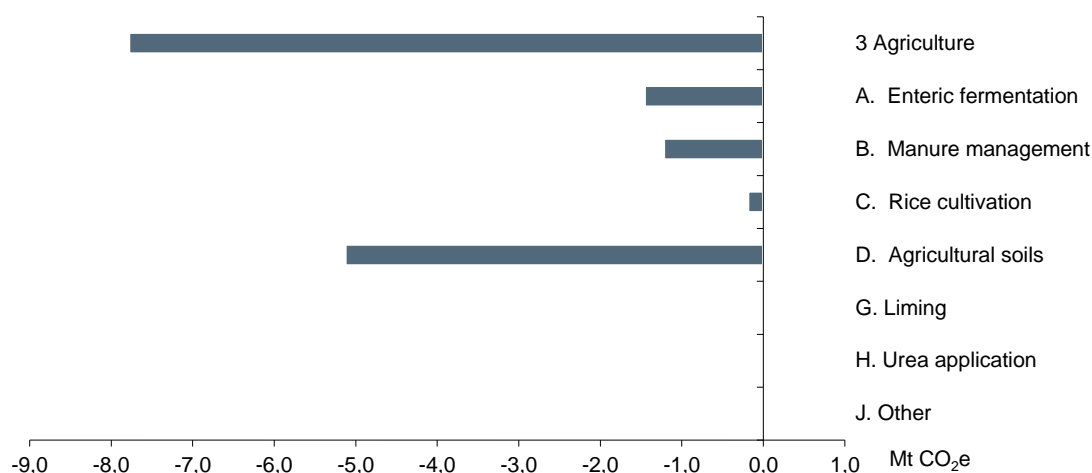
Table 2-6 and Figure 2-9 show the subsector 2021-2022 change, with CH₄ and N₂O emissions shown as CO₂ equivalents (Mt CO₂e).

Table 2-6 Agriculture sector emissions, change 2021-2022

Change 2021/2022, EU27	Mt CO ₂ e	%
3 Agriculture	-7.8	-2.1%
A. Enteric fermentation	-1.5	-0.8%
B. Manure management	-1.2	-1.9%
C. Rice cultivation	-0.2	-6.8%
D. Agricultural soils	-5.1	-4.3%
E. Prescribed burning of savannas	0.0	-
F. Field burning of agricultural residues	0.3	36.5%
G. Liming	0.0	0.5%
H. Urea application	0.0	0.2%
I. Other carbon-containing fertilizers	-0.1	-10.8%
J. Other	0.0	0.0%

Source: The EEA's ETC CM, based on the 2023 Member States' GHG inventories submitted to UNFCCC for the years 1990-2021 and proxy estimates for 2022.

Figure 2-9 Agriculture sector emissions, EU27, change 2020-2021



Source: The EEA's ETC CM, based on the 2023 Member States' GHG inventories submitted to UNFCCC for the years 1990-2021 and proxy estimates for 2022.

Emissions from Enteric Fermentation decreased by 1.5 Mt CO₂e or 0.8%. The largest decrease was in Spain (-0.5 Mt CO₂e). Emissions of CH₄ and N₂O from manure management contribute to about 17% of the agriculture sector and have decreased by 1.2 Mt CO₂e or -1.9%. The largest decrease was in Spain (-0.3 Mt CO₂e). Agricultural soils have decreased by 5.1 Mt CO₂e or 4.3%. The largest decrease was seen in Spain (-1.2 Mt CO₂e) and Romania (-1.1 Mt CO₂e). The largest increase was in Greece (+0.1 Mt CO₂e).

2.2.4 Land use, land-use change and forestry

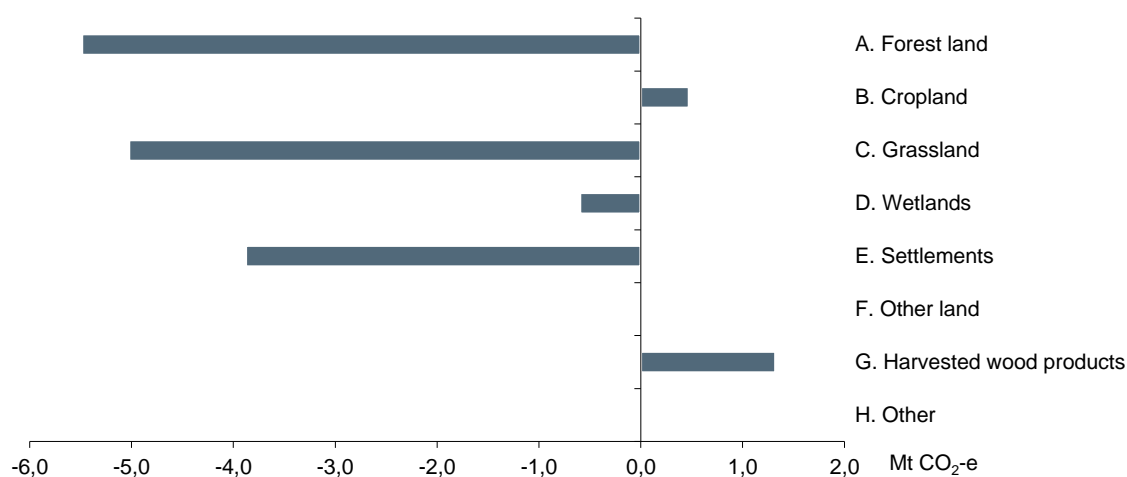
In the EU, the LULUCF sector has higher removals by sinks than emissions by sources, resulting in a net carbon sink. LULUCF removals increased between 2021 and 2022 (-13.8 Mt CO₂e or 6.0%). Table 2-7 and Figure 2-10 show the subsector contributions to this trend. The trends of 4.A Forest land significantly dominate the LULUCF sector.

In 2022, twenty Member States reported net removals within the LULUCF sector while seven Member States reported net emissions. The largest increase of removals was noted for Germany (-5.8 Mt CO₂e) and Italy (-4.2 Mt CO₂e), on the contrary the largest increase in emissions was seen in Latvia (+1.8 Mt CO₂e).

Table 2-7 LULUCF sector emissions and removals, change 2021-2022

Change 2021/2022, EU27	Mt CO ₂ e	%
4 Land use, land-use change and forestry	-13.8	6.0%
A Forest land	-5.5	2.0%
B Cropland	0.5	2.1%
C Grassland	-5.0	-20.1%
D Wetlands	-0.6	-2.8%
E Settlements	-3.9	-14.4%
F Other land	0.0	1.4%
G Harvested wood products	1.3	-2.8%
H Other	0.0	3.5%

Figure 2-10 LULUCF sector emissions and removals, EU27, change 2021-2022



2.2.5 Waste

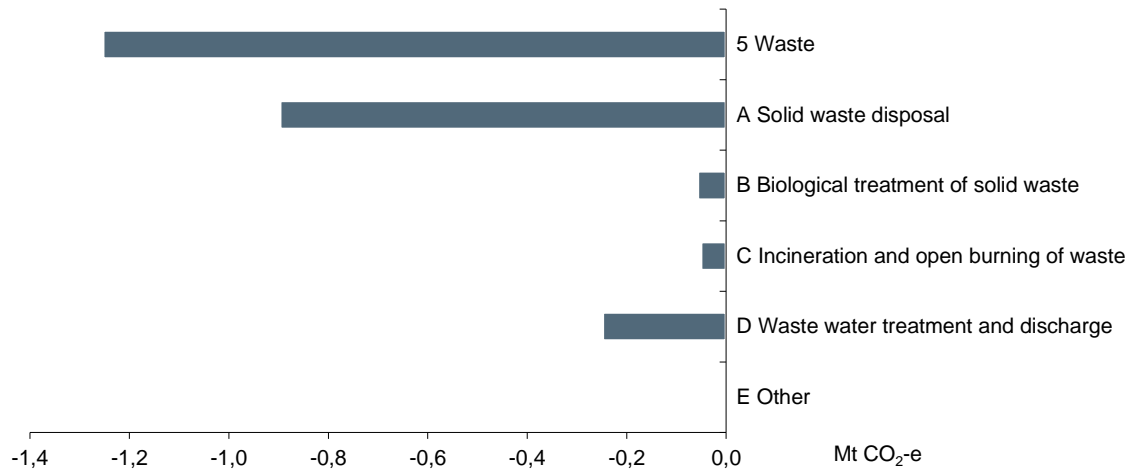
The Waste sector contributes to about 3% of European emissions. Waste related emissions continue to decrease reflecting the large relative proportion of emissions from solid waste disposal (69% share of Waste emissions) and the ongoing effect of restrictions on landfilling of organic degradable waste that was implemented decades ago.

Emissions from the Waste sector decreased by –1.3 Mt CO₂e compared to 2021. Table 2-8 and Figure 2-11 show the subsector contributions to this trend in emissions.

Table 2-8 Waste sector emissions, change 2021-2022

Change 2021/2022, EU27	Mt CO ₂ e	%
5 Waste	-1.3	-1.1%
A Solid Waste Disposal	-0.9	-1.2%
B Biological Treatment of Solid Waste	-0.1	-0.9%
C Incineration and Open burning of Waste	-0.1	-1.3%
D Waste Water Treatment and Discharge	-0.2	-1.1%
E Other	0.0	-1.0%

Figure 2-11 Waste sector emissions, EU27, change 2021-2022



The largest decrease of waste emissions was noted for Poland (-0.4 Mt CO₂e). The trends of 5.A Solid Waste emissions generally dominate the waste sector. 17 Member States decreased emissions from solid waste (largest decrease in Germany with -0.2 Mt CO₂e) while five Member States had an increase in emissions (the largest one in Spain with less than +0.1 Mt CO₂e) For the remaining Member States constant emissions were estimated.

2.3 ETS versus ESR

Within the European Union there are three policy instruments for achieving the GHG emission reductions: One part is covered by the EU Emissions Trading System (ETS) while the other is the Effort Sharing Regulation (ESR) which replaced Effort Sharing Decision (ESD) since 2021. The LULUCF Regulation covers emissions and reductions in the LULUCF sector.

ESR emissions are calculated by deducting ETS emissions and CO₂ emissions from domestic aviation from total emissions including indirect CO₂ emissions. LULUCF is excluded from ESR emissions.

$$E_{ESR} = E_{total} - E_{ETS} - E_{1A3a,CO2}$$

E_{ESR}	Emission under Effort Sharing Regulation
E_{total}	Total emissions excl. LULUCF incl. indirect CO ₂
E_{ETS}	Emissions included in the ETS
$E_{1A3a,CO2}$	CO ₂ emissions from domestic aviation

Table 2-9 shows total (excluding LULUCF, including indirect CO₂), ETS and Effort Sharing emissions per country. ETS emissions are taken from the EEA ETS data viewer (EEA 2023 c) for stationary installations. ESR emissions are calculated as described in the formula above. Relative changes in emissions between the years 2021 and 2022 can be seen on the right.

Table 2-9 Total, ETS and ESD emissions 2021 and 2022, kt CO₂e

	2021 GHG emissions			2022 GHG emissions			Change 2022 versus 2021		
	Total	ETS	ESR	Total	ETS	ESR	Total	ETS	ESR
AT	77 532	28 705	48 804	72 565	26 626	45 894	-6.4%	-7.2%	-6.0%
BE	110 952	41 403	69 541	106 492	39 706	66 778	-4.0%	-4.1%	-4.0%
BG	53 985	28 935	25 036	56 639	33 879	22 743	4.9%	17.1%	-9.2%
CY	8 744	4 315	4 429	8 702	4 328	4 372	-0.5%	0.3%	-1.3%
CZ	119 036	57 871	61 152	116 278	57 045	59 219	-2.3%	-1.4%	-3.2%
DE	760 358	355 081	404 545	745 614	353 953	390 537	-1.9%	-0.3%	-3.5%
DK	43 851	11 618	32 148	43 310	11 228	31 963	-1.2%	-3.4%	-0.6%
EE	12 615	6 850	5 760	14 369	8 407	5 957	13.9%	22.7%	3.4%
ES	288 848	91 685	194 988	293 778	96 324	194 412	1.7%	5.1%	-0.3%
FI	47 856	20 310	27 466	45 816	19 020	26 679	-4.3%	-6.4%	-2.9%
FR	414 800	87 617	323 415	403 771	84 599	314 553	-2.7%	-3.4%	-2.7%
EL	77 489	33 251	43 918	76 991	31 630	44 968	-0.6%	-4.9%	2.4%
HR	24 446	6 997	17 427	23 438	6 455	16 956	-4.1%	-7.7%	-2.7%
HU	64 218	17 615	46 597	59 785	15 559	44 216	-6.9%	-11.7%	-5.1%
IE	62 110	15 320	46 771	60 764	14 665	46 077	-2.2%	-4.3%	-1.5%
IT	417 591	131 447	284 442	418 325	136 293	279 640	0.2%	3.7%	-1.7%
LT	20 292	5 976	14 314	19 284	5 066	14 215	-5.0%	-15.2%	-0.7%
LU	9 391	1 317	8 073	8 211	1 134	7 077	-12.6%	-14.0%	-12.3%
LV	10 738	2 065	8 669	10 051	1 690	8 358	-6.4%	-18.2%	-3.6%
MT	2 134	771	1 362	2 177	797	1 378	2.0%	3.3%	1.2%
NL	167 656	74 132	93 497	154 023	68 507	85 484	-8.1%	-7.6%	-8.6%
PL	399 938	192 033	207 851	384 801	184 146	200 582	-3.8%	-4.1%	-3.5%
PT	56 524	16 037	40 147	57 174	16 191	40 475	1.2%	1.0%	0.8%
RO	115 403	32 303	82 961	107 339	28 161	79 002	-7.0%	-12.8%	-4.8%
SE	47 817	18 476	29 151	45 237	17 440	27 481	-5.4%	-5.6%	-5.7%
SI	16 106	5 681	10 424	15 965	4 861	11 103	-0.9%	-14.4%	6.5%
SK	41 270	20 899	20 370	37 757	17 418	20 338	-8.5%	-16.7%	-0.2%
EU27	3 471 700	1 308 710	2 153 255	3 388 692	1 285 128	2 090 470	-2.4%	-1.8%	-2.9%
IS	4 662	1 844	2 798	4 703	1 875	2 807	0.9%	1.7%	0.3%
NO	49 159	22 967	25 383	48 918	22 574	25 535	-0.5%	-1.7%	0.6%

Note: Only emissions from stationary installations are included in these ETS data hence emissions from aviation are excluded.

Total emissions are without LULUCF, including indirect CO₂.

Source: The EEA's ETC CM, based on the 2023 Member States' GHG inventories submitted to UNFCCC for the years 1990-2021, proxy estimates for 2022 totals. ETS data is from EUTL (verified emissions for 2021 and 2022, not from the Member States proxies). Value for domestic aviation (which is used for calculation of ESR emissions) was obtained from Eurocontrol.

Total emissions excluding LULUCF and including indirect CO₂ changed by -2.4% within the EU between 2021 and 2022. Emissions decreased in the ETS sector and in the ESR sector but the decrease in the ESR sector (-2.9%) is slightly more significant than in the ETS sector (-1.8%). Figure 2-12 illustrates all emission trend changes.

In absolute terms, the total emission decrease in the EU was -83 Mt CO₂e. The decrease of 63 Mt CO₂e occurred in the Effort Sharing sectors and 24 Mt CO₂e in the ETS sector.

At Member State level the trend change in emissions separated between ETS and ESR looks similar. ETS emissions decreased in 20 Member States. The largest absolute decrease was experienced in Poland (-7.9 Mt CO₂e), followed by the Netherlands (-5.6 Mt CO₂e). Latvia saw the highest relative ETS emission decrease (-18.2%).

In seven EU Member States ETS emissions increased. The largest absolute increase was experienced in Bulgaria (+4.9 Mt CO₂e), followed by Italy (+4.9 Mt CO₂e) and Spain (+4.6 Mt CO₂e). Estonia saw the highest relative ETS emission increase (+22.7%).

ESR emissions decreased in 17 Member States. The largest absolute decrease was experienced in Germany (-14.0 Mt CO₂e), followed by France (-8.9 Mt CO₂e) and the Netherlands (-8.0 Mt CO₂e).

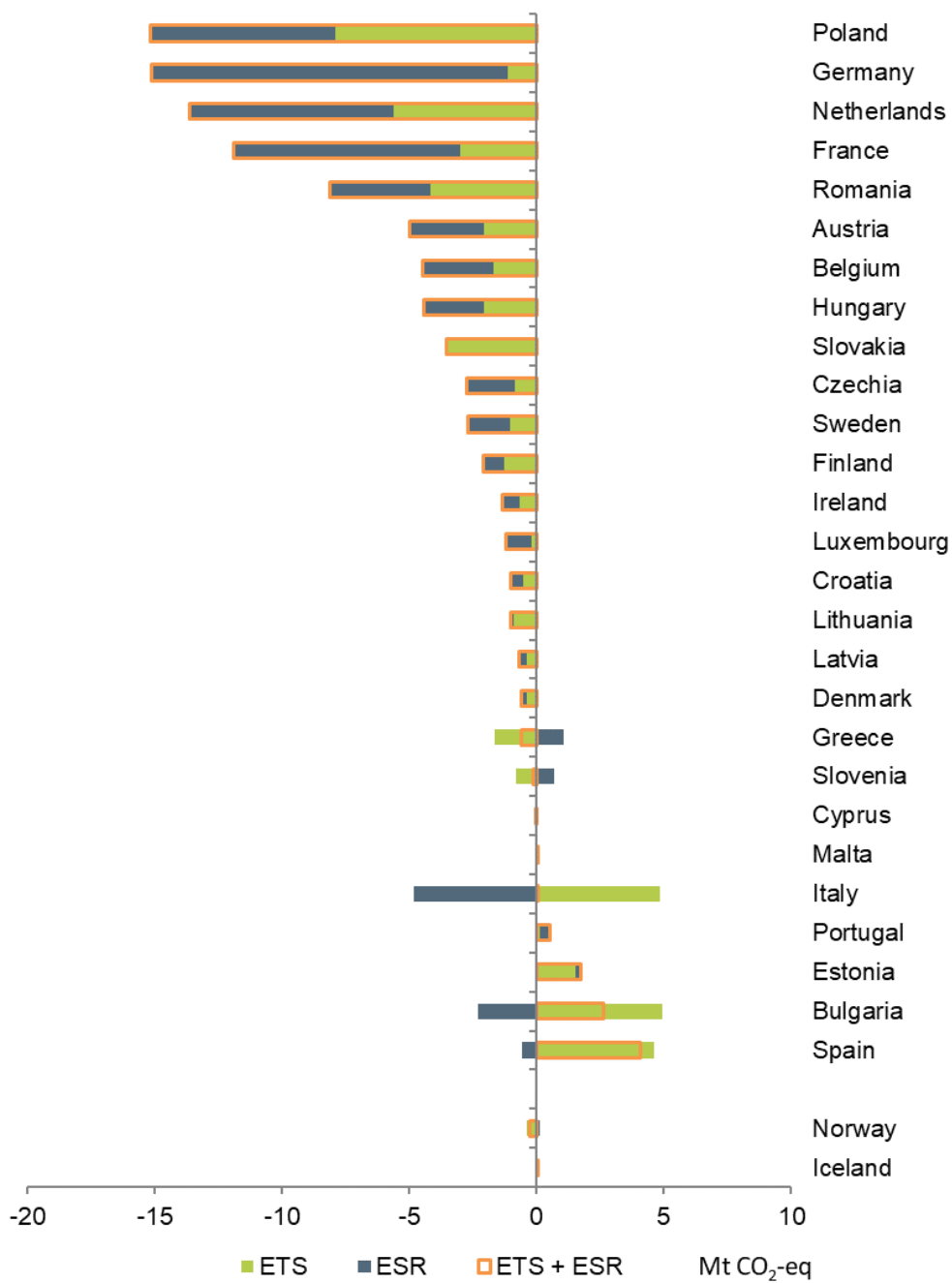
Ten Member States saw increases in ESR emissions. The largest absolute ESR emission increase was in Greece (+1.1 Mt CO₂e). The largest relative increase of ESR emissions was in Slovenia (+6.5%).

Increases of both ETS and ESR emissions can be observed only for three Member States (Estonia, Malta and Portugal). On the other hand, there are 14 Member States which had decreases in both ETS and ESR emissions.

In six Member States emissions in the ETS sector decreased while emissions in the ESR sector increased. A contrasting development can be observed in four Member States, where ETS emissions increased and ESR emissions decreased.

The emission trends both in the ETS and the ESR resemble the emission changes discussed in chapter 2.2.

Figure 2-12 ETS and Effort Sharing emissions, change 2021-2022



3 Performance of last year's EU proxy

National GHG inventories are required to fulfil certain principles as laid out in the UNFCCC reporting guidelines for GHG inventories: inventories must be transparent, consistent, comparable, complete and accurate (TCCCA). The IPCC Guidelines (IPCC, 2006) recommends Parties to perform QA/QC procedures that are important information to enable continuous improvement to inventory estimates. Through the quantification of deviations at the source level and for the inventory as a whole, improvements can be prioritized. Thus, Parties may change methodologies in order to improve their greenhouse gas estimates at source level (e.g. moving from Tier 2 to Tier 3). Such methodological changes at Member States level cannot be captured in the calculation of the approximated GHG inventory for the EU. On-going quality improvements in Member States' inventories to take effect in next year's official submissions to UNFCCC are therefore a source of uncertainty for the EU proxy inventory.

This section compares the differences between the previous proxy estimates and the subsequent official inventory submissions. Since the previous proxy estimates emphasised total emissions including indirect CO₂ and excluding LULUCF, the total emissions mentioned in this chapter include CO₂ and exclude LULUCF as well.

Last year's proxy GHG estimates for 2021 underestimated the GHG emissions (Total EU emissions including indirect CO₂, excluding LULUCF) for the EU by 9.0 Mt CO₂e or 0.4%.

The effect of Member States' recalculations of GHG estimates and methodological improvements dominate the differences of the 2020 proxy emission estimates compared to 2020 emissions officially reported in 2022. After taking these recalculations into account difference between the proxy GHG inventory for 2021 and final GHG inventory submission was 0.3% for total emissions for the EU.

3.1 Difference between MS proxy and final GHG inventories

The proxy submissions by Member States closely mirrored the increase in official emissions as reported to the UNFCCC this year. The differences per Member State given in Table 3-1 arise from several factors: different methodologies and data with varying precision used across the Member States (resp. ETC CME for gap-filling); the lack of updated (t-1) activity data for some key emission sources; and, from Member States' own recalculations of GHG estimates and methodological improvements which mainly cannot be reflected in the approximated data where usually constant methodologies and emission factors are assumed.

The largest deviations in relative terms occurred for Denmark (proxy 6.3% lower), followed by Croatia (proxy 4.9% lower). In absolute terms the deviations were highest for Italy (underestimate by proxy of 12.7 Mt CO₂e), France (overestimate by proxy of 3.4 Mt CO₂e) and Denmark (underestimate by 2.8 Mt CO₂e). By comparing the percentage changes in emission levels 2020/2021 as derived from the 2022 proxy GHG inventory⁶ on the one hand and from the 2023 official GHG inventory submissions to UNFCCC on the other, the deviations are in almost all cases in the same order of magnitude, see Figure 3-1. Also, the direction of the emission trend was estimated correctly.

After taking into account recalculations, the relative differences were largest for Croatia (-4.2%), Denmark (-3.7%) and Malta (-2.9%).

⁽⁶⁾ The 2020 value used in this calculation comes from 2022 submission.

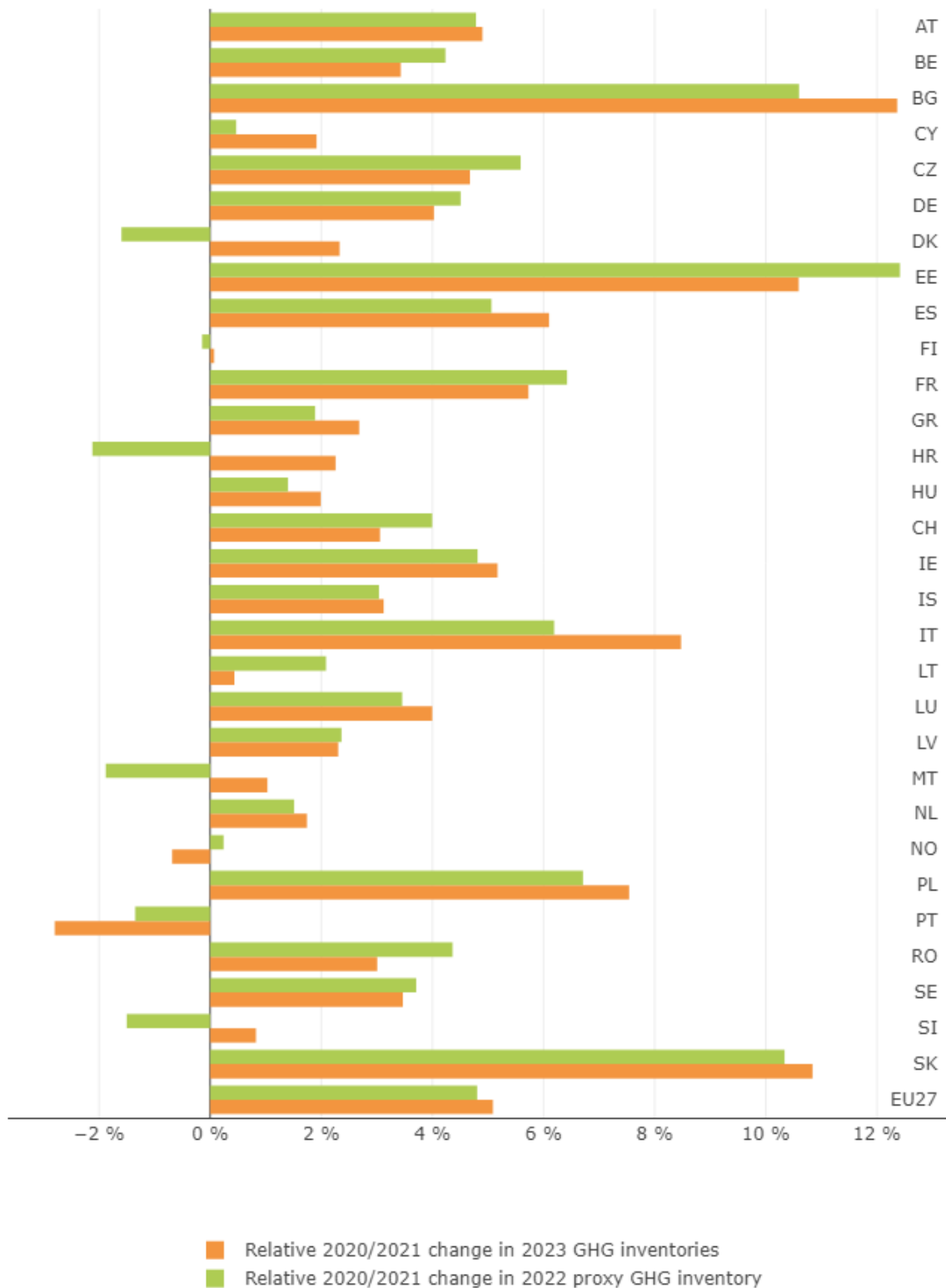
Table 3-1 Difference per Member State for year 2021 between proxy and final GHG inventories

	Inventory 2021 (Submission 2023)	Proxy 2021 (Submission 2022)	Deviation 2021	Recalculations	Deviation 2021 cleared of impact of recalculations	Proxy calculated by	
	kt CO ₂ e			%			
AT	77 532	77 113	-419	-0.5	0.4	-0.1	MS
BE	110 952	110 940	-11	0.0	0.8	0.8	MS
BG	53 985	54 398	413	0.8	-2.3	-1.6	ETC CM
CY	8 744	8 920	176	2.0	-3.4	-1.4	MS
CZ	119 036	119 671	636	0.5	0.3	0.9	MS
DE	760 358	761 591	1 233	0.2	0.3	0.5	MS
DK	43 851	41 079	-2 772	-6.3	2.7	-3.7	MS
EE	12 615	12 990	375	3.0	-1.3	1.7	MS
ES	288 848	288 649	-199	-0.1	-0.9	-1.0	MS
FI	47 856	47 713	-143	-0.3	0.1	-0.2	MS
FR	414 800	418 202	3 401	0.8	-0.2	0.7	MS
EL	77 489	76 249	-1 240	-1.6	0.8	-0.8	MS
HR	24 446	23 253	-1 194	-4.9	0.6	-4.2	MS
HU	64 218	63 698	-520	-0.8	0.2	-0.6	MS
IE	62 110	60 494	-1 616	-2.6	2.3	-0.3	MS
IT	417 591	404 849	-12 742	-3.1	1.0	-2.1	MS
LT	20 292	20 603	312	1.5	0.1	1.6	MS
LU	9 391	9 378	-13	-0.1	-0.4	-0.5	MS
LV	10 738	10 707	-31	-0.3	0.3	0.1	MS
MT	2 134	2 082	-52	-2.4	-0.5	-2.9	MS
NL	167 656	166 817	-838	-0.5	0.3	-0.2	MS
PL	399 938	401 268	1 331	0.3	-1.1	-0.8	MS
PT	56 524	56 809	285	0.5	1.0	1.5	MS
RO	115 403	114 731	-672	-0.6	1.9	1.3	MS
SE	47 817	48 001	184	0.4	-0.2	0.2	MS
SI	16 106	15 614	-493	-3.1	0.8	-2.3	MS
SK	41 270	40 878	-392	-0.9	0.5	-0.4	MS
EU27	3 471 700	3 456 699	-15 002	-0.4	0.1	-0.3	ETC CM

Note: Total GHG emissions without LULUCF including indirect CO₂

Source: Member States submissions to UNFCCC and proxy estimates for 2021.

Figure 3-1 Relative difference between proxy and submitted inventories by Member State 2020/2021



Note: Total GHG emissions without LULUCF including indirect CO₂

Source: Member States submissions to UNFCCC and proxy estimates for 2021.

3.2 Sectoral differences between proxy and final GHG inventories

At the sectoral level, the largest difference between the proxy and the final GHG inventory in absolute terms was in 3.D Agricultural soils [Agriculture] (+28.2 Mt CO₂e) and 3.A Enteric Fermentation [Agriculture] (-19.1 Mt CO₂e). The next largest differences were in 1.A.2 Manufacturing Industries and Construction [Energy] (-9.5 Mt CO₂e) and 3.B Manure Management [Agriculture] (-6.3 Mt CO₂e). After accounting for recalculation effects, the differences for most of these sectors are significantly smaller. Sectors with highest relative deviation after allowing for recalculation effects were 2.E Electronics industry [IPPU] (+81.9%), 3.F Field Burning of Agricultural Residues [Agriculture] (+37.1%), 3.I Other carbon-containing fertilizers [Agriculture] (+13.3%) and 1.A.5 Other [Energy] (-11.2%), see Table 3-2. Therefore, largest relative deviations occur mainly in “other” categories which are compound items and usually comparatively low in absolute emission levels.

Changes in the data reported as proxy in last year and as final in 2023 submissions under the UNFCCC are mostly affected by the sources of the activity data. The data available during preparation of the proxy inventory for the Energy sector are based on preliminary data and energy balances provided by the statistical offices. For the inventory submitted in 2023 however, final energy balances were used. In case of the IPPU sector, data for the year X-1 is not usually available when preparing the approximated inventories, thus extrapolation and interpolation of the activity data are mostly used. In Agriculture and Waste there is usually the case that activity data are partly available (for instance population data), however statistical methods are also partly applied to estimate the proxy inventory.

Table 3-2 Difference per sector for year 2021 between proxy and final GHG inventories

Sector	Inventory 2021 (Submission 2023)	Proxy 2021 (Submission 2022)	Deviation 2021 kt CO ₂ eq	Recalculations	Deviation 2021 cleared of impact of recalculations	
					%	
Total incl. indirect CO₂ excl. LULUCF	3 456 699	3 471 700	-15 002	-0.4	0.2	-0.3
1 Energy	2 641 226	2 662 746	-21 521	-0.8	0.5	-0.3
1.A Fuel combustion	2 579 831	2 601 568	-21 737	-0.8	0.4	-0.4
1.A.1 Energy industries	838 318	840 447	-2 129	-0.3	-0.4	-0.6
1.A.2 Manufacturing industries	430 084	439 540	-9 456	-2.2	1.7	-0.4
1.A.3 Transport	776 959	782 101	-5 142	-0.7	-0.2	-0.8
1.A.4 Other sectors	527 991	532 534	-4 543	-0.9	1.5	0.7
1.A.5 Other	6 478	6 943	-465	-6.7	-4.5	-11.2
1.B Fugitive emissions	61 395	61 178	217	0.4	2.4	2.7
2 Industrial processes & product use	322 009	317 934	4 075	1.3	-2.2	-1.0
2.A Mineral products	103 504	104 086	-582	-0.6	0.2	-0.4
2.B Chemical industry	52 323	52 045	277	0.5	-1.6	-1.1
2.C Metal production	73 571	74 664	-1 093	-1.5	0.0	-1.4
2.D Non-energy products	8 825	7 723	1 102	14.3	-17.3	-3.0
2.E Electronic Industry	1 396	768	628	81.9	0.1	81.9
2.F Product uses as ODS substitutes	73 885	70 842	3 043	4.3	-5.5	-1.2
2.G Other product manufacture and use	8 231	7 473	758	10.1	-7.8	2.3
2.H Other	274	267	7	2.8	-3.5	-0.7

Sector	Inventory 2021 (Submission 2023)	Proxy 2021 (Submission 2022)	Deviation 2021 kt CO ₂ eq	Recalculations	Deviation 2021 cleared of impact of recalculations	
					%	
3 Agriculture	381 092	378 430	2 662	0.7	-0.1	0.6
3.A Enteric fermentation	163 418	182 545	-19 128	-10.5	12.0	1.6
3.B Manure management	56 603	62 903	-6 300	-10.0	13.0	3.0
3.C Rice cultivation	2 452	2 742	-289	-10.5	12.7	2.1
3.D Agricultural soils	146 144	117 994	28 150	23.9	-19.3	4.5
3.F Field burning of agricultural residues	963	701	263	37.5	-0.4	37.1
3.G Liming	5 373	5 629	-257	-4.6	5.2	0.6
3.H Urea application	3 762	3 487	274	7.9	2.3	10.2
3.I Other carbon-containing fertilizers	812	702	110	15.7	-2.4	13.3
3.J Other	1 566	1 728	-162	-9.4	10.3	1.0
5 Waste	110 896	109 284	1 612	1.5	-0.8	0.6
5.A Solid waste disposal	78 398	75 450	2 948	3.9	-3.3	0.6
5.B Biological treatment of solid waste	6 537	6 628	-91	-1.4	-1.7	-3.1
5.C Incineration & open burning of waste	3 861	3 753	108	2.9	-0.5	2.4
5.D Waste water treatment & discharge	22 038	23 395	-1 357	-5.8	8.5	2.7
5.E Other	62	57	5	9.3	-5.4	3.9

In the Energy sector, deviations after recalculation are very small, except for 1.A.5 Other (-11.2%). For Energy sector overall deviations after recalculation is -0.3%.

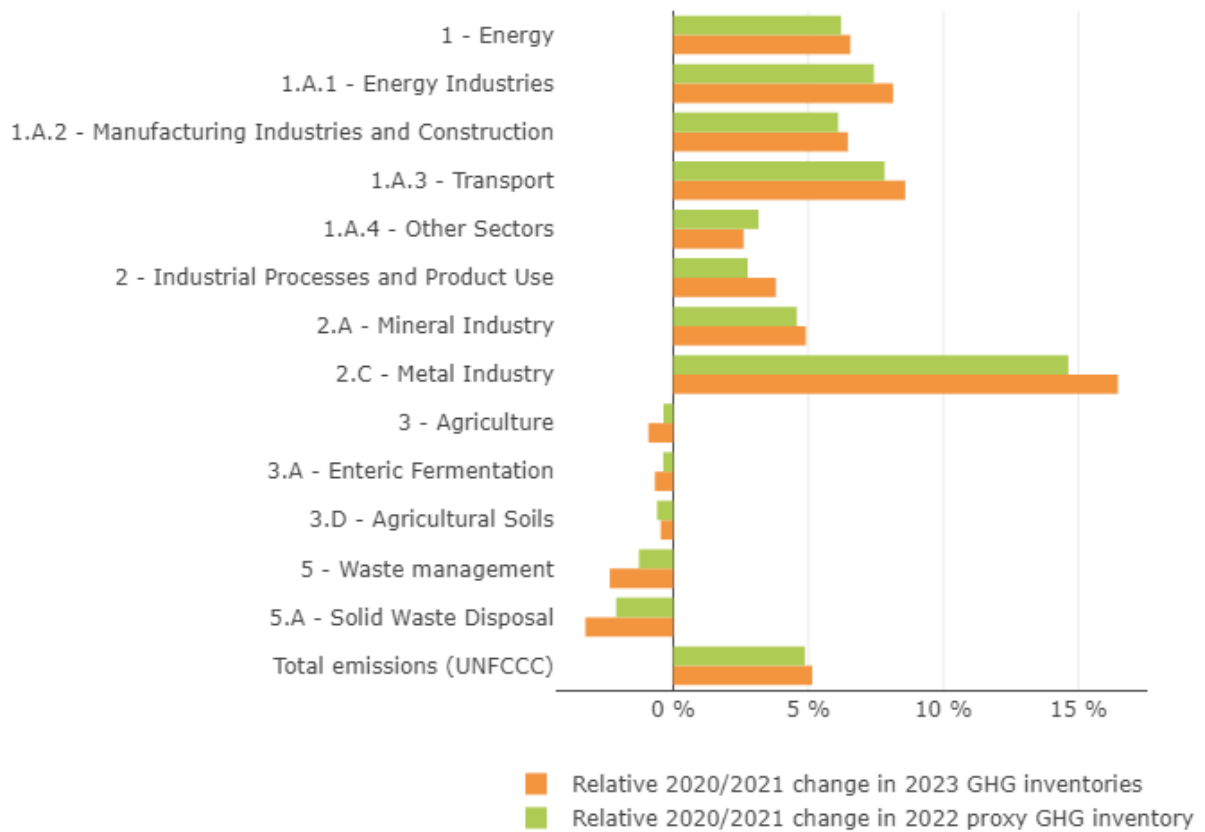
In IPPU, there were considerable recalculations for some categories. The largest relative deviations occurred in 2.E Electronics industry (+81.9%), followed by category 2.D Non-energy Products from Fuels and Solvent Use (+14.3%). The largest absolute difference was in 2.F Product Uses as Substitutes for ODS (+3.0 Mt CO₂e). For the IPPU sector overall after allowing for recalculations the deviation is -1.0%.

In the agricultural sector, deviation before allowing for recalculation is +0.7% and deviation after allowing for recalculations is +0.6%. This can indicate that most of the recalculations were already considered when approximated inventories were created. The largest absolute deviations were in 3.D Agricultural soils (+28.2 Mt CO₂e resp. +23.9%). After considering recalculation effects the deviation for 3.D deviation decreases to +4.5%.

After taking the recalculations effect into consideration, the deviation for the waste sector indicates, that emissions in the waste sector were overestimated only by 0.6%. The largest deviation was found in subsector 5.A Solid Waste Disposal (+3.0 Mt CO₂e or +3.9%). After considering recalculations the deviation of 5.A emissions decreased significantly (+0.6%).

By comparing the percentage changes in emission levels 2020/2021 as derived from the 2022 proxy GHG inventory on the one hand and from the 2023 official GHG inventory submissions to UNFCCC on the other by sectors, the differences are visible the most for IPPU, see Figure 3-2.

Figure 3-2 Relative difference between proxy and submitted inventories by sector 2020/2021



Note: Only sectors with GHG emissions of more than 70 Mt CO₂e in 2021 are shown.

Source: Member States submissions to UNFCCC and proxy estimates for 2021.

4 Methodologies and data sources at Member State level

4.1 Description of different approaches

This report presents the estimated GHG emissions for 2022 based on Member State emissions estimates, submitted to EEA by 31 July. The aggregated EU proxy GHG emission estimates are based on these submissions and gap filling where necessary.

Under the Regulation (EU) 2018/1999, which replaces Regulation (EU) 525/2013 on the mechanism for monitoring and reporting GHG emissions (EU MMR) and its implementing provisions, Member States submit, where possible, to the European Commission approximated GHG inventories by 31 July every year for the preceding year $t-1$. Where a Member State has not submitted a 'proxy' inventory, the EEA uses its own estimates for gap-filling purposes in order to have a complete approximated GHG inventory at EU level.

In previous years the EEA and its ETC CM developed and used the latest activity data available at country level to estimate the emissions. For emission sources for which no appropriate data sets exist, emissions from the previous year are kept constant where historic data do not show a clear linear trend. That methodology which estimated emissions using a 'bottom-up' approach was complex and time-consuming. This year, submission of approximated greenhouse gas inventory was missing from Bulgaria, which have a share less than 2% of the emissions of the whole EU. Previous year gap-filling for Bulgaria had 0.8% deviation between the 2021 proxy and final GHG inventory of Bulgaria.

In some cases, it has been necessary to allocate or distribute the reported emissions to sectors or within sub-sectors. This is done to allow for the aggregation and explanation of trends at EU level. Details are given in section 4.4.

4.2 MS proxies submitted

Member States are responsible for the methodological choice regarding their own estimates. The MS should submit approximated GHG inventories for the preceding year ($t-1$) in accordance with the table in Annex VI of Regulation (EU) 2020/1208 which is based on Summary2 table of the Common Reporting Format (CRF). The implementing regulation of the EU Governance Regulation requires the calculation at a level of disaggregation of source categories reflecting the activity data and methods available for the preparation of the proxy estimates. Therefore, it is in line with the legislation if Member States submit only partially complete aggregated table with their proxy estimates. Additionally, Member States should split emissions – where available – into ETS and non-ETS emissions and shall provide information on drivers and trends for $t-1$.

4.3 Gap-filling for MS not submitting a proxy inventory

This year estimates by the EEA and ETC CM are made for all source categories. Relevant data sources with updated activity or emissions data for the year $t-1$ were identified and used to calculate emissions. For source categories for which no international data sets with updated activity data exist or which are too complex for a simple approach, emissions from the previous year were kept constant. On this basis, a simple approach was developed covering the full scope of emissions included in a GHG inventory submission.

The EEA estimates are based on publicly available data sets at the European level. For the estimation of approximated emissions, the following data sources for emissions or activities were used:

- Verified emissions reported under the EU-ETS and recorded in the EUTL (EEA);
- Eurostat data on Supply, transformation and consumption

Based on these data sources, emission estimates for year 2022 were made for the following source categories:

- 1. Energy
 - 1.A Fuel Combustion
 - 1.A.1 Energy Industries
 - 1.A.2 Manufacturing Industries and Construction
 - 1.A.3 Transport
- 2. Industrial Processes and Product Use
 - 2.A Mineral Industry
 - 2.B Chemical Industry
 - 2.C Metal Production

All other source categories were filled by using previous year emissions.

The timing of these calculations depends on the release of the underlying data sources. The availability of data sources (including the MS GHG inventories) is shown in Table 4-1.

Table 4-1 Time of availability of data used for the proxy inventory

Data source	Availability
EUTL verified emissions	Data as of 27 July 2023 was used
Eurostat	Data as of 26 July 2023 was used
GHG inventory data from CRF files	mid-April
Eurocontrol flight and emissions data	late August

Source: ETC CM

National GHG inventories are required to fulfil certain principles as laid out in the UNFCCC reporting guidelines for GHG inventories: inventories must be transparent, consistent, comparable, complete and accurate (TCCCA). The IPCC Good Practice Guidance recommends Parties to perform QA/QC procedures that are important information to enable continuous improvement to inventory estimates. Through the quantification of uncertainty at the source level and for the inventory as a whole, improvements can be prioritised. Thus Parties may change methodologies in order to improve their greenhouse gas estimates at source level (e.g. moving from Tier 2 to Tier 3). Such methodological changes at Member States level cannot be captured in the calculation of the approximated GHG inventory for the EU. On-going quality improvements in Member States' inventories to take effect in next year's official submissions to UNFCCC are therefore a source of uncertainty for the proxy inventory.

It has to be taken into account that any recent national improvements of GHG reporting methodologies could not be considered for approximated GHG inventories calculated centrally by EEA and its ETC CM, as the 2023 estimates for the 2022 proxy inventory were based on the national methodologies used for 2023 inventory submissions (covering emissions until 2021). Thus, revised methodologies and parameters at Member States level can result in differences between the final inventory and the proxy inventory.

4.3.1 Energy and IPPU emissions from selected categories

To estimate CO₂, CH₄ or N₂O emissions from 1.A.1 Energy industries, 2.A Mineral industry and 2.C Metal industry, the following calculation was performed.

$$E_{GHG}^{Y-1} = \frac{E_{ETS,Activities}^{Y-1}}{E_{ETS,Activities}^{Y-2}} \cdot E_{GHG}^{Y-2}$$

E_{GHG}^{Y-1}	Emission of CO ₂ , CH ₄ or N ₂ O in source category in the proxy year
$E_{ETS,Activities}^{Y-1}$	ETS emissions for some activities in the proxy year
$E_{ETS,Activities}^{Y-2}$	ETS emissions for some activities in the previous year
E_{GHG}^{Y-2}	Emission of CO ₂ , CH ₄ or N ₂ O in source category in the previous year

ETS emission data from the European Transaction Log (EUTL) was used. The following table shows the ETS activities that were aggregated for the calculation.

Table 4-2 ETS activities used for the emission estimates

Energy industries	20-99 All stationary installations
Mineral industry	29 Production of cement clinker 30 Production of lime, or calcination of dolomite/magnesite 31 Manufacture of glass 32 Manufacture of ceramics 33 Manufacture of mineral wool
Chemical industry	38 Production of nitric acid 41 Production of ammonia
Metal industry	24 Production of pig iron or steel 25 Production or processing of ferrous metals 28 Production or processing of non-ferrous metals

To estimate CO₂, CH₄ or N₂O emissions from 1.A.2 Manufacturing industries and construction and 1.A.3 Transport, the following calculation was performed.

$$E_{GHG}^{Y-1} = \frac{E_{ESTAT,fuel\ consumption}^{Y-1}}{E_{ESTAT,fuel\ consumption}^{Y-2}} \cdot E_{GHG}^{Y-2}$$

E_{GHG}^{Y-1}	Emission of CO ₂ , CH ₄ or N ₂ O in source category in the proxy year
$E_{ESTAT,fuel\ consumption}^{Y-1}$	Consumption of selected fuel in the proxy year
$E_{ESTAT,fuel\ consumption}^{Y-2}$	Consumption of selected fuel in the previous year
E_{GHG}^{Y-2}	Emission of CO ₂ , CH ₄ or N ₂ O in source category in the previous year

The following table shows a description of Eurostat data used for the calculation.

Table 4-3 Eurostat data used for the emission estimates

Manufacturing industries and construction	Inland consumption – calculated: Natural Gas
Transport	Gross inland deliveries – calculated: Gas oil and diesel oil (excluding biofuel portion)

4.3.2 Other emissions

For the source categories not mentioned before the emission values from previous year (2020) were used as proxy estimates for the year 2021. Also, for all emissions of fluorinated greenhouse gases (HFCs, PFCs, SF₆, NF₃) previous year values were used as proxy estimates.

4.4 Methodology for gap-filling of partially complete proxy submissions

The approximated GHG emissions data are submitted by Member States in a form consistent with CRF Summary2 tables. However, these tables are not always submitted with complete sub-sector level disaggregation. Because EU emissions are the sum of the Member States' emissions, in order to achieve a complete EU proxy inventory, some gap filling has been required. For some MS proxies the reported emissions have been allocated or distributed within sub-sectors. This is done to allow for the aggregation and explanation of trends at EU level. Allocations were needed for Germany and Sweden.

4.4.1 Total CO₂e, including indirect CO₂, without LULUCF in ETS and non-ETS

Most Member States did report *Total CO₂ equivalent emissions, without LULUCF*. There has however been some ambiguity about how to report included indirect CO₂ emissions. In previous years, a total was included in cell J68 whether or not the total included indirect CO₂ emissions. Many MS leave this cell blank even if they do report indirect CO₂ emissions. For consistency this calculation has been adjusted (J68 =SUM J66, B65), in all proxy sheets so that there is a total shown in cell J68 whether or not the MS has calculated any indirect CO₂ emissions.

Most Member States provided a split of ETS and non-ETS emissions in their submissions.

4.4.2 F-gases

Emissions from fluorinated greenhouse gases (F-gases⁷) can appear in the following source categories of industrial processes and product use:

- 2.B Chemical industry
- 2.C Metal industry
- 2.E Electronic industry
- 2.F Product uses as ODS substitutes
- 2.G Other product manufacture and use
- 2.H Other

Germany and Sweden reported F-gas emissions but did not disaggregate into source categories. Reported F-gas emissions were allocated using the shares of F-gas emissions per source categories of the latest available GHG inventories.

The gap-filling approach used for Bulgaria (described in section 4.3), calculates proxy estimates for whole of the IPPU sector. For Bulgaria, the F-gas emissions were distributed in the same way as for Germany and Sweden using allocations derived from reports for the previous year.

4.4.3 Gap-filling LULUCF

Previous years values were applied to gap-fill LULUCF. Gap-filling was done only for Croatia.

⁽⁷⁾ F-gas emissions include emission of the following gases or groups of gases: hydrofluorocarbons = HFCs; perfluorocarbons = PFCs; sulphur hexafluoride = SF₆; nitrogen trifluoride =NF₃.

4.4.4 Gap-filling aviation data

Gap-filling of aviation data was done by applying Eurocontrol data. International aviation was gap-filled for Bulgaria, Denmark, Luxembourg and Portugal. Domestic aviation was gap-filled for all Member States except Finland and Malta. Eurocontrol aviation data is divided into three parts; international aviation, domestic aviation and to other aviation, when Eurocontrol has been uncertain where to allocate the data. Domestic aviation data has an effect on total ESR value.

4.4.5 Gap-filling navigation data

Gap-filling of international navigation data was done by applying Eurostat monthly data about supply and transformation of oil and petroleum products (Eurostat 2023). This database contains information about international maritime bunkers. International navigation was gap-filled for Bulgaria, Denmark and Portugal.

5 References

BP 2023, BP Statistical Review of World Energy 2022 <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2022-full-report.pdf>

Copernicus 2023, Temperature in 2022. <https://climate.copernicus.eu/esotc/2022/temperature>

EEA 2023, Annual European Union greenhouse gas inventory 1990–2021 and inventory report 2023. https://www.eea.europa.eu/ds_resolveuid/a9f7f010d2d348488e4345e7fdb3709e

EEA 2023 a, The approximated energy efficiency estimates 2023, for the EEA by ETC CM

EEA 2023 b, The approximated renewable energy shares estimates 2023, for the EEA by ETC CM

EEA 2023 c, European Union Emissions Trading System data viewer, 4 August 2023. <https://www.eea.europa.eu/data-and-maps/dashboards/emissions-trading-viewer-1>

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

Eurostat 2023, Supply and transformation of oil and petroleum products – monthly data https://ec.europa.eu/eurostat/databrowser/view/nrg_cb_oilm/default/table?lang=en

IPCC 2006, 2006 IPCC Guidelines for National Greenhouse Gas Inventories www.ipcc-nggip.iges.or.jp/public/2006gl/

Annex 1: Detailed results for each Member State

Country	Compiled by	Submission date	Resubmission date
Austria	Member State	18 July 2023	
Belgium	Member State	28 July 2023	
Bulgaria	EEA, ETC CM		
Cyprus	Member State	04 July 2023	
Czechia	Member State	31 July 2023	
Germany	Member State	06 July 2023	
Denmark	Member State	28 July 2023	
Estonia	Member State	26 July 2023	
Spain	Member State	1 September 2023	
Finland	Member State	04 July 2023	
France	Member State	31 July 2023	
Greece	Member State	20 July 2023	
Croatia	Member State	27 July 2023	
Hungary	Member State	03 August 2023	
Ireland	Member State	26 July 2023	
Italy	Member State	27 July 2023	
Lithuania	Member State	31 July 2023	
Luxembourg	Member State	27 July 2023	
Latvia	Member State	27 July 2023	
Malta	Member State	27 July 2023	
Netherlands	Member State	13 July 2023	
Poland	Member State	18 July 2023	18 September 2023
Portugal	Member State	28 July 2023	13 September 2023
Romania	Member State	24 July 2023	
Sweden	Member State	12 July 2023	
Slovenia	Member State	28 July 2023	
Slovakia	Member State	10 July 2023	
European Union (EU27)	EEA, ETC CM		
Iceland	Country	10 July 2022	
Switzerland	Country	06 July 2023	
Norway	Country	17 July 2023	21 August 2023

5.1 Austria (submitted by member state)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories

Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999

Year 2023

Submission 2022

Country Austria

Geographical scope⁽⁴⁾

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total	ETS	non-ETS
Total (net emissions)⁽¹⁾	50653.91	6473.45	3151.32	1465.74	30.86	375.20	NO	12.53	62163.00	26626.26	45905.39
1. Energy	46999.70	604.13	543.95						48147.77	12 831	35 284
A. Fuel combustion (sectoral approach)	46915.46	357.01	543.95						47816.42	12 831	34 952
1. Energy industries	8280.59	28.76	87.32						8396.67	6 881	1 516
2. Manufacturing industries and construction	9918.30	21.72	109.75						10049.77	5 798	4 251
3. Transport (3)	20510.98	21.09	218.70						20750.78	152	20 566
4. Other sectors	8175.84	285.41	127.65						8588.91	NO	8 589
5. Other	29.74	0.03	0.52						30.29	NO	30
B. Fugitive emissions from fuels	84.24	247.11	0.00						331.35	NO	331
1. Solid fuels	NO	NO	NO						NO	NO	NO
2. Oil and natural gas	84.24	247.11	NO						331.35	NO	331
C. CO ₂ transport and storage	NO								NO	NO	NO
2. Industrial processes and product use	14040.68	58.58	55.34	1465.74	30.86	375.20	NA	12.53	16038.93	13 795	2 244
A. Mineral industry	2920.50								2920.50	2 884	36
B. Chemical industry	611.04	54.39	22.89	NA	NA	NA	NA	NA	688.32	567	121
C. Metal industry	10343.83	4.19	NO	NO	NO	2.35	NA	NO	10350.37	10 344	7
D. Non-energy products from fuels and solvent use	165.31	NA	NA						165.31	NO	165
E. Electronic Industry				3.39	30.86	24.82	NA	12.53	71.60	NO	72
F. Product uses as ODS substitutes				1462.35	NO	NO	NO	NO	1462.35	NO	1 462
G. Other product manufacture and use	NO	NO	32.45	NO	NO	348.03	NO	NO	380.48	NO	380
H. Other	NA	NA	NA	NO	NO	NO	NO	NO	NA	NO	NO
3. Agriculture	152.35	4849.01	2213.21						7214.57		
A. Enteric fermentation		4225.27							4225.27		
B. Manure management		623.74	469.55						1093.29		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NA	1743.66						1743.66		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		NO	NO						NO		
G. Liming	98.44								98.44		
H. Urea application	26.85								26.85		
I. Other carbon-containing fertilizers	27.06								27.06		
J. Other	NA	NA	NA						NA		
4. Land use, land-use change and forestry⁽¹⁾	-10540.87	27.12	112.05						-10401.70		
A. Forest land	-10375.43	0.48	16.35						-10358.60		
B. Cropland	259.37	NO	18.01						277.38		
C. Grassland	434.08	26.64	NO						460.72		
D. Wetlands	75.88	NO	NO						75.88		
E. Settlements	441.04	NO	55.17						496.20		
F. Other land	513.58	NO	11.11						524.70		
G. Harvested wood products	-1889.39								-1889.39		
H. Other	NO	NO	NO						NO		
5. Waste	2.05	934.61	226.76						1163.43		
A. Solid waste disposal	NO	831.78							831.78		
B. Biological treatment of solid waste		77.35	73.32						150.68		
C. Incineration and open burning of waste	2.05	0.47	0.05						2.57		
D. Waste water treatment and discharge		25.00	153.39						178.39		
E. Other	NO	NO	NO						NO		
6. Other (as specified in summary 1.A)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NA	
Memo items:											
International bunkers	1289.30	0.30	13.52						1303.13		
Aviation	1228.04	0.27	8.96						1237.27		
Navigation	61.26	0.04	4.56						65.86		
CO₂ emissions from biomass	NE								NE		
CO₂ captured	NO								NO		
Indirect CO₂⁽²⁾	NO								NO		
Total CO₂ equivalent emissions without land use, land-use change and forestry									72564.70	26626.258	45905.38979
Total CO₂ equivalent emissions with land use, land-use change and forestry									62163.00		
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry									NA	0	0
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry									NA		

⁽¹⁾ For carbon dioxide (CO₂) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and

⁽²⁾ For Member States that report indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽³⁾ CO₂ emissions from civil aviation are treated as zero for effort sharing purposes.

⁽⁴⁾ Where applicable: please clarify the geographical scope

Brief description of the key drivers underpinning the increase or decrease in GHG emissions in x-1 (proxy) compared to x-2 (inventory). If this information is publicly available please include the hyperlink to the relevant website. Information on the uncertainties associated with the estimations for the LULUCF sector may also be provided.

The trend of 1.A fuel combustion widely follows the trend in preliminary energy statistics
(<https://www.statistik.at/statistiken/energie-und-umwelt/energie/energiebilanzen>)

The most significant trends 2021-2022 in fuel consumption by type of fuel are:

Transport diesel sales decreased by -5.8% and gasoline sales increased by +3.3% (approx. -0.9 Mt of CO₂ from diesel and gasoline).

Gasoil consumption decreased by -16% (approx. -0.6 Mt of CO₂)

Natural gas consumption decreased by 11% (approx.-2.0 Mt of CO₂)

(<http://www.e-control.at/de/statistik/gas>)

Refinery emissions decreased by -0.5 Mt CO₂ (-18%) due to about 30% lower crude oil processing

Industrial processes:

CO₂ emissions from iron and steel industries (1.A.2.a and 2.C.1) decreased by -6% (approx -0.7 Mt CO₂) due to an decrease in crude steel production (-5%).

CO₂ emissions from Non Metallic Mineral Products (2.A.1) decreased by approx. -0.1 Mt CO₂.

CO₂ emissions from Chemicals Industries (2.B) decreased by approx. -0.1 Mt CO₂.

(<https://www.worldsteel.org/steel-by-topic/statistics.html>)

International bunkers:

Kerosin consumption increased by +52% (+0.6 Mt CO₂)

Agriculture: Fertilizer Use: two-year mean value decreased by 8.7% (<https://www.ama.at/Marktinformationen/Getreide-und-Olsaaten/Dungemittel>)

Animals numbers: total cattle decreased by 0.5%; milk cows increased by 4.6 % while milk yield increased by 0.01%; swine number decreased by 4.9%

(<https://www.ama.at/Marktinformationen/Vieh-und-Fleisch/Produktion>; <https://www.statistik.at/statistiken/land-und-forstwirtschaft/tiere-tierische-erzeugung/viehbestand/viehbestand-jaehrlich>)

5.2 Belgium (submitted by member state)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories									Year	2023	
Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999									Submission	2022	
									Country	Belgium	
									Geographical scope ⁽⁴⁾		
GREENHOUSE GAS SOURCE AND	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total	ETS	non-ETS
SINK CATEGORIES	CO ₂ equivalent (kt)									CO ₂ equivalent (Gg)	
Total (net emissions)⁽¹⁾	91022.21	7855.34	4730.91	2350.26	108.24	95.02	NO	5.25	106167.24		
1. Energy	77135.36	1185.04	538.70						78859.10	25 526	53 334
A. Fuel combustion (sectoral approach)	77024.59	625.39	538.70						78188.68	25 415	52 774
1. Energy industries	18442.68	38.31	103.88						18584.87	16 285	2 300
2. Manufacturing industries and construction	12659.73	56.72	97.04						12813.48	8 818	3 995
3. Transport (3)	24418.96	20.98	233.22						24673.16	262	24 411
4. Other sectors	21398.83	509.22	103.62						22011.66	49	21 962
5. Other	104.39	0.16	0.95						105.50	0	106
B. Fugitive emissions from fuels	110.77	559.65	NO						670.43	111	560
1. Solid fuels	NO	44.22	NO						44.22	0	44
2. Oil and natural gas	110.77	515.43	NO						626.21	111	516
C. CO ₂ transport and storage											
2. Industrial processes and product use	13900.89	22.17	526.96	2350.26	108.24	95.02	NO	5.25	17008.80	13 949	3 060
A. Mineral industry	3912.82								3912.82	3 913	0
B. Chemical industry	6346.20	17.81	482.84	64.56	83.71	0.54	NA	4.32	6999.97	6 512	488
C. Metal industry	3501.94	4.36	NO						3506.31	3 502	4
D. Non-energy products from fuels and solvent use	117.51	NO	NO						117.51	0	117
E. Electronic industry				2.09	24.40	14.99	NO	0.93	42.41	0	42
F. Product uses as ODS substitutes				2283.61	0.13				2283.74	0	2 284
G. Other product manufacture and use	NO	NO	44.12	NO	NO	79.49	NO	NO	123.61	0	124
H. Other	22.41	NO	NO	NO	NO	NO	NO	NO	22.41	22	0
3. Agriculture	190.93	5785.80	3437.47						9414.19		
A. Enteric fermentation		4463.93							4463.93		
B. Manure management		1321.86	569.36						1891.22		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NA	2868.11						2868.11		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		NO	NO						NO		
G. Liming	141.06								141.06		
H. Urea application	49.86								49.86		
I. Other carbon-containing fertilizers	NO								NO		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry⁽¹⁾	-427.61	0.29	102.95						-324.37		
A. Forest land	-2000.54	NO	0.02						-2000.52		
B. Cropland	643.69	NO	44.99						688.68		
C. Grassland	300.82	0.29	18.48						319.60		
D. Wetlands	-4.03	NO	0.02						-4.01		
E. Settlements	510.51	NO	20.71						531.22		
F. Other land	NO	NO	NO						NO		
G. Harvested wood products	121.94								121.94		
H. Other	NO	NO	NO						NO		
5. Waste	222.64	862.04	124.84						1209.52		
A. Solid waste disposal	NO	581.28							581.28		
B. Biological treatment of solid waste		25.28	30.63						55.91		
C. Incineration and open burning of waste	222.64	0.00	0.11						222.75	190.45	32.30
D. Waste water treatment and discharge		255.48	94.10						349.58		
E. Other	NO	NO	NO						NO		
6. Other (as specified in summary 1.A)	NO	NO	NO	NO	NO	NO	NO	NO	NO		
Memo items:											
International bunkers	30101.21	5.44	209.07						30315.72		
Aviation	4542.61	0.73	32.58						4575.92		
Navigation	25558.59	4.71	176.49						25739.79		
CO₂ emissions from biomass	12804.73								12804.73		
CO₂ captured	NO								NO		
Indirect CO₂⁽²⁾	NO								NO		
Total CO₂ equivalent emissions without land use, land-use change and forestry									106491.61	39665.24	66826.36
Total CO₂ equivalent emissions with land use, land-use change and forestry									106167.24		
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry									106491.61	39665.24	66826.36
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry									106167.24		

⁽¹⁾ For carbon dioxide (CO₂) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always

⁽²⁾ For Member States that report indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽³⁾ CO₂ emissions from civil aviation are treated as zero for effort sharing purposes.

⁽⁴⁾ Where applicable: please clarify the geographical scope

Brief description of the key drivers underpinning the increase or decrease in GHG emissions in x-1 (proxy) compared to x-2 (inventory). If this information is publicly available please include the hyperlink to the relevant website. Information on the uncertainties associated with the estimations for the LULUCF sector may also be provided.

In 2022, with the end of the restrictions due to Covid-19, road transport continues to increase (+2.8%) without however catching up with its pre-epidemic levels. However, net emissions decrease overall by 4.0%. The impact of high gas prices linked to the conflict in Ukraine and a very mild winter explain the decrease in consumption. The difference between the total reported ETS-emission data and the ETS-emissions reported in the greenhouse gas inventory is due to a different approach in methodologies and, consequently, the subtraction in the inventory of a part of the 'avoided' emissions of CO₂ that are recuperated during the production of ammonia. In 2022 an emission of 40 ktCO₂ is involved.

In Wallonia, first estimates of the emissions for the year 2022 indicate a decrease of the total GHG emissions. This decrease is evenly due to the ETS sector (mineral, iron and steel and chemical industry sectors) and a milder winter (residential and tertiary sectors), 2022 being the warmest year currently measured in Belgium, equal to 2020.

In the case of the Brussels-Capital region, first estimates of the emissions for the year 2022 indicate a decrease of the total GHG emissions mainly due to an important decrease of the emissions in the building sector as a consequence of warm temperature records. The winter as a whole was warmer than normal. While 2021 recorded slightly colder temperatures than normal throughout the year, 2022 is, together with 2020, the warmest year in Belgium since records began in 1833.

In the Flemish region, first estimates of the emissions for the year 2022 indicate a decrease of the total GHG emissions (w/o LULUCF) compared to 2021 (-2,8Mton CO₂eq). This decrease is mainly due to a milder winter in 2022 (-2,2 Mton CO₂ eq) compared to 2021 (residential, tertiary and agriculture sectors), 2022 being the warmest year currently measured in Belgium, about equal to 2020. Besides a decrease in emissions in the ETS-sector (-0,9 Mton CO₂eq) took place (mainly in chemical industry, the refineries and

5.3 Bulgaria (EEA calculation)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories

Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999

Year 2022

Submission 2023

Country BULGARIA

Geographical scope⁽⁴⁾

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total
	CO ₂ equivalent (kt)								
Total (net emissions)⁽¹⁾	35348.18	4468.88	766.45	739.42	0.01	23.27	NO, NA	NO, NA	47452.55
1. Energy	41588.96	1621.32	317.74						43528.02
A. Fuel combustion (sectoral approach)	41026.44	434.24	317.21						41777.90
1. Energy industries	25696.97	36.63	124.07						25857.67
2. Manufacturing industries and construction	3706.98	13.36	24.65						3744.99
3. Transport (3)	9964.87	23.77	87.74						10076.38
4. Other sectors	1656.69	360.49	80.75						2097.93
5. Other	0.92	0.00	0.01						0.93
B. Fugitive emissions from fuels	562.52	1187.07	0.53						1750.12
1. Solid fuels	22.90	883.22	NO						906.12
2. Oil and natural gas	539.62	303.85	0.53						844.00
C. CO ₂ transport and storage	NO								0.00
2. Industrial processes and product use	3346.36	0.00	62.94	739.42	0.01	23.27	NO, NA	NO, NA	4172.01
A. Mineral industry	2224.40								2224.40
B. Chemical industry	951.96	NO,NA	52.58	NA	NA	NA	NA	NA	1004.54
C. Metal industry	130.92	NO,NA	NA	NA	NA	NA	NA	NA	130.92
D. Non-energy products from fuels and solvent use	16.28	NO,NA	NO,NA						16.28
E. Electronic Industry				NO	NO	NO	NO	NO	0.00
F. Product uses as ODS substitutes				739.42	0.01	NO	NO	NO	739.43
G. Other product manufacture and use	22.79	NO	10.36			NO	23.27		56.43
H. Other	1E,NA	NA	NA						0.00
3. Agriculture	0.00	0.00	0.00						6106.34
A. Enteric fermentation		1713.56							1713.56
B. Manure management		366.94	257.08						624.02
C. Rice cultivation		121.58							121.58
D. Agricultural soils		NO	3546.99						3546.99
E. Prescribed burning of savannas		NO	NO						0.00
F. Field burning of agricultural residues		34.48	7.15						41.63
G. Liming	24.64								24.64
H. Urea application	33.92								33.92
I. Other carbon-containing fertilizers	NO								0.00
J. Other									0.00
4. Land use, land-use change and forestry⁽¹⁾	-9592.86	142.10	264.01						-9186.75
A. Forest land	-8376.45	142.10	94.52						-8139.83
B. Cropland	196.20	NO,NE	71.87						268.06
C. Grassland	-982.99	NO,NE	25.13						-957.86
D. Wetlands	191.34	NO	19.44						210.78
E. Settlements	564.36	NO	53.06						617.41
F. Other land	NO	NO	NO						0.00
G. Harvested wood products	-1185.31								-1185.31
H. Other	NO	NO	NO						0.00
5. Waste	5.71	2705.46	121.76						2832.94
A. Solid waste disposal	NO	2238.71							2238.71
B. Biological treatment of solid waste		3.33	1.83						5.16
C. Incineration and open burning of waste	5.71	0.00	0.25						5.97
D. Waste water treatment and discharge		463.42	119.68						583.10
E. Other	NO	NO	NO						NO
6. Other (as specified in summary 1.A)									NO
Memo items:									
International bunkers	819.56	0.71	6.00						826.27
Aviation	595.98	0.13	4.42						600.53
Navigation	223.58	0.58	1.58						225.74
CO₂ emissions from biomass									
CO₂ captured									
Indirect CO ₂ ⁽²⁾	NO								
Total CO₂ equivalent emissions without land use, land-use change and forestry									56639.30
Total CO₂ equivalent emissions with land use, land-use change and forestry									47452.55
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry									56639.30
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry									47452.55

⁽¹⁾ For carbon dioxide (CO₂) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always

⁽²⁾ For Member States that report indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽³⁾ CO₂ emissions from civil aviation are treated as zero for effort sharing purposes.

⁽⁴⁾ Where applicable: please clarify the geographical scope

5.4 Cyprus (submitted by member state)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories								Year	2023
Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999								Submission	2022
								Country	Cyprus
								Geographical scope ⁽⁴⁾	
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total
CO ₂ equivalent (kt)									
Total (net emissions)⁽¹⁾	6805.58	1106.28	178.00	354.58	NO	16.29	NO	NO	8460.73
1. Energy	6145.96	20.72	24.78						6191.45
A. Fuel combustion (sectoral approach)	6145.96	20.72	24.78						6191.45
1. Energy industries	3087.19	3.44	6.46						3097.09
2. Manufacturing industries and construction	523.68	3.68	4.90						532.26
3. Transport (3)	2042.55	3.26	11.68						2057.49
4. Other sectors	469.54	10.25	1.68						481.48
5. Other	23.00	0.08	0.05						23.13
B. Fugitive emissions from fuels	NO	NO	NO						NO
1. Solid fuels	NO	NO	NO						NO
2. Oil and natural gas	NO	NO	NO						NO
C. CO ₂ transport and storage	NO								NO
2. Industrial processes and product use	904.80	0.00	6.08	354.58	0.00	16.29	0.00	NO	1281.75
A. Mineral industry	899.76								899.76
B. Chemical industry	NO	NO	NO	NO	NO	NO	NO	NO	NO
C. Metal industry	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Non-energy products from fuels and solvent use	5.05	0.00	0.00						5.05
E. Electronic Industry				NO	NO	NO	NO	NO	NO
F. Product uses as ODS substitutes				354.58	NO	NO	NO	NO	354.58
G. Other product manufacture and use	0.00	0.00	6.08	NO	NO	16.29	NO	NO	22.37
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Agriculture	0.30	438.01	120.66						558.97
A. Enteric fermentation		353.24							353.24
B. Manure management		84.27	69.97						154.24
C. Rice cultivation		NO							NO
D. Agricultural soils		NO	50.57						50.57
E. Prescribed burning of savannas		NO	NO						NO
F. Field burning of agricultural residues		0.50	0.12						0.63
G. Liming	NO								NO
H. Urea application	0.30								0.30
I. Other carbon-containing fertilizers	NO								NO
J. Other	NO	NO	NO						NO
4. Land use, land-use change and forestry⁽¹⁾	-245.48	5.49	3.93						-236.05
A. Forest land	-121.62	5.49	2.88						-113.25
B. Cropland	-128.12	NO	0.13						-127.99
C. Grassland	-19.79	NO	NO						-19.79
D. Wetlands	0.50	NO	NO						0.50
E. Settlements	3.57	NO	0.74						4.30
F. Other land	NO	NO	NO						NO
G. Harvested wood products	19.99								19.99
H. Other	NO	NO	NO						NO
5. Waste	0.00	642.06	22.54						664.60
A. Solid waste disposal	0.00	573.87							573.87
B. Biological treatment of solid waste		13.67	7.74						21.41
C. Incineration and open burning of waste	NO	NO	NO						NO
D. Waste water treatment and discharge		54.51	14.81						69.32
E. Other	NO	NO	NO						NO
6. Other (as specified in summary 1.A)	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo items:									
International bunkers	1359.54	1.76	12.20						1373.49
Aviation	556.63	0.11	4.13						560.87
Navigation	802.91	1.65	8.07						812.63
CO₂ emissions from biomass	421.91								421.91
CO₂ captured	NO								NO
Indirect CO₂⁽²⁾	5.23								
Total CO₂ equivalent emissions without land use, land-use change and forestry									8696.78
Total CO₂ equivalent emissions with land use, land-use change and forestry									8460.73
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry									8702.01
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry									8465.96

⁽¹⁾ For carbon dioxide (CO₂) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and

⁽²⁾ For Member States that report indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽³⁾ CO₂ emissions from civil aviation are treated as zero for effort sharing purposes.

⁽⁴⁾ Where applicable: please clarify the geographical scope

5.5 Czechia (submitted by member state)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories

Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999

Year 2023
Submission 2022
Country Czechia

Geographical scope⁽⁴⁾

GREENHOUSE GAS SOURCE AND	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total	ETS	non-ETS
SINK CATEGORIES										CO ₂ equivalent (Gg)	
CO ₂ equivalent (kt)										CO ₂ equivalent (Gg)	
Total (net emissions)⁽¹⁾	101889.13	13139.90	4735.81	979.75	30.95	61.94	0.00	2.29	120839.77	56541.92	64297.85
1. Energy	84833.96	3757.09	568.66						89159.71	47 460	41 700
A. Fuel combustion (sectoral approach)	84783.88	1242.32	568.63						86594.83	47 359	39 235
1. Energy industries	41102.50	44.77	186.28						41333.55	39 871	1 462
2. Manufacturing industries and construction	11850.70	53.12	67.99						11971.81	7 444	4 528
3. Transport (3)	20285.14	24.66	174.83						20484.63	NO	20 485
4. Other sectors	11245.50	1119.32	136.81						12501.63	44	12 457
5. Other	300.04	0.45	2.72						303.21	NO	303
B. Fugitive emissions from fuels	50.08	2514.77	0.03						2564.88	100	2 464
1. Solid fuels	46.86	1838.76	NO						1885.62	IE	
2. Oil and natural gas	3.22	676.01	0.03						679.26	IE	
C. CO ₂ transport and storage	NO								NO	NO	
2. Industrial processes and product use	11472.05	71.95	355.10	979.75	30.95	61.94	0.00	2.29	12974.03	9 082	3 907
A. Mineral industry	3198.82								3198.82	3 152	47
B. Chemical industry	1882.40	55.72	156.35	NO	NO	NO	NO	NO	2109.35	214	1 895
C. Metal industry	6235.81	16.23	NA	NO	NO	NO	NO	NO	6252.04	5 716	536
D. Non-energy products from fuels and solvent use	154.49	NO	NO						154.49	NO	154
E. Electronic industry				1.13	30.79	2.49	NO	2.29	36.71	NO	37
F. Product uses as ODS substitutes				978.58	0.16	NO	NO	NO	978.74	NO	979
G. Other product manufacture and use	NO	NO	198.75	NO	NO	59.45	NO	NO	258.20	NO	258
H. Other	0.53	NO	NO	0.04	NO	NO	NO	NO	0.57	1	0
3. Agriculture	348.38	4055.78	3561.19						7965.35		
A. Enteric fermentation		3679.11							3679.11		
B. Manure management		376.67	386.93						763.60		
C. Rice cultivation		NO							NO		
D. Agricultural soils			3174.27						3174.27		
E. Prescribed burning of savannas			NO						NO		
F. Field burning of agricultural residues			NO						NO		
G. Liming	153.77								153.77		
H. Urea application	194.61								194.61		
I. Other carbon-containing fertilizers	NO								NO		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry⁽¹⁾	5130.98	0.74	0.05						5164.92		
A. Forest land	7624.40	0.74	0.04						7656.07		
B. Cropland	52.20	NO	0.01						54.46		
C. Grassland	-487.87	NO	NO						-487.87		
D. Wetlands	71.54	NO	NO						71.54		
E. Settlements	245.20	NO	NO						245.20		
F. Other land	NO	NO	NO						NO		
G. Harvested wood products	-2374.48								-2374.48		
H. Other	NO	NO	NO						NO		
5. Waste	103.76	5254.34	250.80						5608.90		
A. Solid waste disposal	0.00	3602.46							3602.46		
B. Biological treatment of solid waste		726.90	69.98						796.88		
C. Incineration and open burning of waste	103.76	5.36	3.59						112.71		
D. Waste water treatment and discharge		919.62	177.24						1096.86		
E. Other	NO	NO	NO						NO		
6. Other (as specified in summary 1.A)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo items:											
International bunkers	806.40	0.16	5.81						812.36		
Aviation	806.40	0.16	5.81						812.36		
Navigation	NO	NO	NO						NO		
CO₂ emissions from biomass	20738.99								20738.99		
CO₂ captured	NO								NO		
Indirect CO₂⁽²⁾	570.09										
Total CO₂ equivalent emissions without land use, land-use change and forestry									115674.85	56541.92	64297.85
Total CO₂ equivalent emissions with land use, land-use change and forestry									120839.77		
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry									116244.94	0	0
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry									121409.86		

⁽¹⁾ For carbon dioxide (CO₂) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always

⁽²⁾ For Member States that report indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽³⁾ CO₂ emissions from civil aviation are treated as zero for effort sharing purposes.

⁽⁴⁾ Where applicable: please clarify the geographical scope

5.6 Germany (submitted by member state)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories

Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999

Year 2023

Submission 2022

Country Germany

Geographical scope⁽⁴⁾

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total	CO ₂ equivalent (Gg)	
										ETS	non-ETS
CO ₂ equivalent (kt)											
Total (net emissions)⁽¹⁾	657037.49	51449.21	25268.44	7790.11	166.09	1931.84	142.18	12.88	743798.24		
1. Energy	622502.42	6402.76	4278.36						633183.54	307 847	325 337
A. Fuel combustion (sectoral approach)	620704.19	4421.45	4277.50						629403.14	307 398	322 005
1. Energy industries	246619.48	2619.01	1812.79						251051.29	219 435	31 616
2. Manufacturing industries and construction	110516.07	297.50	684.31						111497.89	86 188	25 309
3. Transport (3)	147263.00	245.62	1378.48						148887.11	1 241	147 646
4. Other sectors	115450.47	1257.73	398.63						117106.83	452	116 655
5. Other	855.16	1.59	3.28						860.03	82	778
B. Fugitive emissions from fuels	1798.23	1981.31	0.86						3780.40	449	3 332
1. Solid fuels	598.56	151.39	NA						749.95	IE	750
2. Oil and natural gas	1199.67	1829.92	0.86						3030.45	449	3 030
C. CO ₂ transport and storage	NO								NO	NO	
2. Industrial processes and product use	41411.78	583.43	619.18	7790.11	166.09	1931.84	142.18	12.88	52657.49	46 235	6 422
A. Mineral industry	18871.61								18871.61	18 344	527
B. Chemical industry	4280.10	554.64	356.93	IE	IE	IE	IE	IE	5191.66	2 675	2 516
C. Metal industry	16203.43	6.95	11.20	IE	IE	IE	IE	IE	16221.58	25 216	-8 994
D. Non-energy products from fuels and solvent use	2056.65	NA	1.35						2058.00	NA	NA
E. Electronic Industry				IE	IE	IE	IE	IE	IE	NA	NA
F. Product uses as ODS substitutes				IE	IE	IE	IE	IE	IE	NA	NA
G. Other product manufacture and use	NA	21.84	249.70	IE	IE	IE	IE	IE	271.54	NA	NA
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3. Agriculture	2540.20	34320.97	18620.86						55482.03		
A. Enteric fermentation		26182.58							26182.58		
B. Manure management		6638.18	2323.25						8961.43		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NA	16070.24						16070.24		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		NO	NO						NO		
G. Liming	2005.36								2005.36		
H. Urea application	370.13								370.13		
I. Other carbon-containing fertilizers	164.71								164.71		
J. Other	NA	1500.21	227.37						1727.58		
4. Land use, land-use change and forestry⁽¹⁾	-9416.91	6435.50	1165.24						-1816.16		
A. Forest land	-43612.81	25.68	434.86						-43152.28		
B. Cropland	15284.36	93.23	426.54						15804.13		
C. Grassland	22101.58	914.62	34.61						23050.81		
D. Wetlands	4597.21	5373.52	38.96						10009.69		
E. Settlements	864.03	28.45	230.28						1122.77		
F. Other land	NO	NO	NO						NO		
G. Harvested wood products	-8651.28								-8651.28		
H. Other	NO	NO	NO						NO		
5. Waste	0.00	3706.56	584.79						4291.35		
A. Solid waste disposal	NA	2370.37							2370.37		
B. Biological treatment of solid waste		787.38	183.67						971.04		
C. Incineration and open burning of waste	NO	NO	NO						NO		
D. Waste water treatment and discharge		546.22	372.62						918.84		
E. Other	NE	2.59	28.50						31.10		
6. Other (as specified in summary 1.A)	NO	NO	NO	NO	NO	NO	NO	NO	NO		
Memo items:											
International bunkers	30559.85	4.12	270.44						30834.40		
Aviation	26802.59	3.02	225.11						27030.73		
Navigation	3757.25	1.09	45.32						3803.67		
CO ₂ emissions from biomass	111271.09								111271.09		
CO ₂ captured	NO								NO		
Indirect CO ₂ ⁽²⁾	NO								NO		
Total CO₂ equivalent emissions without land use, land-use change and forestry									745614.40		
Total CO₂ equivalent emissions with land use, land-use change and forestry									743798.24		
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry											
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry											

⁽¹⁾ For carbon dioxide (CO₂) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and

⁽²⁾ For Member States that report indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽³⁾ CO₂ emissions from civil aviation are treated as zero for effort sharing purposes.

⁽⁴⁾ Where applicable: please clarify the geographical scope

Brief description of the key drivers underpinning the increase or decrease in GHG emissions in x-1 (proxy) compared to x-2 (inventory). If this information is publicly available please include the hyperlink to the relevant website. Information on the uncertainties associated with the estimations for the LULUCF sector may also be provided.

Please see our press release: <https://www.umweltbundesamt.de/en/press/pressinformation/uba-forecast-2022-greenhouse-gas-emissions-down-19>

5.7 Denmark (submitted by member state)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories

Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999

Year 2023
Submission 2022
Country Denmark

Geographical scope⁽⁴⁾

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total	ETS	non-ETS
										CO ₂ equivalent (kt)	
Total (net emissions)⁽¹⁾	29070.01	8587.13	5112.68	281.56	0.01	13.42	NA	NA	43064.80		
1. Energy	27370.81	354.05	312.10						28036.96	10 111	17 926
A. Fuel combustion (sectoral approach)	27362.97	292.90	312.05						27967.93	10 105	17 863
1. Energy industries	7876.82	127.04	73.18						8077.04	7 833	244
2. Manufacturing industries and construction	3657.60	21.92	54.35						3733.87	2 261	1 473
3. Transport (3)	12084.90	9.86	117.34						12212.10	0	12 212
4. Other sectors	3525.06	133.82	64.98						3723.86	10	3 714
5. Other	218.58	0.26	2.20						221.04	0	221
B. Fugitive emissions from fuels	7.84	61.14	0.05						69.03	6	63
1. Solid fuels	NA	NA	NA						NA	NA	NA
2. Oil and natural gas	7.84	61.14	0.05						69.03	6	63
C. CO ₂ transport and storage	NO								NO	NA	NA
2. Industrial processes and product use	1401.93	3.27	18.84	281.56	0.01	13.42	NA	NA	1719.02	1 158	561
A. Mineral industry	1222.40								1222.40	1 158	64
B. Chemical industry	1.23	NA	NA	NA	NA	NA	NA	NA	1.23	0	1
C. Metal industry	0.07	NO	NO	NO	NO	NO	NO	NO	0.07	0	0
D. Non-energy products from fuels and solvent use	178.01	0.52	0.14						178.68	0	179
E. Electronic industry				NO	NO	NO	NO	NO	0.00	0	0
F. Product uses as ODS substitutes				281.56	0.01	NA	NA	NA	281.56	0	282
G. Other product manufacture and use	0.22	2.75	18.69	NA	NA	13.42	NA	NA	35.07	0	35
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3. Agriculture	275.66	7209.11	4589.62						12074.39		
A. Enteric fermentation		4142.42							4142.42		
B. Manure management		3063.94	595.77						3659.71		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NE	3993.44						3993.44		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		2.75	0.41						3.16		
G. Liming	271.02								271.02		
H. Urea application	1.19								1.19		
I. Other carbon-containing fertilizers	3.45								3.45		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry⁽¹⁾	2089.06	290.67	40.33						2420.06		
A. Forest land	-2966.90	24.43	21.75						-2920.72		
B. Cropland	2653.98	102.81	2.32						2759.10		
C. Grassland	2186.83	128.26	0.16						2315.24		
D. Wetlands	54.41	35.17	0.10						89.68		
E. Settlements	216.62	NA	16.01						232.63		
F. Other land	NA	NA	NA						NA		
G. Harvested wood products	-55.87								-55.87		
H. Other	NO	NO	NO						NO		
5. Waste	21.61	1020.71	192.12						1234.44		
A. Solid waste disposal	NO	433.54							433.54		
B. Biological treatment of solid waste		496.77	65.20						561.97		
C. Incineration and open burning of waste	NA	0.02	0.25						0.27		
D. Waste water treatment and discharge		87.46	126.68						214.13		
E. Other	21.61	2.92	NA						24.53		
6. Other (as specified in summary 1.A)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo items:											
International bunkers	NE	NE	NE						NE		
Aviation	NE	NE	NE						NE		
Navigation	NE	NE	NE						NE		
CO₂ emissions from biomass	NE								NE		
CO₂ captured	NO								NO		
Indirect CO₂⁽²⁾	245.42										
Total CO₂ equivalent emissions without land use, land-use change and forestry									40644.74	11269.61	29375.13
Total CO₂ equivalent emissions with land use, land-use change and forestry									43064.80		
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry									40890.16	11269.61	29620.55
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry									43310.22		

⁽¹⁾ For carbon dioxide (CO₂) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always

⁽²⁾ For Member States that report indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽³⁾ CO₂ emissions from civil aviation are treated as zero for effort sharing purposes.

⁽⁴⁾ Where applicable: please clarify the geographical scope

5.8 Estonia (submitted by member state)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories

Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999

Year 2022
Submission 2023
Country Estonia

Geographical scope⁽⁴⁾

GREENHOUSE GAS SOURCE AND	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total	ETS	non-ETS
SINK CATEGORIES										CO ₂ equivalent (Gg)	
CO ₂ equivalent (kt)										CO ₂ equivalent (Gg)	
Total (net emissions)⁽¹⁾	14689.15	1209.33	1136.84	208.32	NO	3.09	NO	NO	17246.73		
1. Energy	12045.73	61.50	57.12						12164.34	8 380	3 785
A. Fuel combustion (sectoral approach)	12045.70	41.06	57.12						12143.88	8 380	3 764
1. Energy industries	8571.42	17.72	28.44						8617.57	8 287	331
2. Manufacturing industries and construction	460.32	1.24	1.79						463.35	86	377
3. Transport (3)	2323.48	3.13	20.37						2346.98	5	2 342
4. Other sectors	690.48	18.98	6.52						715.98	2	714
5. Other	NO	NO	NO						NO	NO	NO
B. Fugitive emissions from fuels	0.03	20.43	NO						20.46	NO	20
1. Solid fuels	NO	NO	NO						NO	NO	NO
2. Oil and natural gas	0.03	20.43	NO						20.46	NO	20
C. CO ₂ transport and storage	NO								NO	NO	NO
2. Industrial processes and product use	71.69	NO	3.03	208.32	NO	3.09	NO	NO	286.14	33	253
A. Mineral industry	32.70								32.70	33	0
B. Chemical industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C. Metal industry	2.62	NO	NO	NO	NO	NO	NO	NO	2.62	NO	3
D. Non-energy products from fuels and solvent use	36.37	NO	NO						36.37	NO	36
E. Electronic industry				NO	NO	NO	NO	NO	NO	NO	NO
F. Product uses as ODS substitutes				208.32	NO	NO	NO	NO	208.32	NO	208
G. Other product manufacture and use	NO	NO	3.03		NO	3.09	NO	NO	6.12	NO	6
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Agriculture	36.17	803.75	770.96						1610.88	NO	1 610.88
A. Enteric fermentation		622.48							622.48		
B. Manure management		181.27	67.01						248.28		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NO	703.95						703.95		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		NO	NO						NO		
G. Liming	36.04								36.04		
H. Urea application	0.13								0.13		
I. Other carbon-containing fertilizers	NO								NO		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry⁽¹⁾	2535.17	75.31	266.85						2877.33		
A. Forest land	1083.24	75.19	242.44						1400.87		
B. Cropland	579.80	NO	6.07						585.87		
C. Grassland	-27.27	0.01	0.00						-27.26		
D. Wetlands	1444.11	0.11	2.02						1446.24		
E. Settlements	309.02	NO	10.08						319.10		
F. Other land	95.32	NO	6.23						101.55		
G. Harvested wood products	-949.05								-949.05		
H. Other	NO	NO	NO						NO		
5. Waste	0.39	268.78	38.87						308.03	NO	308.03
A. Solid waste disposal	NO	188.00							188.00		
B. Biological treatment of solid waste		19.15	10.88						30.03		
C. Incineration and open burning of waste	0.39	0.21	0.03						0.63		
D. Waste water treatment and discharge		61.42	27.96						89.38		
E. Other	NO	NO	NO						NO		
6. Other (as specified in summary 1.A)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo items:											
International bunkers	1028.04	2.24	5.71						1035.99		
Aviation	159.99	0.00	0.00						160.00		
Navigation	868.05	2.24	5.70						875.99		
CO₂ emissions from biomass	5493.87								5493.87		
CO₂ captured	NO								NO		
Indirect CO₂⁽²⁾	IE										
Total CO₂ equivalent emissions without land use, land-use change and forestry									14369.40	8407.46	5961.94
Total CO₂ equivalent emissions with land use, land-use change and forestry									17246.73		
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry									14369.40		
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry									17246.73		

⁽¹⁾ For carbon dioxide (CO₂) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always

⁽²⁾ For Member States that report indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽³⁾ CO₂ emissions from civil aviation are treated as zero for effort sharing purposes.

⁽⁴⁾ Where applicable: please clarify the geographical scope

5.9 Spain (submitted by member state)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories

Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999

Year 2023
Submission 2022
Country Spain

Geographical scope⁽⁴⁾

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total	ETS	non-ETS
										CO ₂ equivalent (kt)	
Total (net emissions)⁽¹⁾	191765.29	40869.13	10710.67	4122.31	12.50	240.20	1553.36	NO	249273.46		
1. Energy	220102.07	2204.86	1744.13						224051.06	85 796	138 255
A. Fuel combustion (sectoral approach)	216588.04	1987.16	1744.12						220319.32	82 800	137 519
1. Energy industries	54692.63	87.10	515.47						55295.19	51 310	3 985
2. Manufacturing industries and construction	38502.45	940.44	166.24						39609.13	28 390	11 219
3. Transport (3)	88279.50	130.80	843.79						89254.09	2 946	86 308
4. Other sectors	34716.79	828.52	215.56						35760.87	154	35 607
5. Other	396.68	0.30	3.06						400.05	0	400
B. Fugitive emissions from fuels	3514.03	217.69	0.02						3731.74	2 996	736
1. Solid fuels	101.26	26.59	NA						127.85	0	128
2. Oil and natural gas	3412.78	191.10	0.02						3603.89	2 996	608
C. CO ₂ transport and storage	NO								NO	NO	NO
2. Industrial processes and product use	16099.74	122.99	854.77	4122.31	12.50	240.20	1553.36	NO	23005.88	13 473	9 533
A. Mineral industry	10240.36								10240.36	10 026	214
B. Chemical industry	3206.43	104.37	307.58	NO	NO	NO	NO	NO	3618.39	1 511	2 108
C. Metal industry	2270.75	18.62	NA	NO	0.97	NO	NO	NA	2290.33	1 936	354
D. Non-energy products from fuels and solvent use	382.21	NA	NA						382.21	0	382
E. Electronic industry				NO	NO	NO	NO	NO	NO	NO	NO
F. Product uses as ODS substitutes				4122.31	11.54	NO	1553.36	NO	5687.21	0	5 687
G. Other product manufacture and use	NO	NO	547.12	NO	NO	240.20	NO	NO	787.32	0	787
H. Other	IE	IE	0.07	NA	NA	NA	NA	NA	0.07	0	0
3. Agriculture	434.29	25406.86	6499.01						32340.16		
A. Enteric fermentation		16685.00							16685.00		
B. Manure management		8238.25	1566.63						9804.88		
C. Rice cultivation		462.91							462.91		
D. Agricultural soils		IE	4927.30						4927.30		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		20.71	5.08						25.79		
G. Liming	30.51								30.51		
H. Urea application	356.69								356.69		
I. Other carbon-containing fertilizers	47.10								47.10		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry⁽¹⁾	-44870.82	144.30	221.49						-44505.03		
A. Forest land	-39796.66	76.08	41.13						-39679.45		
B. Cropland	-3531.51	10.40	53.33						-3467.78		
C. Grassland	-1717.05	57.82	54.96						-1604.28		
D. Wetlands	-78.53	0.00	0.03						-78.50		
E. Settlements	1729.84	NO	72.05						1801.89		
F. Other land	5.94	NO	0.35						NO		
G. Harvested wood products	-1476.91								-1476.91		
H. Other	NO	NO	NO						NO		
5. Waste	NO	12990.12	1391.26						14381.38		
A. Solid waste disposal	NO	10439.95							10439.95		
B. Biological treatment of solid waste		381.48	198.14						579.62		
C. Incineration and open burning of waste	NO	381.96	339.45						721.41		
D. Waste water treatment and discharge		1786.16	853.67						2639.83		
E. Other	NA	0.57	NA						0.57		
6. Other (as specified in summary 1.A)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Memo items:											
International bunkers									44018.60		
Aviation									14925.55		
Navigation									29093.05		
CO₂ emissions from biomass									24586.68		
CO₂ captured									NO		
Indirect CO₂⁽²⁾											
Total CO₂ equivalent emissions without land use, land-use change and forestry									293778.49	99269.37	194509.1
Total CO₂ equivalent emissions with land use, land-use change and forestry									249273.46		
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry									NA		
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry									NA		

⁽¹⁾ For carbon dioxide (CO₂) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always

⁽²⁾ For Member States that report indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽³⁾ CO₂ emissions from civil aviation are treated as zero for effort sharing purposes.

⁽⁴⁾ Where applicable: please clarify the geographical scope

5.10 Finland (submitted by member state)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories

Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999

Year 2023

Submission 2022

Country Finland

Geographical scope⁽⁴⁾

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total	CO ₂ equivalent (Gg)	
										ETS	non-ETS
CO ₂ equivalent (kt)											
Total (net emissions)⁽¹⁾	32564.58	5517.85	5925.29	764.13	1.57	22.85	NO	NO	44796.27		
1. Energy	32211.72	297.83	479.45						32989.01	15 637	17 235
A. Fuel combustion (sectoral approach)	32166.24	280.00	479.00						32925.24		
1. Energy industries	13437.00	37.00	233.00						13707.00		
2. Manufacturing industries and construction	5240.00	22.00	119.00						5381.00		
3. Transport (3)	9870.00	12.00	75.00						9957.00		
4. Other sectors	2930.00	206.00	48.00						3184.00		
5. Other	689.24	3.00	4.00						696.24		
B. Fugitive emissions from fuels	45.48	17.83	0.45						63.77		
1. Solid fuels	NO	NO	NO						NO		
2. Oil and natural gas	45.48	17.83	0.45						63.77		
C. CO ₂ transport and storage	NO								NO		
2. Industrial processes and product use	3749.80	1.74	175.80	764.13	1.57	22.85	NO	NO	4715.89	3 380	1 336
A. Mineral industry	941.28								941.28		
B. Chemical industry	995.08	1.57	144.81	NO	NO	NO	NO	NO	1141.46		
C. Metal industry	1659.73	0.00	NO	NO	NO	NO	NO	NO	1659.73		
D. Non-energy products from fuels and solvent use	153.71	0.16	0.78						154.65		
E. Electronic Industry				NO	NO	NO	NO	NO	NO		
F. Product uses as ODS substitutes				759.50	0.64	NO	NO	NO	760.14		
G. Other product manufacture and use	NO	NO	30.21	NO	NO	16.85	NO	NO	47.06		
H. Other	NO	NO	NO	4.63	0.93	6.01	NO	NO	11.57		
3. Agriculture	201.42	2734.84	3387.14						6323.39		
A. Enteric fermentation		2255.97							2255.97		
B. Manure management		478.87	233.19						712.05		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NE	3153.96						3153.96		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		NO	NO						0.00		
G. Liming	200.21								200.21		
H. Urea application	1.21								1.21		
I. Other carbon-containing fertilizers	NA								NA		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry⁽¹⁾	-3598.36	851.19	1784.06						-963.11		
A. Forest land	-12561.94	776.46	1677.38						-10108.10		
B. Cropland	8848.49	IE	6.78						8855.28		
C. Grassland	702.00	0.02	0.62						702.64		
D. Wetlands	2087.41	74.71	80.91						2243.03		
E. Settlements	972.08	NE	16.70						988.77		
F. Other land	NO	NA	NA						NO		
G. Harvested wood products	-3646.40								-3646.40		
H. Other	NA	NA	NA						NA		
5. Waste	NO	1632.25	98.83						1731.08		
A. Solid waste disposal	NO	1383.11							1383.11		
B. Biological treatment of solid waste		73.75	33.77						107.52		
C. Incineration and open burning of waste	NO	NO	NO						NO		
D. Waste water treatment and discharge		175.39	65.06						240.45		
E. Other	NO	NO	NO						NO		
6. Other (as specified in summary 1.A)	NO	NO	NO	NO	NO	NO	NO	NO	NO		
Memo items:											
International bunkers	2706.78	2.58	12.75						2722.11		
Aviation	1629.53	0.11	5.97						1635.62		
Navigation	1077.25	2.46	6.78						1086.49		
CO₂ emissions from biomass	40900.34								40900.34		
CO₂ captured	48.76								48.76		
Indirect CO₂⁽²⁾	56.56								56.56		
Total CO₂ equivalent emissions without land use, land-use change and forestry									45759.38	19017.313	26624.82325
Total CO₂ equivalent emissions with land use, land-use change and forestry									44796.27		
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry									45815.94	19017.313	26681.38535
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry									44852.83		

⁽¹⁾ For carbon dioxide (CO₂) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and

⁽²⁾ For Member States that re-allocate indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽³⁾ CO₂ emissions from civil aviation are treated as zero for effort sharing purposes.

⁽⁴⁾ Where applicable: please clarify the geographical scope

Brief description of the key drivers underpinning the increase or decrease in GHG emissions in x-1 (proxy) compared to x-2 (inventory). If this information is publicly available please include the hyperlink to the relevant website. Information on the uncertainties associated with the estimations for the LULUCF sector may also be provided.

According to Statistics Finland's instant preliminary data, total greenhouse gas emissions without the land use, land use change and forestry (LULUCF) sector in 2022 amounted to 45.8 million tonnes of CO₂ equivalent, which was 2.0 million tonnes less than in 2021. The land use sector (LULUCF) was a net sink of -1.0 million tonnes of CO₂ equivalent.

The energy sector was the largest source of greenhouse gas emissions in Finland, accounting for 72 per cent (33.0 million tonnes of CO₂ equivalent) of total emissions in 2022. The sector's emissions decreased by 1.3 million tonnes of CO₂ equivalent from the previous year. The decrease was particularly due to the fallen consumption of natural gas, which was caused by the high price of natural gas and the ending of imports from Russia. This decreased emissions by 2.1 million tonnes of CO₂ equivalent. On the other hand, the growth in the consumption of hard coal increased emissions by 0.8 million tonnes of CO₂ equivalent. Emissions from transport remained on level with the previous year.

Emissions in the effort sharing sector amounted to around 26.6 million tonnes of CO₂ equivalent in 2022, and they fell by three per cent from the previous year. Emissions included in the EU's Emissions Trading System grew by six per cent from the previous year, being 19.0 million tonnes of CO₂ equivalent.

According to the instant preliminary data, the LULUCF sector was a net sink of -1.0 million tonnes of CO₂ equivalent in 2022. The sum of emissions and removals in the forest land use category, or the net sink, was around -10.1 million tonnes of CO₂ equivalent, which was 21 per cent higher than in the year before because of a two-percent reduction in felling volumes. The combined net emissions of mineral and peat soil in forest land grew by around 1.2 million carbon dioxide tonnes, because reduced fellings decreased the forest litter yield of the growing stock in the soil and the warmer year than usual in 2022 increased the decomposition of organic matter. Emissions from cropland increased by four percent compared to 2021. Lower than average amount of agricultural residues ending up in the soil during the preceding weak crop years and warmer than usual summer months increased emissions from agricultural mineral soil in 2022.

For more information on trends, see <https://stat.fi/en/publication/cl8a46vp7vq8n0bvvyqi4724gw>

Quantitative assessment of the UC of the approximated LULUCF estimates were not carried out. Compared to UCs of GHGI estimates, the UCs of the approximated LULUCF estimates can be assessed to be higher because preliminary statistics are used as activity data. In the GHGI, more up-to-date tree data can be used. Other reasons to the higher UCs of the approximated LULUCF estimates are:

- For carbon stock changes from soil in cropland, preliminary statistics were used; for activity data, the 2021 areas were employed including the areas of organic soils under different land-use categories; for harvested wood products, the 2021 production statistics were used.
- For emissions and removals in grassland, wetlands, settlements, all land-use changes and non-CO₂ emissions, the estimates for 2021 were used.

Note 1: The preliminary estimate for transport includes a preliminary estimate also for domestic aviation: 117.24 kt CO₂. Please use this estimate when publishing data on emissions

5.11 France (submitted by member state)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories

Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999

Year 2023
Submission 2022
Country France
Geographical scope⁽⁴⁾

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total	ETS	non-ETS
										CO ₂ equivalent (kt)	
Total (net emissions)⁽¹⁾	288138.81	62323.86	26929.55	8515.25	394.00	537.91	NO	13.12	386852.48	84598.59	302253.89
1. Energy	274692.62	2832.91	3084.74						280610.27	52 227	228 383
A. Fuel combustion (sectoral approach)	272724.02	1975.26	3076.41						277775.69	50 665	227 110
1. Energy industries	41033.34	62.25	225.71						41321.29	50 665	13 191
2. Manufacturing industries and construction	40978.35	110.83	470.31						41559.49	21 920	19 639
3. Transport (3)	125901.96	200.22	1149.17						127251.35	225	127 026
4. Other sectors	62313.85	1599.16	1216.89						65129.89	390	64 740
5. Other	2496.52	2.81	14.33						2513.66	NO	2 514
B. Fugitive emissions from fuels	1968.60	857.65	8.33						2834.58	1 562	1 273
1. Solid fuels	NO	9.58	NO						9.58	NO	10
2. Oil and natural gas	1968.60	848.07	8.33						2825.00	1 562	1 263
C. CO ₂ transport and storage	NO								NO	NO	NO
2. Industrial processes and product use	28923.76	65.33	478.28	8515.25	394.00	537.91	NO	13.12	38927.64	32 371	6 556
A. Mineral industry	9365.83								9365.83	8 866	500
B. Chemical industry	6473.02	31.03	357.04	35.17	NO	166.28	NO	NO	7062.53	6 207	856
C. Metal industry	11120.04	34.00	NO	NO	34.60	7.90	NO	NA	11196.54	17 234	-6 038
D. Non-energy products from fuels and solvent use	1391.75	0.30	1.93						1393.98	52	1 342
E. Electronic industry				6.28	65.62	5.31	NO	13.12	90.33	NO	90
F. Product uses as ODS substitutes				8472.81	NA	NA	NA	NA	8472.81	NO	8 473
G. Other product manufacture and use	573.01	NO	119.31	0.99	293.78	358.42	NA	NA	1345.51	12	1 333
H. Other	0.12	NO	NO	NA	NA	NA	NA	NA	0.12	0	0
3. Agriculture	1955.52	42568.98	21622.99						66147.48		
A. Enteric fermentation		36238.28							36238.28		
B. Manure management		6266.42	2947.21						9213.63		
C. Rice cultivation		36.15							36.15		
D. Agricultural soils		NO	18668.87						18668.87		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		28.13	6.90						35.03		
G. Liming	780.61								780.61		
H. Urea application	1014.76								1014.76		
I. Other carbon-containing fertilizers	160.14								160.14		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry⁽¹⁾	-19133.38	1123.89	1090.67						-16918.82		
A. Forest land	-28388.97	520.39	271.75						-27596.83		
B. Cropland	7020.76	137.21	509.62						7667.60		
C. Grassland	-1579.31	173.97	60.55						-1344.79		
D. Wetlands	494.90	6.92	20.08						521.90		
E. Settlements	4564.41	40.67	224.24						4829.33		
F. Other land	87.78	0.56	4.42						92.77		
G. Harvested wood products	-1367.94								-1367.94		
H. Other	35.00	244.16	NA						279.16		
5. Waste	1700.28	15732.74	652.87						18085.90		
A. Solid waste disposal	NA	12254.99							12254.99		
B. Biological treatment of solid waste		838.30	220.03						1058.33		
C. Incineration and open burning of waste	1700.28	103.59	91.97						1895.84		
D. Waste water treatment and discharge		2535.86	340.87						2876.74		
E. Other	NO	NO	NO						NO		
6. Other (as specified in summary 1.A)	NO	NO	NO	NO	NO	NO	NO	NO	NO		
Memo items:											
International bunkers	15228.95	396.14	409.13						16034.22		
Aviation	11381.34	48.30	309.75						11739.38		
Navigation	3847.62	347.84	99.38						4294.84		
CO₂ emissions from biomass	58495.94								58495.94		
CO₂ captured	NO								NO		
Indirect CO₂⁽²⁾	NO								NO		
Total CO₂ equivalent emissions without land use, land-use change and forestry									403771.29	84598.59	319172.7
Total CO₂ equivalent emissions with land use, land-use change and forestry									386852.48		
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry									NA		
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry									NA		

⁽¹⁾ For carbon dioxide (CO₂) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always

⁽²⁾ For Member States that report indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽³⁾ CO₂ emissions from civil aviation are treated as zero for effort sharing purposes.

⁽⁴⁾ Where applicable: please clarify the geographical scope

5.12 Greece (submitted by member state)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories

Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999

Year 2023

Submission 2022

Country Greece

Geographical scope⁽⁴⁾

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total	ETS	non-ETS
										CO ₂ equivalent (Gg)	
Total (net emissions)⁽¹⁾	51252.25	11523.97	3984.36	4600.00	88.06	5.00	NO	NO	71668.64		
1. Energy	52227.07	763.57	476.41						53467.05		
A. Fuel combustion (sectoral approach)	52222.07	333.57	476.31						53031.95		
1. Energy industries	24297.33	7.78	73.43						24378.54	24 041	338
2. Manufacturing industries and construction	4034.74	5.78	52.62						4093.14	3 103	990
3. Transport (3)	18150.00	90.00	270.00						18510.00		18 510
4. Other sectors	5700.00	230.00	80.00						6010.00		6 010
5. Other	40.00	0.01	0.25						40.26		40
B. Fugitive emissions from fuels	5.00	430.00	0.10						435.10		
1. Solid fuels	NO	270.00	NA						270.00		270
2. Oil and natural gas	5.00	160.00	0.10						165.10		165
C. CO ₂ transport and storage	NO								NO		
2. Industrial processes and product use	4513.18	0.30	6.64	4600.00	88.06	5.00	NO	NO	9428.18		
A. Mineral industry	3352.01								3352.01	3 340	12
B. Chemical industry	399.87	NO	6.64	NO	NO	NA	NO	NA	406.51		407
C. Metal industry	671.30	0.30	NO	NO	63.06	NO	NO	NO	734.65	626	109
D. Non-energy products from fuels and solvent use	90.00	NA	NA						90.00		90
E. Electronic Industry				NO	NO	NO	NO	NO	NO		
F. Product uses as ODS substitutes				4600.00	25.00	NO	NO	NO	4625.00		4 625
G. Other product manufacture and use	90.00	NA	125.00	NO	NO	5.00	NO	NO	220.00		220
H. Other	NA	NA	NA	NO	NO	NO	NO	NO	NA		
3. Agriculture	35.00	5000.00	3175.00						8210.00		
A. Enteric fermentation		4100.00							4100.00		4 100.00
B. Manure management		730.00	270.00						1000.00		1 000.00
C. Rice cultivation		150.00							150.00		150.00
D. Agricultural soils		NE	2900.00						2900.00		2 900.00
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		20.00	5.00						25.00		25.00
G. Liming	NO								NO		
H. Urea application	35.00								35.00		35.00
I. Other carbon-containing fertilizers	NO								NO		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry⁽¹⁾	-5528.00	165.00	40.32						-5322.68		
A. Forest land	-2400.00	150.00	25.00						-2225.00		
B. Cropland	-1200.00	NO	1.30						-1198.70		
C. Grassland	-2000.00	15.00	1.00						-1984.00		
D. Wetlands	2.00	NO	0.02						2.02		
E. Settlements	120.00	NO	7.00						127.00		
F. Other land	100.00	NO	6.00						106.00		
G. Harvested wood products	-150.00								-150.00		
H. Other	NO	NO	NO						NO		
5. Waste	5.00	5595.10	286.00						5886.10		
A. Solid waste disposal	NO	4200.00							4200.00		4 200.00
B. Biological treatment of solid waste		95.00	15.00						110.00		110.00
C. Incineration and open burning of waste	5.00	0.10	1.00						6.10		6.10
D. Waste water treatment and discharge		1300.00	270.00						1570.00		1 570.00
E. Other	NO	NO	NO						NO		
6. Other (as specified in summary 1.A)	NO	NO	NO	NO	NO	NO	NO	NO	NO		
Memo items:											
International bunkers	9000.00	15.50	190.00						9205.50		
Aviation	3000.00	0.50	20.00						3020.50		
Navigation	6000.00	15.00	170.00						6185.00		
CO₂ emissions from biomass	NE								NE		
CO₂ captured	NO								NO		
Indirect CO₂⁽²⁾											
Total CO₂ equivalent emissions without land use, land-use change and forestry									76991.32	31515.734	45475.58737
Total CO₂ equivalent emissions with land use, land-use change and forestry									71668.64		
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry									NO		
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry									NO		

⁽¹⁾ For carbon dioxide (CO₂) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and

⁽²⁾ For Member States that report indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽³⁾ CO₂ emissions from civil aviation are treated as zero for effort sharing purposes.

⁽⁴⁾ Where applicable: please clarify the geographical scope

5.13 Croatia (submitted by member state)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories

Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999

Year 2023
Submission 2022
Country Croatia

Geographical scope⁽⁴⁾

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total	ETS	non-ETS
Total (net emissions)⁽¹⁾	16377.66	3815.54	1420.55	1813.58	NA	10.46	NA	NA	NE	6455.40	10 518
1. Energy	14842.10	577.35	202.89						15622.34	5 104	10 081
A. Fuel combustion (sectoral approach)	14556.40	425.86	202.77						15185.04	5 104	10 081
1. Energy industries	3494.26	12.26	23.77						3530.29	3 339	191
2. Manufacturing industries and construction	2322.82	4.99	6.82						2334.64	1 765	569
3. Transport (3)	5890.65	9.05	57.93						5957.63	NO	5 958
4. Other sectors	2848.67	399.56	114.25						3362.48	NO	3 362
5. Other	NO	NO	NO						NO	NO	NO
B. Fugitive emissions from fuels	285.70	151.49	0.12						437.31	NO	437
1. Solid fuels	NO	NO	NO						NO	NO	NO
2. Oil and natural gas	285.70	151.49	0.12						437.31	NO	437
C. CO ₂ transport and storage	NA								NA	NO	NO
2. Industrial processes and product use	1430.24	NA	29.16	1813.58	NA	10.46	NA	NA	3283.43	1 351	1 932
A. Mineral industry	1255.49								1255.49	1 255	
B. Chemical industry	70.01	NA	12.22	NA	NA	NA	NA	NA	82.23	82	
C. Metal industry	13.39	NA	NA	NA	NA	NA	NA	NA	13.39	13	
D. Non-energy products from fuels and solvent use	91.35	NA	NA						91.35	NO	91
E. Electronic industry				NO	NO	NO	NO	NO	NO	NO	NO
F. Product uses as ODS substitutes				1813.58	NO	NA	NA	NA	1813.58	NO	1 814
G. Other product manufacture and use	NA	NA	16.94	NA	NA	10.46	NA	NA	27.40	NO	27
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NO	NO
3. Agriculture	105.32	1438.69	1100.67						2644.68		
A. Enteric fermentation		1043.68							1043.68		
B. Manure management		395.01	104.80						499.81		
C. Rice cultivation		NA							0.00		
D. Agricultural soils		NA	995.87						995.87		
E. Prescribed burning of savannas		NA	NA						0.00		
F. Field burning of agricultural residues		NA	NA						0.00		
G. Liming	13.98								13.98		
H. Urea application	91.34								91.34		
I. Other carbon-containing fertilizers	NA								NA		
J. Other	NA	NA	NA						NA		
4. Land use, land-use change and forestry⁽¹⁾	NE	NE	NE						NE		
A. Forest land	NE	NE	NE						NE		
B. Cropland	NE	NE	NE						NE		
C. Grassland	NE	NE	NE						NE		
D. Wetlands	NE	NE	NE						NE		
E. Settlements	NE	NE	NE						NE		
F. Other land	NE	NE	NE						NE		
G. Harvested wood products	NE								NE		
H. Other	NE	NE	NE						NE		
5. Waste	NO	1799.51	87.83						1887.34		
A. Solid waste disposal	NA	1278.35							1278.35		
B. Biological treatment of solid waste		21.85	7.87						29.73		
C. Incineration and open burning of waste	NO	6.55	1.43						7.98		
D. Waste water treatment and discharge		492.75	78.53						571.28		
E. Other	NO	NO	NO						NO		
6. Other (as specified in summary 1.A)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo items:											
International bunkers	372.76	0.25	2.71						375.73		
Aviation	298.31	0.06	2.18						300.55		
Navigation	74.45	0.20	0.53						75.18		
CO₂ emissions from biomass	7049.25								7049.25		
CO₂ captured	NO								NO		
Indirect CO₂⁽²⁾	NO								NO		
Total CO₂ equivalent emissions without land use, land-use change and forestry									23437.80	6455.403	16982.39
Total CO₂ equivalent emissions with land use, land-use change and forestry									NE		
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry									NA	NA	
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry									NA		

⁽¹⁾ For carbon dioxide (CO₂) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always

⁽²⁾ For Member States that report indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽³⁾ CO₂ emissions from civil aviation are treated as zero for effort sharing purposes.

⁽⁴⁾ Where applicable: please clarify the geographical scope

Brief description of the key drivers underpinning the increase or decrease in GHG emissions in x-1 (proxy) compared to x-2 (inventory). If this information is publicly available please include the hyperlink to the relevant website. Information on the uncertainties associated with the estimations for the LULUCF sector may also be provided.

1A1 - 90% of total CO2 emissions is from ETS, according to 2020. It is assumed that the distribution stayed the same in 2021. For CH4 and N2O emissions is assumed that ratio CH4/CO2 and N2O/CO2 in 2022 is the same as for 2021.

1A2 - It is assumed that the distribution stayed the same in 2022 as it was in 2021. For CH4 and N2O emissions is assumed that ratio CH4/CO2 and N2O/CO2 in 2022 is the same as for 2021.

1A3 - Transport, 1A4. Other Sectors, 1B2. Oil and Natural Gas all GHG were extrapolated based on emissions from 2017-2021. [\[1\]](#)

1B2 - all GHG are extrapolated based on emissions from 2017-2021.

2.A-2.G: linear extrapolation based on trend from 2017 to 2021. [\[1\]](#)

2.B.2 - ETS: verified ETS N2O emission (based on measurements), provided by Ministry of economy and sustainable development. [\[1\]](#)

3.A-3.H. linear extrapolation is based on trend from 2017-2021.

5.A.1; 5.A.2 CH4 emissions are assessed by extrapolation, according to emissions trend from 2017 to 2021, due to the lack of the information. [\[1\]](#)

5.B.1 CH4 and N2O emissions are assessed by extrapolation, according to emissions trend from 2017 to 2021, due to the lack of the information. [\[1\]](#)

5.B.2 CH4 emission is assessed by extrapolation, according to emissions trend from 2019 to 2021, due to the lack of the information. [\[1\]](#)

5.C.1 CO2 emission is assessed according to data for 2021 as NO, due to the lack of the information. There was no incineration of clinical waste without energy recovery in 2022. [\[1\]](#)

5.C.2 CH4 and N2O emissions are assessed by extrapolation, according to emissions trend from 2017 to 2021, due to the lack of the information. [\[1\]](#)

5.D.1 CH4 emission is assessed by extrapolation, according to emissions trend from 2017 to 2021, due to the lack of the information. [\[1\]](#)

5.D.1 N2O emission is assessed by extrapolation, according to emissions trend from 2017 to 2021, due to the lack of the information. [\[1\]](#)

5.D.2 CH4 emission is assessed by extrapolation, according to emissions trend from 2017 to 2021, due to the lack of the information. [\[1\]](#)

1A1 - 90% of total CO2 emissions is from ETS, according to 2020. It is assumed that the distribution stayed the same in 2021. For CH4 and N2O emissions is assumed that ratio CH4/CO2 and N2O/CO2 in 2022 is the same as for 2021.

1A2 - It is assumed that the distribution stayed the same in 2022 as it was in 2021. For CH4 and N2O emissions is assumed that ratio CH4/CO2 and N2O/CO2 in 2022 is the same as for 2021.

1A3 - Transport, 1A4. Other Sectors, 1B2. Oil and Natural Gas all GHG were extrapolated based on emissions from 2017-2021. [\[1\]](#)

1B2 - all GHG are extrapolated based on emissions from 2017-2021.

2.A-2.G: linear extrapolation based on trend from 2017 to 2021. [\[1\]](#)

2.B.2 - ETS: verified ETS N2O emission (based on measurements), provided by Ministry of economy and sustainable development. [\[1\]](#)

3.A-3.H. linear extrapolation is based on trend from 2017-2021.

5.A.1; 5.A.2 CH4 emissions are assessed by extrapolation, according to emissions trend from 2017 to 2021, due to the lack of the information. [\[1\]](#)

5.B.1 CH4 and N2O emissions are assessed by extrapolation, according to emissions trend from 2017 to 2021, due to the lack of the information. [\[1\]](#)

5.B.2 CH4 emission is assessed by extrapolation, according to emissions trend from 2019 to 2021, due to the lack of the information. [\[1\]](#)

5.C.1 CO2 emission is assessed according to data for 2021 as NO, due to the lack of the information. There was no incineration of clinical waste without energy recovery in 2022. [\[1\]](#)

5.C.2 CH4 and N2O emissions are assessed by extrapolation, according to emissions trend from 2017 to 2021, due to the lack of the information. [\[1\]](#)

5.D.1 CH4 emission is assessed by extrapolation, according to emissions trend from 2017 to 2021, due to the lack of the information. [\[1\]](#)

5.D.1 N2O emission is assessed by extrapolation, according to emissions trend from 2017 to 2021, due to the lack of the information. [\[1\]](#)

5.D.2 CH4 emission is assessed by extrapolation, according to emissions trend from 2017 to 2021, due to the lack of the information. [\[1\]](#)

5.14 Hungary (submitted by member state)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories

Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999

Year 2023
Submission 2022
Country Hungary

Geographical scope⁽⁴⁾

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total	ETS	non-ETS
										CO ₂ equivalent (kt)	
Total (net emissions)⁽¹⁾	38545.08	9018.31	3731.67	1745.66	1.97	95.57	NO	NO	53138.26	15558.99	37579.27
1. Energy	41278.24	2297.21	298.97						43874.42	12 135	31 740
A. Fuel combustion (sectoral approach)	41137.05	562.03	298.68						41997.75	12 117	29 881
1. Energy industries	10576.13	26.96	44.82						10647.90	10 027	6 21
2. Manufacturing industries and construction	4384.31	15.56	27.41						4427.29	2 015	2 412
3. Transport (3)	14906.82	25.10	149.04						15080.96	43	15 038
4. Other sectors	11170.11	494.29	76.98						11741.38	32	11 709
5. Other	99.68	0.12	0.42						100.22	NO	100
B. Fugitive emissions from fuels	141.19	1735.18	0.30						1876.67	18	1 859
1. Solid fuels	0.02	31.90	0.00						31.92	0	32
2. Oil and natural gas	141.17	1703.28	0.30						1844.75	18	1 827
C. CO ₂ transport and storage	NO								NO	NO	NO
2. Industrial processes and product use	3722.89	41.10	242.46	1745.66	1.97	95.57	NO	NO	5849.66	3 424	2 425
A. Mineral industry	1126.66								1126.66	1 123	3
B. Chemical industry	1856.40	38.45	22.64	NO	NO	NO	NO	NO	1917.48	1 672	245
C. Metal industry	628.41	2.66	NO	NO	NO	NO	NO	NO	631.07	628	3
D. Non-energy products from fuels and solvent use	111.43	NO	NO						111.43	NO	111
E. Electronic industry				NO	NO	NO	NO	NO	NO	NO	NO
F. Product uses as ODS substitutes				1745.66	1.97	NO	NO	NO	1747.63	NO	1 748
G. Other product manufacture and use	NO	NO	219.82	NO	NO	95.57	NO	NO	315.39	NO	315
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Agriculture	209.63	3098.85	3046.69						6355.18		
A. Enteric fermentation		2336.62							2336.62		
B. Manure management		744.41	375.17						1119.58		
C. Rice cultivation		17.58							17.58		
D. Agricultural soils		NA	2671.46						2671.46		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		0.24	0.06						0.30		
G. Liming	3.26								3.26		
H. Urea application	137.51								137.51		
I. Other carbon-containing fertilizers	68.86								68.86		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry⁽¹⁾	-6690.39	14.76	28.98						-6646.65		
A. Forest land	-6510.00	13.00	14.00						-6483.00		
B. Cropland	106.08	0.75	8.15						114.98		
C. Grassland	59.43	1.00	1.47						61.91		
D. Wetlands	63.80	NO	0.37						64.18		
E. Settlements	175.30	NO	4.99						180.28		
F. Other land	0.00	NO	NO						0.00		
G. Harvested wood products	-585.00								-585.00		
H. Other	NA	NA	NA						NA		
5. Waste	24.70	3566.39	114.56						3705.65		
A. Solid waste disposal	NO	3186.38							3186.38		
B. Biological treatment of solid waste		118.92	39.59						158.51		
C. Incineration and open burning of waste	24.70	0.11	0.35						25.16		
D. Waste water treatment and discharge		260.98	74.62						335.60		
E. Other	NO	NO	NO						NO		
6. Other (as specified in summary 1.A)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo items:											
International bunkers	765.24	0.15	5.57						770.96		
Aviation	765.24	0.15	5.57						770.96		
Navigation	NE	NE	NE						NE		
CO₂ emissions from biomass	11025.64								11025.64		
CO₂ captured	NO								NO		
Indirect CO₂⁽²⁾											
Total CO₂ equivalent emissions without land use, land-use change and forestry									59784.91	15558.99	44225.92
Total CO₂ equivalent emissions with land use, land-use change and forestry									53138.26		
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry									NE	NE	
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry									NE		

⁽¹⁾ For carbon dioxide (CO₂) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always

⁽²⁾ For Member States that report indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽³⁾ CO₂ emissions from civil aviation are treated as zero for effort sharing purposes.

⁽⁴⁾ Where applicable: please clarify the geographical scope

Brief description of the key drivers underpinning the increase or decrease in GHG emissions in x-1 (proxy) compared to x-2 (inventory). If this information is publicly available please include the hyperlink to the relevant website. Information on the uncertainties associated with the estimations for the LULUCF sector may also be provided.

Preliminary data indicate that total emissions DECREASED by 7% in 2022. ETS emissions fell by 12%

ENERGY (-5%): Generally, energy consumption decreased due to higher energy prices. Domestic supply of natural gas decreased by 15%. Also, the mild winter contributed to lower energy consumption of buildings. In contrast, transport emissions increased further by around 8% in 2022.

IPPU (-18%): Due to the drastic increase in the price of energy carriers - especially in the price of natural gas - industrial production fell significantly in 2022 in Hungary. Within this, ammonia production fell by half compared to 2021, resulting in an almost 30% decrease in the emissions of the 2B sectors. Moreover, due to management problems, pig iron and steel production of the BOF steel producing company decreased by about 30% causing 25% decrease in the emissions of the 2C1 sector. Emission of fluorinated gases (in category 2.F) has a slightly decreasing trend because of the reduced amount of used gases (mainly due to the regulations). There is also a slight decrease in SF6 emissions.

AGRICULTURE (-12%): The main reasons for the decrease in emissions were the 28,7 percent drop in N fertilizer use due to the high gas prices and the 23,3 percent drop in N2O emission from crop residues because of the extreme low maize yield. Maize yield was 44,4 percent lower than in 2021. In addition, cattle herd size decreased by 1,6 percent. However, emission from urea application increased by 7,6 percent. The demand for urea increased due to rising fertilizer prices. Urea became the best value for money type of fertilizer in 2022.

In case of LULUCF, annual variation of emissions and removals is usually dampened by the fact that some emissions are estimated for a 20-year period rather than one year. This year, due to lack of data, most of the preliminary estimates of the activity data are simple extrapolations of previous years that may further reduce variation. However, the activity data resulting in the largest net emissions, i.e., the stock change of volume stocks of forests, was taken to be equal to that in the last inventory instead of extrapolation. This was to avoid an even larger sink than what was estimated for year x-2. This is because wood harvests in year x-1 (2022) are expected to be larger than what was estimated for x-2 (2021), most probably not even maintaining but reducing the sink. Because of the above, all LULUCF proxy estimates are rather uncertain this year, but overall, no large change in the net sink is expected.

5.15 Ireland (submitted by member state)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories

Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999

Year 2023
Submission 2022
Country Ireland

Geographical scope⁽⁴⁾

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total	ETS	non-ETS
Total (net emissions)⁽¹⁾	43202.81	18179.54	5945.47	665.77	50.37	16.68	NO	8.24	68068.88	14605.58	53463.31
1. Energy	33673.89	254.70	307.45						34236.04	12 541	21 695
A. Fuel combustion (sectoral approach)	33673.69	165.31	307.45						34146.45	12 541	21 606
1. Energy industries	9872.34	11.86	102.56						9986.76	9 317	669
2. Manufacturing industries and construction	4269.50	8.14	10.76						4288.41	3 223	1 065
3. Transport (3)	11503.09	8.73	122.15						11633.97	0	11 634
4. Other sectors	8028.76	136.57	71.98						8237.31	0	8 237
5. Other	IE	IE	IE						IE		
B. Fugitive emissions from fuels	0.20	89.40	0.00						89.60		90
1. Solid fuels	NO	19.34	NO						19.34		19
2. Oil and natural gas	0.20	70.05	0.00						70.25		70
C. CO ₂ transport and storage	NO								NO		
2. Industrial processes and product use	2248.77	NO	40.55	665.77	50.37	16.68	NO	8.24	3030.38	2 065	966
A. Mineral industry	2068.41								2068.41	2 065	4
B. Chemical industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C. Metal industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Non-energy products from fuels and solvent use	180.36	NO	NO						180.36		180
E. Electronic industry				3.54	50.37	9.42	NO	8.24	71.57		72
F. Product uses as ODS substitutes				662.23	NO	NO	NO	NO	662.23		662
G. Other product manufacture and use	NO	NO	40.55	NO	NO	7.26	NO	NO	47.81		48
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Agriculture	750.79	16616.42	5262.80						22630.02		
A. Enteric fermentation		14581.46							14581.46		
B. Manure management		2034.96	637.12						2672.07		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NE	4625.69						4625.69		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		NO	NO						NO		
G. Liming	623.98								623.98		
H. Urea application	126.82								126.82		
I. Other carbon-containing fertilizers	NO								NO		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry⁽¹⁾	6496.71	588.00	220.34						7305.06		
A. Forest land	357.24	IE	IE						357.24		
B. Cropland	-45.81	0.09	0.02						-45.70		
C. Grassland	6415.59	288.73	98.05						6802.37		
D. Wetlands	1427.85	299.18	16.39						1743.42		
E. Settlements	146.89	NO	72.62						219.50		
F. Other land	14.58	NO	33.27						47.85		
G. Harvested wood products	-1819.62								-1819.62		
H. Other	NO	NO	NO						NO		
5. Waste	32.64	720.42	114.33						867.39		
A. Solid waste disposal	NO	627.81							627.81		
B. Biological treatment of solid waste		33.85	16.48						50.33		
C. Incineration and open burning of waste	32.64	0.07	0.30						33.01		
D. Waste water treatment and discharge		58.69	97.55						156.24		
E. Other	NO	NO	NO						NO		
6. Other (as specified in summary 1.A)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo items:											
International bunkers	3409.70	1.61	24.57						3435.89		
Aviation	3026.32	0.59	21.80						3048.71		
Navigation	383.39	1.02	2.77						387.18		
CO₂ emissions from biomass	2835.21								2835.21		
CO₂ captured	NO								NO		
Indirect CO₂⁽²⁾	NE										
Total CO₂ equivalent emissions without land use, land-use change and forestry									60763.83	14605.58	46158.25
Total CO₂ equivalent emissions with land use, land-use change and forestry									68068.88		
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry									60763.83		
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry									68068.88		

⁽¹⁾ For carbon dioxide (CO₂) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always

⁽²⁾ For Member States that report indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽³⁾ CO₂ emissions from civil aviation are treated as zero for effort sharing purposes.

⁽⁴⁾ Where applicable: please clarify the geographical scope

5.16 Italy (submitted by member state)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories

Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999

Year 2023
Submission 2022
Country Italy

Geographical scope⁽⁴⁾

GREENHOUSE GAS SOURCE AND	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total	ETS	non-ETS
CO ₂ equivalent (kt)										CO ₂ equivalent (Gg)	
SINK CATEGORIES											
Total (net emissions)⁽¹⁾	306409.62	47195.97	17308.35	15233.66	135.76	313.54	23.40	17.88	386638.18	136198.71	250439.47
1. Energy	323889.10	7206.01	4107.33						335202.43	124 423	210 780
A. Fuel combustion (sectoral approach)	322016.11	3305.95	4099.73						329421.79	123 175	206 246
1. Energy industries	92347.30	135.99	332.66						92815.95	90 543	2 273
2. Manufacturing industries and construction	49584.60	319.49	726.72						50630.81	31 318	19 313
3. Transport (3)	110084.17	243.50	919.91						11247.57	826	110 422
4. Other sectors	69700.59	2605.90	2113.90						74420.39	489	73 932
5. Other	299.46	1.06	6.55						307.07	0	307
B. Fugitive emissions from fuels	1872.99	3900.06	7.60						5780.64	1 247	4 533
1. Solid fuels	0.00	31.95	0.00						31.95	0	32
2. Oil and natural gas	1872.99	3868.10	7.60						5748.69	1 247	4 501
C. CO ₂ transport and storage											
2. Industrial processes and product use	14890.50	39.38	499.75	15233.66	135.76	313.54	23.40	17.88	31153.87	11 776	19 378
A. Mineral industry	11166.62								11166.62	9 650	1 517
B. Chemical industry	1039.13	4.16	46.83	268.36	0.95	0.00	0.00	0.00	1359.44	751	608
C. Metal industry	1685.87	35.22	0.00	5.83	0.00	0.00	0.00	0.00	1726.92	1 375	352
D. Non-energy products from fuels and solvent use	998.88	0.00	0.00						998.88	0	999
E. Electronic industry				7.26	134.81	45.06	23.40	17.88	228.42	0	228
F. Product uses as ODS substitutes				14952.20	0.00	0.00	0.00	0.00	14952.20	0	14 952
G. Other product manufacture and use	NO	0.00	452.92	0.00	0.00	268.48	0.00	0.00	721.39	0	721
H. Other	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
3. Agriculture	461.26	20736.21	10620.41						31817.88		
A. Enteric fermentation		14350.18							14350.18		
B. Manure management		4786.23	1738.58						6524.81		
C. Rice cultivation		1585.42							1585.42		
D. Agricultural soils		0.00	8878.79						8878.79		
E. Prescribed burning of savannas		0.00	0.00						0.00		
F. Field burning of agricultural residues		14.38	3.04						17.42		
G. Liming	25.59								25.59		
H. Urea application	413.50								413.50		
I. Other carbon-containing fertilizers	22.17								22.17		
J. Other	0.00	0.00	0.00						0.00		
4. Land use, land-use change and forestry⁽¹⁾	-32917.00	699.06	531.12						-31686.82		
A. Forest land	-29441.64	427.24	1.58						-29012.83		
B. Cropland	1069.89	4.90	77.15						1151.94		
C. Grassland	-5423.37	266.92	97.08						-5059.37		
D. Wetlands	18.03	0.00	0.00						18.03		
E. Settlements	924.23	0.00	226.27						1150.50		
F. Other land	0.00	0.00	0.00						0.00		
G. Harvested wood products	-64.14								-64.14		
H. Other	0.00	0.00	0.00						0.00		
5. Waste	85.77	18515.31	1549.74						20150.82		
A. Solid waste disposal	0.00	15651.87							15651.87		
B. Biological treatment of solid waste		124.86	427.16						552.03		
C. Incineration and open burning of waste	85.77	56.00	16.04						157.81		
D. Waste water treatment and discharge		2682.57	1106.53						3789.10		
E. Other	NO	0.00	0.00						0.00		
6. Other (as specified in summary 1.A)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
Memo items:											
International bunkers	14348.21	15.43	108.16						14471.81		
Aviation	9231.00	1.90	73.99						9306.89		
Navigation	5117.21	13.54	34.17						5164.91		
CO₂ emissions from biomass	46983.65								46983.65		
CO₂ captured											
Indirect CO₂⁽²⁾	NO										
Total CO₂ equivalent emissions without land use, land-use change and forestry									418325.00	136198.7	282126.3
Total CO₂ equivalent emissions with land use, land-use change and forestry									386638.18		
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry									418325.00	136198.7	282126.3
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry									386638.18		

⁽¹⁾ For carbon dioxide (CO₂) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always

⁽²⁾ For Member States that report indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽³⁾ CO₂ emissions from civil aviation are treated as zero for effort sharing purposes.

⁽⁴⁾ Where applicable: please clarify the geographical scope

Brief description of the key drivers underpinning the increase or decrease in GHG emissions in x-1 (proxy) compared to x-2 (inventory). If this information is publicly available please include the hyperlink to the relevant website. Information on the uncertainties associated with the estimations for the LULUCF sector may also be provided.

Total national emissions without LULUCF are expected to be quite stable in 2022 with respect 2021 (+0.2%). In particular emissions from transport are expected to increase (+7.7%) as well as from energy production (7.4%) due to the use of coal instead of natural gas for the increase of gas international costs. On the other side emissions from civil sector reduced (10.6%) due to the temperate climate condition in winter.

5.17 Lithuania (submitted by member state)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories

Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999

Year 2022
Submission 2023
Country Lithuania

Geographical scope⁽⁴⁾

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total	ETS	non-ETS
Total (net emissions)⁽¹⁾	6632.21	3191.46	2706.78	571.43	NO	4.36	NO	NO	13106.24	5066.01	14174.49
1. Energy	11163.69	448.99	143.28						11755.96	3 186	8 568
A. Fuel combustion (sectoral approach)	10983.47	211.00	143.27						11337.74	2 949	8 386
1. Energy industries	2460.44	30.20	38.39						2529.03	2 299	230
2. Manufacturing industries and construction	1202.90	6.23	11.93						1221.06	641	580
3. Transport (3)	5948.24	7.83	57.59						6013.65	6	6 005
4. Other sectors	1344.72	166.74	35.17						1546.63	3	1 543
5. Other	27.16	0.01	0.20						27.37	NA	27
B. Fugitive emissions from fuels	180.22	237.99	0.01						418.21	237	182
1. Solid fuels	NO	NO	NO						NO	NA	NA
2. Oil and natural gas	180.22	237.99	0.01						418.21	237	182
C. CO ₂ transport and storage	NO								NO	NO	NO
2. Industrial processes and product use	1606.28	NO	94.38	571.43	NO	4.36	NO	NO	2276.46	1 880	396
A. Mineral industry	703.59								703.59	700	3
B. Chemical industry	887.86	NO	90.95	NO	NO	NO	NO	NO	978.81	1 180	-201
C. Metal industry	0.03	NO	NO	NO	NO	NO	NO	NO	0.03	NO	0
D. Non-energy products from fuels and solvent use	14.80	NO	NO						14.80	NO	15
E. Electronic industry				NO	NO	3.76	NO	NO	3.76	NO	4
F. Product uses as ODS substitutes				571.43	NO	NO	NO	NO	571.43	NO	571
G. Other product manufacture and use	NO	NO	3.44	NO	NO	0.60	NO	NO	4.04	NO	4
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Agriculture	108.24	1956.61	2294.27						4359.11		
A. Enteric fermentation		1701.73							1701.73		
B. Manure management		254.88	155.39						410.26		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NA	2138.88						2138.88		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		NO	NO						NO		
G. Liming	48.47								48.47		
H. Urea application	59.77								59.77		
I. Other carbon-containing fertilizers	NE								NE		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry⁽¹⁾	-6248.26	0.56	111.30						-6136.40		
A. Forest land	-6912.88	0.28	26.50						-6886.10		
B. Cropland	758.21	0.01	42.40						800.62		
C. Grassland	-656.08	0.28	0.00						-655.80		
D. Wetlands	812.82	NO	NO						812.82		
E. Settlements	550.46	NO	39.75						590.21		
F. Other land	38.93	NO	2.65						41.58		
G. Harvested wood products	-839.72								-839.72		
H. Other	NO	NO	NO						NO		
5. Waste	2.26	785.30	63.55						851.11		
A. Solid waste disposal	NO	572.93							572.93		
B. Biological treatment of solid waste		81.62	21.25						102.87		
C. Incineration and open burning of waste	2.26	0.00	0.06						2.33		
D. Waste water treatment and discharge		130.74	42.24						172.98		
E. Other	NO	NO	NO						NO		
6. Other (as specified in summary 1.A)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Memo items:											
International bunkers	792.08	1.32	5.67						799.07		
Aviation	306.75	0.06	2.27						309.08		
Navigation	485.33	1.26	3.40						489.99		
CO₂ emissions from biomass	6202.41								6202.41		
CO₂ captured	NO								NO		
Indirect CO₂⁽²⁾	40.97										
Total CO₂ equivalent emissions without land use, land-use change and forestry									19242.64	5066.009	14174.49
Total CO₂ equivalent emissions with land use, land-use change and forestry									13106.24		
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry									NA	5066.009	
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry									NA		

⁽¹⁾ For carbon dioxide (CO₂) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always

⁽²⁾ For Member States that report indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽³⁾ CO₂ emissions from civil aviation are treated as zero for effort sharing purposes.

⁽⁴⁾ Where applicable: please clarify the geographical scope

5.18 Luxembourg (submitted by member state)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories

Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999

Year 2023
Submission 2022
Country Luxembourg

Geographical scope⁽⁴⁾

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total	ETS	non-ETS
Total (net emissions)⁽¹⁾	6532.53	642.52	238.92	40.37	NA	10.16	NA	NA	7464.50	1133.55	6306.85
1. Energy	6786.19	50.26	62.96						6899.41	680	6 219
A. Fuel combustion (sectoral approach)	6786.16	23.66	62.96						6872.78	680	6 192
1. Energy industries	188.77	3.63	4.56						196.96	29	168
2. Manufacturing industries and construction	942.51	6.42	14.78						963.71	651	313
3. Transport (3)	4224.29	3.06	40.26						4267.61	NA	4 267
4. Other sectors	1430.48	10.56	3.35						1444.39	NA	1 444
5. Other	0.11	0.00	0.00						0.12	NA	0
B. Fugitive emissions from fuels	0.03	26.60	NA						26.63	NA	27
1. Solid fuels	NO	NO	NO						NO	NO	NO
2. Oil and natural gas	0.03	26.60	NO						26.63	NA	27
C. CO ₂ transport and storage	NO								NO	NO	NO
2. Industrial processes and product use	485.93	NA	5.06	40.37	NA	10.16	NA	NA	541.53	454	88
A. Mineral industry	371.30								371.30	371	0
B. Chemical industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
C. Metal industry	82.27	NA	NA	NA	NA	NA	NA	NA	82.27	82	0
D. Non-energy products from fuels and solvent use	32.36	NA	NA						32.36	NA	32
E. Electronic industry				NO	NO	NO	NO	NO	NO	NO	NO
F. Product uses as ODS substitutes				36.89	NO	NO	NO	NO	36.89	NA	37
G. Other product manufacture and use	NO	NO	5.06	3.48	NO	10.16	NO	NO	18.70	NA	19
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Agriculture	14.53	519.91	154.45						688.89		
A. Enteric fermentation		439.51							439.51		
B. Manure management		80.40	33.78						114.17		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NA	120.68						120.68		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		NO	NO						NO		
G. Liming	10.87								10.87		
H. Urea application	0.04								0.04		
I. Other carbon-containing fertilizers	3.62								3.62		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry⁽¹⁾	-754.12	NO	7.52						-746.61		
A. Forest land	-717.65	NO	NO						-717.65		
B. Cropland	-24.23	NO	2.67						-21.56		
C. Grassland	-24.44	NO	0.04						-24.40		
D. Wetlands	0.21	NO	0.01						0.22		
E. Settlements	20.76	NO	1.86						22.61		
F. Other land	0.04	NO	0.00						0.04		
G. Harvested wood products	-8.82								-8.82		
H. Other	NO	NO	NO						NO		
5. Waste	NA	72.35	8.93						81.28		
A. Solid waste disposal	NA	45.42							45.42		
B. Biological treatment of solid waste		24.82	5.12						29.94		
C. Incineration and open burning of waste	IE	IE	IE						IE		
D. Waste water treatment and discharge		2.11	3.81						5.92		
E. Other	NO	NO	NO						NO		
6. Other (as specified in summary 1.A)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo items:											
International bunkers	NE	NE	NE						NE		
Aviation	NE	NE	NE						NE		
Navigation	NE	NE	NE						NE		
CO₂ emissions from biomass	NE								NE		
CO₂ captured	NO								NO		
Indirect CO₂⁽²⁾											
Total CO₂ equivalent emissions without land use, land-use change and forestry									8211.11	1133.545	7077.017
Total CO₂ equivalent emissions with land use, land-use change and forestry									7464.50		
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry									NE	NE	
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry									NE		

⁽¹⁾ For carbon dioxide (CO₂) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always

⁽²⁾ For Member States that report indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽³⁾ CO₂ emissions from civil aviation are treated as zero for effort sharing purposes.

⁽⁴⁾ Where applicable: please clarify the geographical scope

Brief description of the key drivers underpinning the increase or decrease in GHG emissions in x-1 (proxy) compared to x-2 (inventory). If this information is publicly available please include the hyperlink to the relevant website. Information on the uncertainties associated with the estimations for the LULUCF sector may also be provided.

Approximated GHG emissions for 2022, excl. LULUCF, are based on the preliminary energy balance and are 12.56% lower than the inventory emissions for 2021. The key drivers for the changes in GHG emissions in 2022 compared to 2021 are:

- lower natural gas consumption (-21.4%);
- higher gasoline consumption (+1.59%)
- lower fossil diesel oil consumption (-16.83%)
- lower heating gasoil consumption (-10.01%)
- lower IPPU emissions (-4.31%)
- lower agriculture emissions (-1.21%)
- lower waste emissions (-7.91%)

No information about uncertainties associated with the estimations for the LULUCF sector.

5.19 Latvia (submitted by member state)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories

Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999

Year 2023

Submission 2022

Country Latvia

Geographical scope⁽⁴⁾

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total	ETS	non-ETS
Total (net emissions)⁽¹⁾	6618.63	1856.05	1317.73	232.99	NA	12.88	NA	NA	10038.28	1689.97	8344.11
1. Energy	5930.33	305.47	172.04						6407.85	1 112	5 292
A. Fuel combustion (sectoral approach)	5930.33	207.03	172.04						6309.40	1 112	5 193
1. Energy industries	954.98	19.54	24.60						999.12	827	172
2. Manufacturing industries and construction	544.06	19.20	37.61						600.87	280	321
3. Transport (3)	3092.39	3.27	31.51						3127.17	NA	3 123
4. Other sectors	1315.00	164.96	78.15						1558.12	5	1 553
5. Other	23.90	0.06	0.17						24.13	NO	24
B. Fugitive emissions from fuels	0.01	98.44	NA						98.45	NO	98
1. Solid fuels	NO	NO	NA						NA	NO	NO
2. Oil and natural gas	0.01	98.44	NO						98.45	NA	98
C. CO ₂ transport and storage	NO								NO	NO	NO
2. Industrial processes and product use	600.83	NO	3.45	232.99	NA	12.88	NA	NA	850.15	578	272
A. Mineral industry	551.60								551.60	578	
B. Chemical industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NA	NA
C. Metal industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Non-energy products from fuels and solvent use	49.24	NO	NO						49.24	NA	49
E. Electronic industry				NO	NO	NO	NO	NO	NO	NO	NO
F. Product uses as ODS substitutes				232.99	NO	NO	NO	NO	232.99	NA	233
G. Other product manufacture and use	NO	NO	3.45	NO	NO	12.88	NO	NO	16.33	NO	16
H. Other	NO	NO	NO	NA	NA	NA	NA	NA	NA	NA	NA
3. Agriculture	87.46	1047.43	1095.47						2230.36		
A. Enteric fermentation		944.42							944.42		
B. Manure management		103.01	65.10						168.11		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NE	1030.38						1030.38		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		NO	NO						NO		
G. Liming	77.88								77.88		
H. Urea application	9.57								9.57		
I. Other carbon-containing fertilizers	NE								NE		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry⁽¹⁾	2754.22	829.55	606.12						4189.89		
A. Forest land	378.73	395.21	473.79						1247.73		
B. Cropland	1369.21	145.35	NO						1514.56		
C. Grassland	880.13	187.48	NO						1067.61		
D. Wetlands	1443.41	91.63	5.79						1540.83		
E. Settlements	827.26	9.88	126.54						963.68		
F. Other land	NO	NA	NA						NA		
G. Harvested wood products	-2144.52								-2144.52		
H. Other	NA	NA	NA						NA		
5. Waste	NO	503.14	46.77						549.92		
A. Solid waste disposal	NA	365.00							365.00		
B. Biological treatment of solid waste		45.92	18.12						64.04		
C. Incineration and open burning of waste	NO	NA	NO						0.00		
D. Waste water treatment and discharge		92.23	28.65						120.87		
E. Other	NO	NO	NO						NO		
6. Other (as specified in summary 1.A)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo items:											
International bunkers	781.66	0.69	33.02						815.37		
Aviation	434.19	0.14	3.76						438.10		
Navigation	347.47	0.54	29.26						377.27		
CO₂ emissions from biomass	7199.06								7199.06		
CO₂ captured	NO								NO		
Indirect CO₂⁽²⁾	12.83										
Total CO₂ equivalent emissions without land use, land-use change and forestry									10038.28	1689.969	8344.113
Total CO₂ equivalent emissions with land use, land-use change and forestry									14228.17		
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry									10051.11	1689.969	8356.94
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry									14241.00		

⁽¹⁾ For carbon dioxide (CO₂) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always

⁽²⁾ For Member States that report indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽³⁾ CO₂ emissions from civil aviation are treated as zero for effort sharing purposes.

⁽⁴⁾ Where applicable: please clarify the geographical scope

Brief description of the key drivers underpinning the increase or decrease in GHG emissions in x-1 (proxy) compared to x-2 (inventory). If this information is publicly available please include the hyperlink to the relevant website. Information on the uncertainties associated with the estimations for the LULUCF sector may also be provided.

Latvia's approximate GHG emissions for 2022 were estimated using available activity data from Central Statistical Bureau of Latvia, annual GHG reports under EU ETS and data from national databases or extrapolation in cases activity data were not available yet. In sectors where stable trend was not observed the emissions were left in 2021 level. Compared to GHG inventory (1990 – 2021) submission to UNFCCC on 12nd of April 2023 Latvia's total GHG emissions excluding LULUCF, including indirect CO₂ have decreased by 6.4% in 2022. Latvia's total GHG emissions including LULUCF and indirect CO₂ have increased by 8.4% in 2022. Under 2A1 (Cement production) two different CO₂ emission calculation approaches are used. Under EU ETS clinker producer uses Monitoring reporting Regulation (COMMISSION REGULATION (EU) No 601/2012 of 21 June 2012 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council) to calculate CO₂ emissions from clinker and cement kiln dust using default EFs, but for GHG inventory CO₂ emissions are calculated according to 2006 IPCC Guidelines and EFs are calculated using plant specific data. This results in 4.8% (26 kt CO₂ eq.) difference between ETS CO₂ emissions from clinker production reported under Article 21 of the ETS directive (column L) and GHG inventory (column J) calculated in 2022. Very minor differences occur also for glass production due to the same reason and rounding.

Total GHG emissions in Energy sector (excluding Transport) have decreased by 14% in 2022 compared to 2021. In 2022, emissions in sector 1A1 Energy Industries have significantly decreased by 30.5% compared to 2021 due to decrease use of natural gas -36.0%. Also, use of solid fossil fuels has decreased by 58% and biomass by 2%. Use of liquid fossil fuels have increased 3 times compared to 2021. In sector 1A2 Manufacturing Industries and Construction emissions have decreased by 8.3% compared to 2021. Use of natural gas in sector have decreased by 31% compared to 2021, also, use of coal has decreased by 33%. Use of liquid fossil fuels, other fossil fuels and biomass have increased by 19%, 7% and 10% accordingly. In 2022, emissions in sector 1A4 Other Sectors have decreased by 1,6% compared to 2021. In 2022, use of natural gas has decreased by 10% but liquid fossil fuels and biomass have increased by 5% and 3%.

GHG emissions for 2022 in Transport sector are 3.1% lower than in 2021. The trend of these changes is mainly driven by the reduction of calculated GHG emissions in road transport, where emissions in 2022 are 2.9% lower than in 2021. A key factor for these changes is the decline in fossil fuel consumption in 2022 by 2.5% compared with 2021. Secondly, the estimated emissions for rail transport in 2022 are around 7.2% lower than in 2021. This trend is driven by a decline in freight transport by rail. Given that the number of flights returned to Covid-19 pre-pandemic levels in 2022, the estimated emissions in international aviation are around 81% higher in 2022 than in 2021.

Emissions from IPPU sector in 2022 are decreased by 2.1% compared to 2021 due to a decrease of F-gas emissions. The only lime production company stopped lime production from dolomite since 2016 thus CO₂ emissions from 2.A.2 are NO. The same for the only iron and steel plant which did not produce steel anymore but only rolls armature not causing CO₂ emissions thus CO₂ and CH₄ emissions from 2.C.1 are NO. F-gases Activity data from annual F-gases reports for proxy emission calculation were not available yet, therefore emissions were calculated by either using previous three years average F-gases amounts filled into new manufactured products or keeping previous year's emission amount. Total F-gases emissions (2.F + 2.G) have decreased by 6.3% compared to 2021.

The Solvent Use sector lacked available activity data for the year 2022. Moreover, a consistent trend of stability in CO₂ emissions from

5.20Malta (submitted by member state)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories

Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999

Year 2023
Submission 2022
Country Malta

Geographical scope⁽⁴⁾

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total	ETS	non-ETS
	CO ₂ equivalent (kt)									CO ₂ equivalent (Gg)	
Total (net emissions)⁽¹⁾	1674.49	248.57	39.84	214.54	0.02	0.25	NO	NO	2177.71	796.23	1378.72
1. Energy	1669.28	1.13	3.42						1673.82	796	876
A. Fuel combustion (sectoral approach)	1669.28	1.13	3.42						1673.82	796	876
1. Energy industries	796.13	0.02	0.00						796.14	796	0
2. Manufacturing industries and construction	57.59	0.00	0.00						57.60	0	58
3. Transport (3)	648.99	1.06	3.38						653.43	0	651
4. Other sectors	166.57	0.05	0.03						166.65	0	167
5. Other	IE	IE	IE						IE	0	
B. Fugitive emissions from fuels	NO	NO	NO						NO	NO	
1. Solid fuels	NO	NO	NO						NO	NO	
2. Oil and natural gas	NO	NO	NO						NO	NO	
C. CO ₂ transport and storage	NO								NO	NO	
2. Industrial processes and product use	4.92	NO	2.22	214.54	0.02	0.25	NO	NO	221.96	0	222
A. Mineral industry	0.11								0.11	NA	0
B. Chemical industry	0.00	NA	NA	NA	NA	NA	NA	NA	0.00	NA	0
C. Metal industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
D. Non-energy products from fuels and solvent use	4.81	NA	NA						4.81	0	4
E. Electronic industry				NO	NA	NO	NA	NA	NO	NA	
F. Product uses as ODS substitutes				214.54	0.02	NA	NA	NA	214.56	NA	215
G. Other product manufacture and use	NA	NA	2.22	NA	0.00	0.25	NA	NA	2.47	NA	2
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
3. Agriculture	NO	45.64	26.88						72.52		
A. Enteric fermentation		39.32							39.32		
B. Manure management		6.32	11.40						17.72		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NA	15.47						15.47		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		NO	NO						NO		
G. Liming	NO								NO		
H. Urea application	NE								NE		
I. Other carbon-containing fertilizers	NO								NO		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry⁽¹⁾	0.04	NO	0.58						0.62		
A. Forest land	-0.30	NO	NO						-0.30		
B. Cropland	-1.77	NO	0.04						-1.74		
C. Grassland	-3.06	NO	0.05						-3.01		
D. Wetlands	-0.01	NO	NO						-0.01		
E. Settlements	2.24	NO	0.24						2.48		
F. Other land	2.94	NO	0.26						3.19		
G. Harvested wood products	NO								NO		
H. Other	NO	NO	NO						NO		
5. Waste	0.25	201.81	6.75						208.81		
A. Solid waste disposal	NA	191.25							191.25		
B. Biological treatment of solid waste		1.60	NO						1.60		
C. Incineration and open burning of waste	0.25	0.00	0.14						0.39		
D. Waste water treatment and discharge		8.97	6.60						15.57		
E. Other	NO	NO	NO						NO		
6. Other (as specified in summary 1.A)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Memo items:											
International bunkers	7203.28	17.52	49.86						7270.66		
Aviation	377.12	0.09	2.71						379.92		
Navigation	6826.16	17.44	47.15						6890.75		
CO₂ emissions from biomass	IE								IE		
CO₂ captured	NO								NO		
Indirect CO₂⁽²⁾	NO								NO		
Total CO₂ equivalent emissions without land use, land-use change and forestry									2177.09		
Total CO₂ equivalent emissions with land use, land-use change and forestry									2177.71		
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry									2177.09		
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry									2177.71		

⁽¹⁾ For carbon dioxide (CO₂) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always

⁽²⁾ For Member States that report indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽³⁾ CO₂ emissions from civil aviation are treated as zero for effort sharing purposes.

⁽⁴⁾ Where applicable: please clarify the geographical scope

Brief description of the key drivers underpinning the increase or decrease in GHG emissions in x-1 (proxy) compared to x-2 (inventory). If this information is publicly available please include the hyperlink to the relevant website. Information on the uncertainties associated with the estimations for the LULUCF sector may also be provided.

One of the installations falling under the scope of EU ETS is currently excluded pursuant to Directive 2003/87/EC, Article 27a, and therefore its emissions (0.30 ktonnes CO₂) are being accounted for under Effort Sharing Categories 1.A.3 and 1.A.4 include CO₂ emissions from biofuels.

Emissions arising from military purposes (automotive, marine and aviation) that should be reported under category 1.A.5 are included under category 1.A.3 as data at the level of disaggregation needed, was not available.

For the purposes of distinguishing between ETS and non-ETS emissions, CO₂ emissions from civil aviation (2.14ktonnes CO₂) have been subtracted from the Effort Sharing value reported.

5.21 Netherlands (submitted by member state)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories

Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999

Year 2023

Submission 2022

Country Netherlands

Geographical scope⁽⁴⁾

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total	ETS	non-ETS
										CO ₂ equivalent (kt)	
Total (net emissions)⁽¹⁾	131457.21	18314.40	6882.37	1071.84	55.34	123.87	NO	NO	157905.0378		
1. Energy	122897.08	2036.22	521.40						125454.70	64 147	61 307
A. Fuel combustion (sectoral approach)	121796.68	1628.21	521.40						123946.29	63 076	60 870
1. Energy industries	45319.57	147.51	252.32						45719.40	41 807	3 913
2. Manufacturing industries and construction	25149.98	72.27	36.48						25258.72	20 998	4 261
3. Transport (3)	24977.80	65.89	182.80						25226.49		25 226
4. Other sectors	26137.68	1342.04	46.98						27526.70	271	27 255
5. Other	211.66	0.49	2.82						214.97		215
B. Fugitive emissions from fuels	1100.40	408.01	NO						1508.41	1 071	437
1. Solid fuels	71.46	5.06	NO						76.52	71	5
2. Oil and natural gas	1028.95	402.95	NO						1431.89	1 000	432
C. CO ₂ transport and storage	NO								NO	NO	
2. Industrial processes and product use	4421.61	409.46	637.36	1071.84	55.34	123.87	NO	NO	6719.48	4 361	2 359
A. Mineral industry	1136.41								1136.41	626	511
B. Chemical industry	2888.35	357.78	566.85	143.98	12.14	NO	NO	NO	3969.10	3 704	265
C. Metal industry	31.00	NO	NO	NO	NO	NO	NO	NO	31.00	31	0
D. Non-energy products from fuels and solvent use	340.57	0.36	NO						340.93		341
E. Electronic Industry				NO	43.21	NO	NO	NO	43.21		43
F. Product uses as ODS substitutes				927.86	IE	IE	IE	IE	927.86		928
G. Other product manufacture and use	0.16	51.32	70.51	NO	NO	123.87			245.86		246
H. Other	25.12	NO	NO						25.12		25
3. Agriculture	83.17	13053.62	4815.70						17952.49		
A. Enteric fermentation		9099.14							9099.14		
B. Manure management		3954.48	661.73						4616.21		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NO	4153.97						4153.97		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		NO	NO						NO		
G. Liming	24.03								24.03		
H. Urea application	59.14								59.14		
I. Other carbon-containing fertilizers	NO								NO		
J. Other	NO	NA	NA						NO		
4. Land use, land-use change and forestry⁽¹⁾	4055.35	244.2232444	84.84837798						4384.419992		
A. Forest land	-1964.79	3.83649784	4.333701615						-1956.6222		
B. Cropland	2059.34	45.38	43.0707415						2147.78738		
C. Grassland	2517.17	195.0097505	6.423184321						2718.603706		
D. Wetlands	-53.90	NO	2.08060669						-51.8193933		
E. Settlements	1189.70	NO	19.557583						1209.257583		
F. Other land	185.38	NO	9.38256085						194.7625609		
G. Harvested wood products	0.00								0		
H. Other	122.45	NO	NO						NO		
5. Waste	NO	2570.88	823.06						3393.95		
A. Solid waste disposal	NO	2211.56							2211.56		
B. Biological treatment of solid waste		136.88	82.03						218.91		
C. Incineration and open burning of waste	NO	2.85	1.54						4.39		
D. Waste water treatment and discharge		219.59	739.49						959.08		
E. Other	NO	NO	NO						NO		
6. Other (as specified in summary 1.A)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo items:											
International bunkers	48938.29	158.33	352.06						49448.68		
Aviation	9542.91	1.87	70.74						9615.51		
Navigation	39395.38	156.46	281.32						39833.17		
CO₂ emissions from biomass	19838.53								19838.53		
CO₂ captured	NO								NO		
Indirect CO₂⁽²⁾	502.66										
Total CO₂ equivalent emissions without land use, land-use change and forestry									153520.6178	68507.819	85012.79882
Total CO₂ equivalent emissions with land use, land-use change and forestry									157905.0378		
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry									154023.27	68507.819	85515.45495
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry									158407.69		

⁽¹⁾ For carbon dioxide (CO₂) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and

⁽²⁾ For Member States that report indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽³⁾ CO₂ emissions from civil aviation are treated as zero for effort sharing purposes.

⁽⁴⁾ Where applicable: please clarify the geographical scope

5.22 Poland (submitted by member state)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories

Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999

Year 2023
Submission 2022
Country Poland
Geographical scope⁽⁴⁾

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total	ETS	non-ETS	
												CO ₂ equivalent (kt)
Total (net emissions) ⁽¹⁾										CO ₂ equivalent (Gg)		
1. Energy	296757.17	40853.63	21427.28	4872.81	9.58	96.14	NO	NO	364016.60		NE	
A. Fuel combustion (sectoral approach)	298976.77	22069.94	2588.65						323635.35		NE	
1. Energy industries	294627.16	4105.34	2588.18						301320.68		NE	
2. Manufacturing industries and construction	152020.50	30.84	632.69						152684.03		NE	
3. Transport (3)	27692.85	117.57	151.98						27962.40		NE	
4. Other sectors	69319.29	105.54	699.59						70124.42		NE	
5. Other	45594.52	3851.39	1103.92						50549.83		NE	
B. Fugitive emissions from fuels	NO	NO	NO						NO		NE	
1. Solid fuels	4349.61	17964.60	0.47						22314.67		NE	
2. Oil and natural gas	2448.42	15227.55	NA						17675.98		NE	
C. CO ₂ transport and storage	1901.19	2737.05	0.47						4638.70		NE	
2. Other	NO	NO	NO						NO		NE	
2. Industrial processes and product use	18229.12	61.65	557.40	4872.81	9.58	96.14	NO	NO	23826.70		NE	
A. Mineral industry	12009.42								12009.42		NE	
B. Chemical industry	4031.44	51.53	437.46	NO	NO	NO	NO	NO	4520.44		NE	
C. Metal industry	1847.23	10.11	NA	NA	NO	NO	NO	NO	1857.35		NE	
D. Non-energy products from fuels and solvent use	341.02	NO	NO						341.02		NE	
E. Electronic Industry				NO	NO	NO	NO	NO	NO		NE	
F. Product uses as ODS substitutes				4872.81	9.58	NO	NO	NO	4882.39		NE	
G. Other product manufacture and use	NA	NA	119.94	NO	NO	96.14	NO	NO	216.08		NE	
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO		NE	
3. Agriculture	1325.48	15552.98	15690.84						32569.30			
A. Enteric fermentation		14213.47							14213.47			
B. Manure management		1306.40	2502.09						3808.49			
C. Rice cultivation		NO							NO			
D. Agricultural soils		NA	13176.74						13176.74			
E. Prescribed burning of savannas		NO	NO						NO			
F. Field burning of agricultural residues		33.11	12.01						45.12			
G. Liming	871.08								871.08			
H. Urea application	335.23								335.23			
I. Other carbon-containing fertilizers	119.18								119.18			
J. Other	NO	NO	NO						NO			
4. Land use, land-use change and forestry⁽¹⁾	-22039.05	17.29	1736.29						-20285.47			
A. Forest land	-22172.21	15.97	143.39						-22013.84			
B. Cropland	1699.99	NO	10.62						1710.61			
C. Grassland	-282.60	1.32	0.69						-280.59			
D. Wetlands	1585.91	NO	0.00						1585.91			
E. Settlements	2269.49	NO	1581.59						3851.09			
F. Other land	NO	NO	NO						NO			
G. Harvested wood products	-5139.63								-5139.63			
H. Other	NA	NA	NA						NA			
5. Waste	264.84	3151.78	854.09						4270.72			
A. Solid waste disposal	NO	1187.38							1187.38			
B. Biological treatment of solid waste		227.62	129.26						356.88			
C. Incineration and open burning of waste	264.84	1E	5.22						270.06			
D. Waste water treatment and discharge		1736.78	719.62						2456.40			
E. Other	NO	NO	NO						NO			
6. Other (as specified in summary 1.A)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Memo items:												
International bunkers	2851.96	3.21	20.62						2875.78			
Aviation	1760.07	0.34	12.87						1773.28			
Navigation	1091.89	2.87	7.75						1102.50			
CO₂ emissions from biomass	47927.77								47927.77			
CO₂ captured	NO								NO			
Indirect CO₂⁽²⁾	499.12								499.12			
Total CO₂ equivalent emissions without land use, land-use change and forestry										384302.07	184145.848	200581.9578
Total CO₂ equivalent emissions with land use, land-use change and forestry										364016.60		
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry										384801.19	NE	
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry										364515.72		

⁽¹⁾ For carbon dioxide (CO₂) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and

⁽²⁾ For Member States that re-report indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽³⁾ CO₂ emissions from civil aviation are treated as zero for effort sharing purposes.

⁽⁴⁾ Where applicable: please clarify the geographical scope

5.23 Portugal (submitted by member state)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories

Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999

Year 2023
Submission 2022
Country Portugal
Geographical scope⁽⁴⁾

GREENHOUSE GAS SOURCE AND	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total	ETS	non-ETS
SINK CATEGORIES	CO ₂ equivalent (kt)									CO ₂ equivalent (Gg)	
Total (net emissions)⁽¹⁾	33994.97	10426.61	3130.23	3158.99	26.54	24.20	NO	NO	50761.54	16789.24	33972.31
1. Energy	36834.83	387.64	503.50						37725.97	13 873	23 853
A. Fuel combustion (sectoral approach)	35694.28	316.33	501.19						36511.80	12 732	23 779
1. Energy industries	8243.84	14.74	100.86						8359.45	7 447	913
2. Manufacturing industries and construction	6854.77	56.22	106.14						7017.13	4 676	2 341
3. Transport (3)	16820.74	22.93	155.47						16999.14	609	16 390
4. Other sectors	3702.03	222.43	138.17						4062.63	NO	4 063
5. Other	72.90	0.01	0.54						73.46	NO	73
B. Fugitive emissions from fuels	1140.55	71.31	2.31						1214.16	1 140	74
1. Solid fuels	NO	17.00	NO						17.00	16	1
2. Oil and natural gas	1140.55	54.31	2.31						1197.16	1 124	73
C. CO ₂ transport and storage	NO								NO	NO	
2. Industrial processes and product use	3871.28	30.21	55.02	3158.99	26.54	24.20	NO	NO	7166.23	2 917	4 250
A. Mineral industry	2961.21								2961.21	2 801	160
B. Chemical industry	637.53	30.21	27.73	NO	NO	NO	NO	NO	695.47	80	616
C. Metal industry	67.31	NO	NO	NO	NO	NO	NO	NO	67.31	36	31
D. Non-energy products from fuels and solvent use	205.23	NO	NO						205.23	NO	205
E. Electronic industry				NO	NO	NO	NO	NO	NO	NO	
F. Product uses as ODS substitutes				3158.99	26.54	NO	NO	NO	3185.53	NO	3 186
G. Other product manufacture and use	NO	NO	27.29	NO	NO	24.20	NO	NO	51.49	NO	51
H. Other	0.00	NO	NO	NO	NO	NO	NO	NO	0.00	NO	0
3. Agriculture	30.05	5014.28	2115.02						7159.34		
A. Enteric fermentation		4010.06							4010.06		
B. Manure management		831.01	199.61						1030.61		
C. Rice cultivation		165.56							165.56		
D. Agricultural soils		NO	1913.54						1913.54		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		7.65	1.88						9.52		
G. Liming	8.16								8.16		
H. Urea application	16.27								16.27		
I. Other carbon-containing fertilizers	5.61								5.61		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry⁽¹⁾	-6774.30	259.38	225.68						-6289.24		
A. Forest land	-2298.52	207.52	98.52						-1992.47		
B. Cropland	-1731.42	15.28	69.12						-1647.02		
C. Grassland	-2927.52	36.59	24.98						-2865.96		
D. Wetlands	347.14	0.00	22.65						369.80		
E. Settlements	106.16	NO	10.40						116.57		
F. Other land	NO	NO	0.00						0.00		
G. Harvested wood products	-270.14								-270.14		
H. Other	NO	NO	NO						NO		
5. Waste	33.12	4735.10	231.03						4999.24		
A. Solid waste disposal	NO	3842.32							3842.32		
B. Biological treatment of solid waste		86.61	43.94						130.55		
C. Incineration and open burning of waste	33.12	29.97	16.31						79.40		
D. Waste water treatment and discharge		776.21	170.77						946.98		
E. Other	NO	0.00	0.00						0.00		
6. Other (as specified in summary 1.A)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo items:											
International bunkers	NE	NE	NE						NE		
Aviation	NE	NE	NE						NE		
Navigation	NE	NE	NE						NE		
CO₂ emissions from biomass	NE								NE		
CO₂ captured	NE								NE		
Indirect CO₂⁽²⁾	123.58										
Total CO₂ equivalent emissions without land use, land-use change and forestry									57050.78	16789.24	40261.54
Total CO₂ equivalent emissions with land use, land-use change and forestry									50761.54		
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry									57174.36		
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry									50885.13		

⁽¹⁾ For carbon dioxide (CO₂) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always

⁽²⁾ For Member States that report indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽³⁾ CO₂ emissions from civil aviation are treated as zero for effort sharing purposes.

⁽⁴⁾ Where applicable: please clarify the geographical scope

Brief description of the key drivers underpinning the increase or decrease in GHG emissions in x-1 (proxy) compared to x-2 (inventory). If this information is publicly available please include the hyperlink to the relevant website. Information on the uncertainties associated with the estimations for the LULUCF sector may also be provided.

* In 2022, there was an increase in GHG emissions in the Energy sector, in which the main contribution was the increase in transport activity, with the impact emissions occurring both in road transport, aviation and navigation, this can be justified by the end of restrictions on the movement of individuals that were determined during the COVID-19 Pandemic that took place in 2020 and 2021.

* There is an estimated increase of 0.5% in the IPPU emissions mostly due to the following sectors:
- in mineral industry, specifically cement production (2A1);

* There is an estimated decrease of about 1.4% in the Agriculture GHG emissions mostly due to balance of opposite tendencies of main categories:
- 3A (Enteric Fermentation): related to a decrease in the livestock - particularly cattle and swine;
- 3B (Manure Management): related to a decrease in the livestock - particularly cattle and swine;
- 3C (Rice Cultivation): related to a decrease of rice productivity data;
- 3D (Agriculture Soils): related to a decrease in animal manure applied to soils and in areas of some cultures;
- 3G (Liming): decrease in liming.

5.24 Romania (submitted by member state)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories

Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999

Year 2022

Submission 2023

Country Romania

Geographical scope⁽⁴⁾

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total	ETS	non-ETS
										CO ₂ equivalent (Gg)	
Total (net emissions)⁽¹⁾	20097.66	25372.42	9329.93	1972.56	1.28	50.68	NO	NO	56824.53	27855.52	49307.83
1. Energy	62266.31	9795.18	609.73						72671.22	20 511	46 332
A. Fuel combustion (sectoral approach)	61495.00	1317.88	609.10						63421.98	19 885	43 537
1. Energy industries	17651.74	378.29	174.84						18204.87	16 026	2 179
2. Manufacturing industries and construction	13549.38	290.37	134.20						13973.96	3 859	10 115
3. Transport (3)	18094.11	387.77	179.22						18661.10	NA	18 661
4. Other sectors	11168.01	239.34	110.62						11517.96	NA	11 518
5. Other	1031.76	22.11	10.22						1064.09	NA	1 064
B. Fugitive emissions from fuels	771.31	8477.29	0.64						9249.24	626	2 795
1. Solid fuels	NO	5828.47	NO						5828.47	NA	NA
2. Oil and natural gas	771.31	2648.82	0.64						3420.77	626	2 795
C. CO ₂ transport and storage	NO								NO	NO	NO
2. Industrial processes and product use	8265.49	14.70	15.90	1972.56	1.28	50.68	NO	NO	10320.61	7 345	2 976
A. Mineral industry	4517.45								4517.45	4 255	262
B. Chemical industry	103.18	11.16	14.55	NO	NO	NO	NO	NO	128.88	70	59
C. Metal industry	3028.16	3.54	NO	NO	1.26	NO	NO	NO	3032.96	3 018	15
D. Non-energy products from fuels and solvent use	616.71	NO	NO						616.71	1	616
E. Electronic Industry				NO	NO	NO	NO	NO	NO	NA	NA
F. Product uses as ODS substitutes				1972.56	0.02	NO	NO	NO	1972.58	NA	1 973
G. Other product manufacture and use	NO	NO	1.35	NO	NO	50.68	NO	NO	52.03	NA	52
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NA	NA
3. Agriculture	147.22	9520.25	8230.28						17897.75		
A. Enteric fermentation		8359.28							8359.28		
B. Manure management		562.00	835.53						1397.53		
C. Rice cultivation		15.40							15.40		
D. Agricultural soils		NE	7225.99						7225.99		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		583.57	168.76						752.32		
G. Liming	66.29								66.29		
H. Urea application	80.93								80.93		
I. Other carbon-containing fertilizers	NO								NO		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry⁽¹⁾	-50585.72	3.15	67.81						-50514.76		
A. Forest land	-30276.66	3.15	1.65						-30271.86		
B. Cropland	-15339.26	NO	0.61						-15338.64		
C. Grassland	-1918.37	NO	59.79						-1858.57		
D. Wetlands	-278.71	NO	0.55						-278.16		
E. Settlements	676.88	NO	5.20						682.08		
F. Other land	-34.10	NO	0.00						-34.10		
G. Harvested wood products	-3415.50								-3415.50		
H. Other	NA	NA	NA						NA		
5. Waste	4.35	6039.15	406.21						6449.71		
A. Solid waste disposal	NA	4353.03							4353.03		
B. Biological treatment of solid waste		70.36	23.85						94.21		
C. Incineration and open burning of waste	4.35	0.06	1.92						6.33		
D. Waste water treatment and discharge		1615.69	380.44						1996.13		
E. Other	NA	NA	NA						NA		
6. Other (as specified in summary 1.A)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo items:											
International bunkers	534.21	0.31	0.76						535.28		
Aviation	430.07	0.03	0.01						430.11		
Navigation	104.14	0.28	0.75						105.17		
CO ₂ emissions from biomass	19299.19								19299.19		
CO ₂ captured	NO								NO		
Indirect CO ₂ ⁽²⁾	NO								NO		
Total CO₂ equivalent emissions without land use, land-use change and forestry									107339.29	27855.52419	49307.83498
Total CO₂ equivalent emissions with land use, land-use change and forestry									56824.53		
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry									NA	NA	NA
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry									NA	NA	NA

⁽¹⁾ For carbon dioxide (CO₂) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and

⁽²⁾ For Member States that report indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽³⁾ CO₂ emissions from civil aviation are treated as zero for effort sharing purposes.

⁽⁴⁾ Where applicable: please clarify the geographical scope

5.25 Sweden (submitted by member state)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories

Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999

Year 2023
Submission Country Sweden
Geographical scope⁽⁴⁾

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total	ETS	non-ETS
Total (net emissions)⁽¹⁾	36055.22	4462.27	3843.25	802.65	34.43	39.61	0.00	0.00	45237.44		
1. Energy	29932.95	243.11	529.79						30705.84	IE	
A. Fuel combustion (sectoral approach)	29272.67	191.30	528.46						29992.44	IE	
1. Energy industries	7547.84	52.83	175.41						7776.07	IE	
2. Manufacturing industries and construction	5902.67	28.37	107.63						6038.67	IE	
3. Transport (3)	13737.11	45.01	179.44						13961.57	IE	
4. Other sectors	2085.05	65.09	65.98						2216.12	IE	
5. Other	IE	IE	IE						IE	IE	
B. Fugitive emissions from fuels	660.28	51.80	1.32						713.41	IE	
1. Solid fuels	IE	IE	IE						IE	IE	
2. Oil and natural gas	IE	IE	IE						IE	IE	
C. CO ₂ transport and storage	NO								NO	IE	
2. Industrial processes and product use	5872.01	10.94	154.99	802.65	34.43	39.61	IE	NO	6914.63	IE	
A. Mineral industry	IE								IE	IE	
B. Chemical industry	IE	IE	IE	IE	NO	NO	IE	NO	IE	IE	
C. Metal industry	IE	IE	NA	0.52	34.43	NO	NA	NO	IE	IE	
D. Non-energy products from fuels and solvent use	148.55	NA	NA						IE	IE	
E. Electronic Industry				NA	NA	NA	NA	NO	NA	IE	
F. Product uses as ODS substitutes				802.13	0.00	0.00	NA	NO	802.13	IE	
G. Other product manufacture and use	NE	NA	68.50	NO	NO	39.61	NO	NO	108.11	IE	
H. Other	IE	IE	IE	IE	NO	NO	IE	IE	IE	IE	
3. Agriculture	122.77	3598.01	2947.45						6668.23		
A. Enteric fermentation		3300.95							3300.95		
B. Manure management		297.06	290.33						587.39		
C. Rice cultivation									NO		
D. Agricultural soils									IE		
E. Prescribed burning of savannas									NO		
F. Field burning of agricultural residues									NO		
G. Liming	IE								IE		
H. Urea application	IE								IE		
I. Other carbon-containing fertilizers	NO								NO		
J. Other											
4. Land use, land-use change and forestry⁽¹⁾	-43289.84	470.92	1103.87						-41715.05		
A. Forest land	-37620.06	247.80	1034.29						-36337.97		
B. Cropland	1076.13	197.33	3.12						1276.58		
C. Grassland	234.39	21.76	0.00						256.16		
D. Wetlands	239.48	4.03	0.56						244.07		
E. Settlements	1739.48		65.53						1805.02		
F. Other land	39.21	NO	0.37						39.58		
G. Harvested wood products	-8998.48								-8998.48		
H. Other	NO	NO	NO						NO		
5. Waste	127.49	610.22	211.02						948.73		
A. Solid waste disposal	NO	499.45							499.45		
B. Biological treatment of solid waste		76.88	21.61						98.49		
C. Incineration and open burning of waste	127.49	0.02	4.61						132.12		
D. Waste water treatment and discharge		33.87	184.81						218.67		
E. Other	NO	NO	NO						NO		
6. Other (as specified in summary 1.A)	IE	IE	IE	IE	IE	IE	IE	NO	NO	IE	
Memo items:											
International bunkers	8601.52	11.66	122.08						8735.26		
Aviation	1806.04	0.41	21.85						1828.29		
Navigation	6795.48	11.25	100.24						6906.96		
CO₂ emissions from biomass	NE										
CO₂ captured	NO										
Indirect CO₂⁽²⁾	NE										
Total CO₂ equivalent emissions without land use, land-use change and forestry									45237.44	17959.428	27278.01539
Total CO₂ equivalent emissions with land use, land-use change and forestry									3522.39		
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry											
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry											

⁽¹⁾ For carbon dioxide (CO₂) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and

⁽²⁾ For Member States that report indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽³⁾ CO₂ emissions from civil aviation are treated as zero for effort sharing purposes.

⁽⁴⁾ Where applicable: please clarify the geographical scope

5.26 Slovenia (submitted by member state)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories

Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999

Year 2023
Submission 2022
Country Slovenia

Geographical scope⁽⁴⁾

GREENHOUSE GAS SOURCE AND	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total	ETS	non-ETS
SINK CATEGORIES	CO ₂ equivalent (kt)									CO ₂ equivalent (Gg)	
Total (net emissions)⁽¹⁾	10214.65	1991.55	754.32	271.58	3.89	17.31	0.00	0.00	13253.30	4861.18	8392.12
1. Energy	12180.34	371.92	135.00						12687.27	4 212	8 476
A. Fuel combustion (sectoral approach)	12093.54	150.41	135.00						12378.96	4 170	8 209
1. Energy industries	3366.14	3.50	15.21						3384.86	3 230	155
2. Manufacturing industries and construction	1624.69	5.94	16.99						1647.62	940	708
3. Transport (3)	6038.22	5.25	61.08						6104.55		6 105
4. Other sectors	1059.82	135.73	41.68						1237.23		1 237
5. Other	4.67	0.00	0.04						4.71		5
B. Fugitive emissions from fuels	86.80	221.51							308.31	41	267
1. Solid fuels	86.68	180.66							267.34	41	226
2. Oil and natural gas	0.12	40.85							40.97		41
C. CO ₂ transport and storage											
2. Industrial processes and product use	760.72	0.00	96.95	271.58	3.89	17.31	0.00	0.00	1150.44	650	501
A. Mineral industry	574.12								574.12	565	9
B. Chemical industry	66.11								66.11		66
C. Metal industry	85.45				3.89				89.34	85	4
D. Non-energy products from fuels and solvent use	35.04								35.04		35
E. Electronic industry											
F. Product uses as ODS substitutes				271.58					271.58		272
G. Other product manufacture and use			96.95			17.31			114.26		114
H. Other											
3. Agriculture	31.37	1239.73	436.21						1707.30		
A. Enteric fermentation		987.71							987.71		
B. Manure management		252.02	68.36						320.38		
C. Rice cultivation											
D. Agricultural soils			367.85						367.85		
E. Prescribed burning of savannas											
F. Field burning of agricultural residues											
G. Liming	15.22								15.22		
H. Urea application	11.79								11.79		
I. Other carbon-containing fertilizers	4.35								4.35		
J. Other											
4. Land use, land-use change and forestry⁽¹⁾	-2771.75	16.17	44.15						-2711.43		
A. Forest land	-2615.26	16.17	8.47						-2590.62		
B. Cropland	145.65		4.70						150.35		
C. Grassland	-311.50		0.87						-310.63		
D. Wetlands	20.51								20.51		
E. Settlements	181.73		23.17						204.90		
F. Other land	3.84		0.29						4.13		
G. Harvested wood products	-196.72								-196.72		
H. Other											
5. Waste	13.97	363.73	42.01						419.72		
A. Solid waste disposal		197.54							197.54		
B. Biological treatment of solid waste		14.71	8.35						23.06		
C. Incineration and open burning of waste	13.97	0.00	0.07						14.04		
D. Waste water treatment and discharge		151.49	33.59						185.08		
E. Other											
6. Other (as specified in summary 1.A)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
Memo items:											
International bunkers	340.90	0.73	2.38						344.00		
Aviation	60.69	0.01	0.45						61.15		
Navigation	280.21	0.71	1.93						282.85		
CO₂ emissions from biomass	3156.26								3156.26		
CO₂ captured											
Indirect CO₂⁽²⁾											
Total CO₂ equivalent emissions without land use, land-use change and forestry									15964.73	4861.18	11103.55
Total CO₂ equivalent emissions with land use, land-use change and forestry									13253.30		
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry									15964.73	4861.18	11103.55
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry									13253.30		

⁽¹⁾ For carbon dioxide (CO₂) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always

⁽²⁾ For Member States that report indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽³⁾ CO₂ emissions from civil aviation are treated as zero for effort sharing purposes.

⁽⁴⁾ Where applicable: please clarify the geographical scope

Brief description of the key drivers underpinning the increase or decrease in GHG emissions in x-1 (proxy) compared to x-2 (inventory). If this information is publicly available please include the hyperlink to the relevant website. Information on the uncertainties associated with the estimations for the LULUCF sector may also be provided.

In 2022, GHG emissions without LULUCF decreased by -0.9 % (-142 kt CO₂ eq) compared to 2021. Emissions in the Energy sector decreased by -0.5% (-66 kt CO₂ eq). The main reason for the decrease is a strong decline of emissions from the Energy industries by -19.4% (-814 kt CO₂ eq) and a small decrease of emissions from other stationary sources, which prevailed over the strong increase of emissions in the transport sector by 17.3 % (899 kt CO₂ eq).

Emissions from IPPU increased by 3.5% (39 kt CO₂ eq). The largest decrease in emissions was in the metal industries (-30.8%, -40 kt CO₂ eq) due to the lower production because of the energy crisis. However, this decline did not exceed the increase in emissions in the other product manufacture and use by 139.6% (67 kt CO₂ eq) due to the increase in the use of N₂O.

Emissions in the agriculture sector were 5.9% lower than in the previous year. This decrease is mainly due to drought and lack of fodder, as a result of which breeders have significantly reduced their herd of cattle but also due to the updating of the methodology (IPCC 2019 Refinement).

Removals from the LULUCF sector decreased by -12.7% (394 kt CO₂ eq). The larger decrease in removals was in FLRFL due to the increase in the cut.

Emissions from the waste sector decreased by -2.1% (-9 kt CO₂ eq). The main reason for lower emissions is a decrease of emissions from SWDS by -4.2% (-9 kt CO₂ eq) while

5.27 Slovakia (submitted by member state)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories										Year	2023
Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999										Submission	2022
										Country	Slovakia
										Geographical scope ⁽⁴⁾	
GREENHOUSE GAS SOURCE AND	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total	ETS	non-ETS
SINK CATEGORIES	CO ₂ equivalent (kt)									CO ₂ equivalent (Gg)	
Total (net emissions)⁽¹⁾	23790.26	3559.11	1795.21	672.40	5.88	17.44	NO	NO	29840.31	17418.25	20295.34
1. Energy	24879.43	740.95	190.50						25810.88	10 615	15 196
A. Fuel combustion (sectoral approach)	24865.23	300.09	190.50						25355.81	10 615	14 741
1. Energy industries	6209.61	12.43	20.85						6242.89	5 428	815
2. Manufacturing industries and construction	6285.27	16.72	27.27						6329.26	5 168	1 161
3. Transport (3)	7691.07	5.81	83.44						7780.31	16	7 764
4. Other sectors	4608.11	264.52	58.59						4931.22	2	4 929
5. Other	71.17	0.61	0.35						72.13	NO	72
B. Fugitive emissions from fuels	14.20	440.86	0.00						455.06	NO	455
1. Solid fuels	13.34	156.24	NO						169.57	NO	170
2. Oil and natural gas	0.86	284.63	0.00						285.49	NO	285
C. CO ₂ transport and storage	NO								NO	NO	NO
2. Industrial processes and product use	6797.07	1.61	110.77	672.40	5.88	17.44	NO	NO	7605.18	6 803	802
A. Mineral industry	2276.27								2276.27	2 262	15
B. Chemical industry	1131.81	0.37	53.11	NO	NO	NO	NO	NO	1185.30	1 185	1
C. Metal industry	3355.17	1.24	0.19	NO	5.88	NO	NO	NO	3362.48	3 357	5
D. Non-energy products from fuels and solvent use	33.81	NO	NO						33.81	NO	34
E. Electronic Industry				NO	NO	NO	NO	NO	NO	NO	NO
F. Product uses as ODS substitutes				672.40	NO	NO	NO	NO	672.40	NO	672
G. Other product manufacture and use	NO	NO	57.48	NO	NO	17.44	NO	NO	74.92	NO	75
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3. Agriculture	72.01	1120.78	1255.89						2448.68		
A. Enteric fermentation		1020.48							1020.48		
B. Manure management		100.30	165.83						266.14		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NA	1090.06						1090.06		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		NO	NO						NO		
G. Liming	5.94								5.94		
H. Urea application	66.07								66.07		
I. Other carbon-containing fertilizers	NA								NA		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry⁽¹⁾	-7959.94	45.85	40.81						-7873.27		
A. Forest land	-6643.65	45.85	24.01						-6573.79		
B. Cropland	-1142.65	NO	8.05						-1134.61		
C. Grassland	-36.24	NO	0.25						-36.00		
D. Wetlands	NO	NO	NO						NO		
E. Settlements	80.39	NO	4.18						84.56		
F. Other land	76.37	NO	4.34						80.71		
G. Harvested wood products	-294.16								-294.16		
H. Other	NO	NO	NO						NO		
5. Waste	1.70	1649.92	197.24						1848.85		
A. Solid waste disposal	NO	1244.92							1244.92		
B. Biological treatment of solid waste		135.20	76.77						211.97		
C. Incineration and open burning of waste	1.70	0.00	0.07						1.78		
D. Waste water treatment and discharge		269.79	120.39						390.18		
E. Other	NO	NO	NO						NO		
6. Other (as specified in summary 1.A)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo items:											
International bunkers	175.99	0.08	1.41						177.48		
Aviation	158.57	0.04	1.28						159.89		
Navigation	17.42	0.05	0.12						17.59		
CO ₂ emissions from biomass	8186.69								8186.69		
CO ₂ captured	NO								NO		
Indirect CO ₂ ⁽²⁾	43.67								43.67		
Total CO₂ equivalent emissions without land use, land-use change and forestry									37713.59	17418.24803	20295.34065
Total CO₂ equivalent emissions with land use, land-use change and forestry									29840.31		
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry									37757.25	17418.24803	20339.00665
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry									29883.98		

⁽¹⁾ For carbon dioxide (CO₂) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and

⁽²⁾ For Member States that re-report indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽³⁾ CO₂ emissions from civil aviation are treated as zero for effort sharing purposes.

⁽⁴⁾ Where applicable: please clarify the geographical scope

5.28 Iceland (submitted by country)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories

Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999

Year 2023
Submission 2022
Country Iceland
Geographical scope⁽⁵⁾

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total	ETS	non-ETS
Total (net emissions)⁽¹⁾	9231.23	4394.55	244.85	128.62	71.81	3.08	NO	NO	14074.14	1875.08	12199.06
1. Energy	1797.62	7.91	16.92						1822.45	8	1 815
A. Fuel combustion (sectoral approach)	1611.58	2.90	16.92						1631.40	8	1 624
1. Energy industries	10.52	0.01	0.02						10.56		
2. Manufacturing industries and construction	127.53	0.30	3.75						131.58	8	124
3. Transport (3)	966.91	1.24	7.65						975.80		
4. Other sectors	505.87	1.35	5.49						512.71		
5. Other	0.75	0.00	0.00						0.75		
B. Fugitive emissions from fuels	186.04	5.01	0.00						191.04		
1. Solid fuels	NO	NO	NO						NO		
2. Oil and natural gas	186.04	5.01	0.00						191.04		
C. CO ₂ transport and storage	NO								NO		
2. Industrial processes and product use	1802.19	4.49	1.78	128.62	71.81	3.08	NO	NO	2011.99	1 867	145
A. Mineral industry	0.94								0.94		
B. Chemical industry	NO	NO	NO	NO	NO	NO	NO	NO	NO		
C. Metal industry	1795.71	4.46	NO	NO	71.75	NO	NO	NO	1871.92	1 867	4
D. Non-energy products from fuels and solvent use	5.52	NO	NO						5.52		
E. Electronic Industry				NO	NO	NO	NO	NO	NO		
F. Product uses as ODS substitutes				128.62	0.06	NO	NO	NO	128.69		
G. Other product manufacture and use	0.02	0.03	1.78	NO	NO	3.08	NO	NO	4.92		
H. Other	NA	NA	NA	NO	NO	NO	NO	NO	NO		
3. Agriculture	5.39	381.09	217.07						603.55		
A. Enteric fermentation		316.42							316.42		
B. Manure management		64.67	12.17						76.84		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NA	204.90						204.90		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		NO	NO						NO		
G. Liming	2.89								2.89		
H. Urea application	1.56								1.56		
I. Other carbon-containing fertilizers	0.95								0.95		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry⁽¹⁾	5615.59	3755.01	1.00						9371.60		
A. Forest land	-521.40	0.86	0.76						-519.78		
B. Cropland	1896.79	106.99	NO						2003.79		
C. Grassland	5285.01	469.23	0.10						5754.34		
D. Wetlands	-1056.70	3177.92	NO						2121.23		
E. Settlements	12.00	NO	0.14						12.14		
F. Other land	NO	NO	NO						NO		
G. Harvested wood products	-0.11								-0.11		
H. Other	NO	NO	NO						NO		
5. Waste	10.43	246.05	8.07						264.55		
A. Solid waste disposal	NO	200.32							200.32		
B. Biological treatment of solid waste		3.79	1.76						5.55		
C. Incineration and open burning of waste	10.43	0.40	0.30						11.12		
D. Waste water treatment and discharge		41.54	6.02						47.56		
E. Other	NO	NO	NO						NO		
6. Other (as specified in summary 1.A)	NO	NO	NO	NO	NO	NO	NO	NO	NO		
Memo items:											
International bunkers	1040.59	0.96	7.63						1049.18		
Aviation	730.88	0.14	5.42						736.44		
Navigation	309.71	0.82	2.21						312.74		
CO₂ emissions from biomass									0.00		
CO₂ captured									0.00		
Indirect CO₂⁽²⁾											
Total CO₂ equivalent emissions without land use, land-use change and forestry									4702.54	1875.077	2827.462962
Total CO₂ equivalent emissions with land use, land-use change and forestry									14074.14		
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry									NA		
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry									NA		

⁽¹⁾ For carbon dioxide (CO₂) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and

⁽²⁾ For Member States that report indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽³⁾ CO₂ emissions from civil aviation are treated as zero for effort sharing purposes.

⁽⁴⁾ Where applicable: please clarify the geographical scope

5.29 Norway (submitted by country)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories										Year	2023	
Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999										Submission	2022	
										Country	Norway	
										Geographical scope ⁽⁴⁾		
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total	ETS	non-ETS	
CO ₂ equivalent (kt)										CO ₂ equivalent (Gg)		
Total (net emissions)⁽¹⁾	24635.82	5399.97	2319.71	628.42	122.19	62.25	NO	NO	33168.37	NA		
1. Energy	32430.30	1087.59	205.94						33723.83	14 497	19 226	
A. Fuel combustion (sectoral approach)	30854.99	501.42	204.38						31560.80	13 640	17 921	
1. Energy industries	12787.17	68.71	29.40						12885.28	12 493	392	
2. Manufacturing industries and construction	2782.04	14.60	30.56						2827.20	1 147	1 681	
3. Transport (3)	12459.89	140.23	110.52						12710.64	0	12 711	
4. Other sectors	2735.65	277.84	33.17						3046.66	0	3 046	
5. Other	90.23	0.04	0.73						91.01	0	91	
B. Fugitive emissions from fuels	1575.31	586.17	1.56						2163.03	844	1 319	
1. Solid fuels	0.00	78.20	0.00						78.20	0	78	
2. Oil and natural gas	1561.74	507.98	1.56						2071.27	844	1 227	
C. CO ₂ transport and storage	13.57								13.57	14	0	
2. Industrial processes and product use	8034.21	24.08	246.01	628.42	122.19	62.25	NO	NO	9117.16	8 077	1 040	
A. Mineral industry	986.18								986.18	985	2	
B. Chemical industry	1683.32	22.68	227.42	0.00	0.00	0.00	NO	NO	1933.43	1 861	73	
C. Metal industry	5147.03	1.40	4.10	0.00	122.19	0.00	NO	NO	5274.72	5 222	52	
D. Non-energy products from fuels and solvent use	105.19	0.00	0.00						105.19	0	105	
E. Electronic Industry				0.00	0.00	1.18	NO	NO	1.18	0	1	
F. Product uses as ODS substitutes				628.42	0.00	0.00	NO	NO	628.42	0	628	
G. Other product manufacture and use	0.00	0.00	14.48	0.00	0.00	61.07	NO	NO	75.55	0	76	
H. Other	112.49	0.00	0.00	0.00	0.00	0.00	NO	NO	112.49	9	104	
3. Agriculture	121.74	2917.07	1566.38						4605.19			
A. Enteric fermentation		2516.56							2516.56			
B. Manure management		397.06	142.49						539.55			
C. Rice cultivation		NO							NO			
D. Agricultural soils		0.00	1423.05						1423.05			
E. Prescribed burning of savannas		NO	NO						NO			
F. Field burning of agricultural residues		3.44	0.85						4.29			
G. Liming	121.56								121.56			
H. Urea application	0.17								0.17			
I. Other carbon-containing fertilizers	NO								NO			
J. Other	NO	NO	NO						NO			
4. Land use, land-use change and forestry⁽¹⁾	-15951.11	211.49	242.34						-15497.28			
A. Forest land	-20415.55	57.85	161.03						-20196.66			
B. Cropland	2230.98	101.66	4.26						2336.91			
C. Grassland	172.65	13.89	2.12						188.66			
D. Wetlands	364.51	10.12	31.35						405.98			
E. Settlements	1925.56	NO	13.12						1938.68			
F. Other land	NO	NO	NO						NO			
G. Harvested wood products	-229.26								-229.26			
H. Other	NO	27.97	22.99						50.96			
5. Waste	0.69	1159.74	59.04						1219.47			
A. Solid waste disposal	0.00	875.13							875.13			
B. Biological treatment of solid waste		56.45	14.59						71.04			
C. Incineration and open burning of waste	0.69	0.09	0.02						0.80			
D. Waste water treatment and discharge		228.07	44.43						272.50			
E. Other	NO	NO	NO						NO			
6. Other (as specified in summary 1.A)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Memo items:												
International bunkers	2386.64	43.49	36.69						2466.81			
Aviation	1352.91	0.27	19.67						1372.85			
Navigation	1033.73	43.22	17.01						1093.96			
CO ₂ emissions from biomass	5448.60								5448.60			
CO ₂ captured	261.07								261.07			
Indirect CO ₂ ⁽²⁾	252.01								252.01			
Total CO₂ equivalent emissions without land use, land-use change and forestry										48665.65	22574.27294	26091.37546
Total CO₂ equivalent emissions with land use, land-use change and forestry										33168.37		
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry										48917.66	22574.27294	26343.38515
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry										33420.38		

⁽¹⁾ For carbon dioxide (CO₂) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and

⁽²⁾ For Member States that report indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽³⁾ CO₂ emissions from civil aviation are treated as zero for effort sharing purposes.

⁽⁴⁾ Where applicable: please clarify the geographical scope

5.30 Switzerland (submitted by country)

Implementing Regulation Article 7: Reporting on approximated Greenhouse Gas Inventories										Year	2023
Member States shall report their approximated greenhouse gas inventories pursuant to Article 26(2) of Regulation (EU) 2018/1999										Submission	2022
										Country	Switzerland
										Geographical scope ⁽⁴⁾	
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	HFCs	PFCs	SF ₆	Unspecified mix of HFCs and PFCs	NF ₃	Total	ETS	non-ETS
	CO ₂ equivalent (kt)									CO ₂ equivalent (Gg)	
Total (net emissions)⁽¹⁾	32782.25	4898.36	2458.86	1206.13	28.54	85.84	NO	0.37	41460.35		
1. Energy	30657.55	128.30	221.53						31007.39	NE	
A. Fuel combustion (sectoral approach)											
1. Energy industries											
2. Manufacturing industries and construction											
3. Transport (3)											
4. Other sectors											
5. Other											
B. Fugitive emissions from fuels											
1. Solid fuels											
2. Oil and natural gas											
C. CO ₂ transport and storage											
2. Industrial processes and product use	2058.83	6.85	36.25	1206.13	28.54	85.84	NO	0.37	3422.81	NE	
A. Mineral industry											
B. Chemical industry											
C. Metal industry											
D. Non-energy products from fuels and solvent use											
E. Electronic Industry											
F. Product uses as ODS substitutes											
G. Other product manufacture and use											
H. Other											
3. Agriculture	44.13	4239.15	1617.77						5901.05		
A. Enteric fermentation											
B. Manure management											
C. Rice cultivation											
D. Agricultural soils											
E. Prescribed burning of savannas											
F. Field burning of agricultural residues											
G. Liming											
H. Urea application											
I. Other carbon-containing fertilizers											
J. Other											
4. Land use, land-use change and forestry⁽¹⁾	NE	NE	NE						NE		
A. Forest land											
B. Cropland											
C. Grassland											
D. Wetlands											
E. Settlements											
F. Other land											
G. Harvested wood products											
H. Other											
5. Waste	8.68	523.28	582.78						1114.75		
A. Solid waste disposal											
B. Biological treatment of solid waste											
C. Incineration and open burning of waste											
D. Waste water treatment and discharge											
E. Other											
6. Other (as specified in summary 1.A)	13.05	0.78	0.52	NO	NO	NO	NO	NO	14.35	NE	
Memo items:											
International bunkers	NE	NE	NE						NE		
Aviation											
Navigation											
CO₂ emissions from biomass											
CO₂ captured											
Indirect CO₂⁽²⁾	112.86										
Total CO₂ equivalent emissions without land use, land-use change and forestry									41460.35	NE	
Total CO₂ equivalent emissions with land use, land-use change and forestry									NE		
Total CO₂ equivalent emissions, including indirect CO₂, without land use, land-use change and forestry									41573.21	NE	
Total CO₂ equivalent emissions, including indirect CO₂, with land use, land-use change and forestry									NE		

⁽¹⁾ For carbon dioxide (CO₂) from land use, land-use change and forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and

⁽²⁾ For Member States that report indirect CO₂ the national totals shall be provided with and without indirect CO₂.

⁽³⁾ CO₂ emissions from civil aviation are treated as zero for effort sharing purposes.

⁽⁴⁾ Where applicable: please clarify the geographical scope

Annex 2: List of abbreviations

Abbreviation	Name
AR4	IPCC Fourth Assessment Report: Climate Change 2007
BP	British Petroleum
CH ₄	Methane
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
CRF	Common reporting format
EC	European Commission
EEA	European Environment Agency. The EEA has 32 member countries: the 27 European Union Member States together with Iceland, Liechtenstein, Norway, Switzerland and Turkey
ESD	Effort Sharing Decision
ETC CM	European Topic Centre for Climate Change Mitigation
ETS	Emissions Trading System
EU	European Union
EU27	Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden
EUTL	European Union Transaction Log
F-gas	Fluorinated greenhouse gas; umbrella term including HFC, PFC, SF ₆ and NF ₃
GDP	Gross domestic product
GHG	Greenhouse gas
GWP	Global warming potential
HDD	Heating degree days
HFCs	Hydrofluorocarbons
IEA	International Energy Agency
IEF	Implied emission factor
kt	Kilotons (thousand tonnes)
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial processes and product use
LULUCF	Land use, land-use change and forestry
MMR	Monitoring Mechanism Regulation (Regulation (EU) 525/2013)
Mt	Megatons (million tonnes)
N ₂ O	Nitrous oxide
NF ₃	Nitrogen trifluoride
ODS	Ozone-depleting substance
PEC	Primary Energy Consumption
PFCs	Perfluorocarbons
QA/QC	Quality assurance and quality control
QELRC	Quantified emission limitation and reduction commitment
SF ₆	Sulphur Hexafluoride
UNFCCC	United Nations Framework Convention on Climate Change

Annex 3: Abbreviations of member states and EEA countries included in this report

AT	Austria
BE	Belgium
BG	Bulgaria
CH	Switzerland
CY	Cyprus
CZ	Czechia
DE	Germany
DK	Denmark
EE	Estonia
ES	Spain
FI	Finland
FR	France
EL	Greece
HR	Croatia
HU	Hungary
IE	Ireland
IT	Italy
IS	Iceland
LT	Lithuania
LU	Luxembourg
LV	Latvia
MT	Malta
NL	Netherlands
PL	Poland
PT	Portugal
RO	Romania
SE	Sweden
SI	Slovenia
SK	Slovakia
UK	United Kingdom
CH	Switzerland
NO	Norway
IS	Iceland

European Topic Centre on
Climate change mitigation

<https://www.eionet.europa.eu/etcs/etc-cm>

The European Topic Centre on Climate change mitigation (ETC-CM) is a consortium of European institutes under contract of the European Environment Agency.

European Environment Agency
European Topic Centre
Climate change mitigation

