ETC CM Report 2022/4

Approximated EU greenhouse gas inventory

Proxy GHG emission estimates for 2021

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Contents

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Executive summary

This report provides GHG emissions estimates for the EU including 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 emissions have increased by 158 million tonnes of CO_2 equivalents, or 4.8 % (total GHG emissions without LULUCF, including indirect CO_2, without international aviation) between 2020 and 2021. International aviation equalled for EU27 to 68 million tonnes of CO_2 equivalents in 2021, which is about 21.9 % higher than in 2020. Emissions including international aviation across the EU27 increased by 5.1 % compared to 2020. This is a reduction of 28.1 % when compared to 1990. Table ES-1 provides details on the total levels of emissions including international aviation.

It is important to note that 2021 emissions are below 2019 level (-5.6 %; total GHG emissions without LULUCF, including indirect CO_2, with international aviation). After exceptionally high reductions in 2020 caused partly by the reduction in economic activity due to the COVID-19 pandemic, emissions in 2021 follow the trend visible between years 2017 and 2019. ETS emissions (mostly covering emissions from electricity and heat production) have increased more than the Effort Sharing emissions.

The changes in 2021 are caused by number of reasons, whereby is important to mention increase in total energy consumption. Nevertheless the share of renewable sources also kept the increasing trend. Changes in the fuels consumed in 2021 doesn't follow the weather conditions as much as in previous years.

Table ES-1 Emissions including international aviation (kt CO2 eq.)

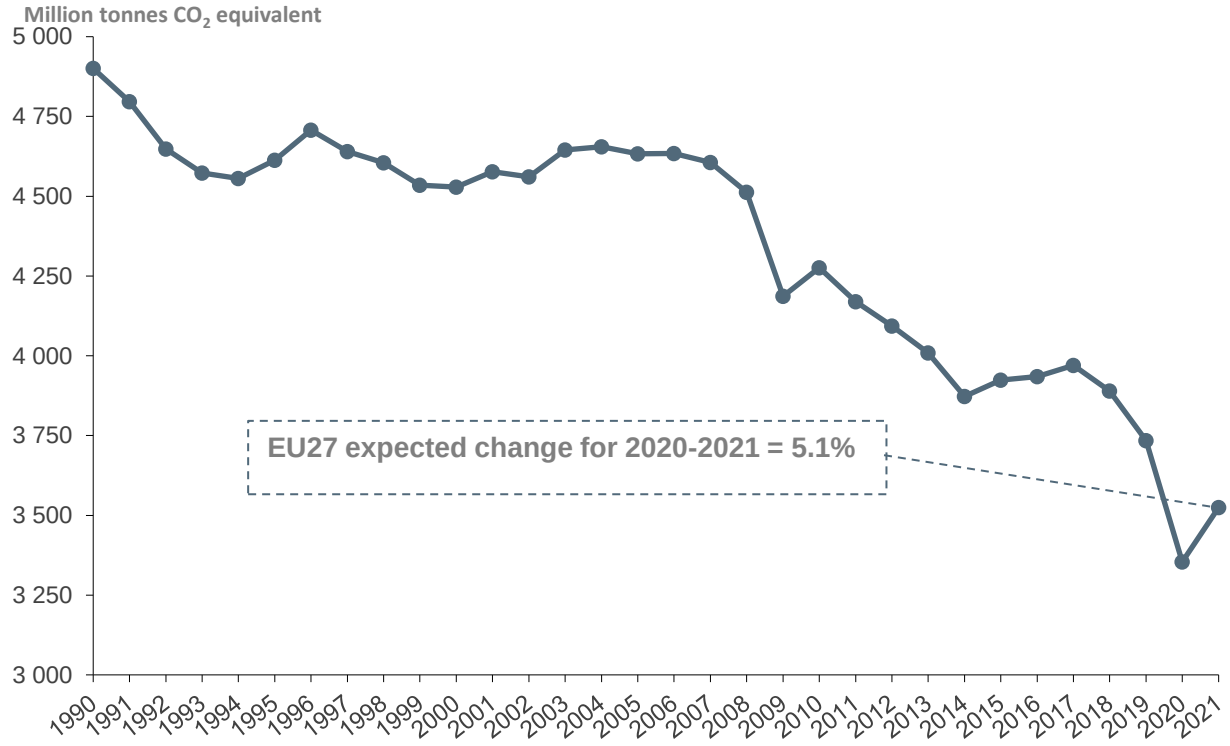
European Union (EU27)	1990	2020	2021	2021-2020	2021/2020	2021-1990	2021/1990
Total excl. LULUCF incl. indirect CO_2	4 846 617	3 298 236	3 456 699	158 463	4.80%	-1 389 918	-28.68%
International aviation	53 984	55 879	68 092	12 213	21.86%	14 108	26.13%
Total CO_2eq. including international aviation	4 900 600	3 354 115	3 524 790	170 675	5.09%	-1 375 810	-28.07%

Changes in GHG emissions across the EU

The estimates for 2021 indicate the change in trend. Emissions levelled off between 2014 and 2017 (Figure ES-1), then decreased strongly between 2017 and 2020 and the estimate for 2021 shows 5.1 % increase compared to 2020 emissions level, but still continue the downward trend from 2019.

For EU27 the 2021 emissions are estimated to be 3525 million tonnes of CO_2 equivalents (Mt CO_2 eq.), which indicates an increase from 2020 of 171 million tonnes of CO_2 equivalents (Mt CO_2 eq.).

Figure ES-1 Trends in total GHG emissions, 1990-2021

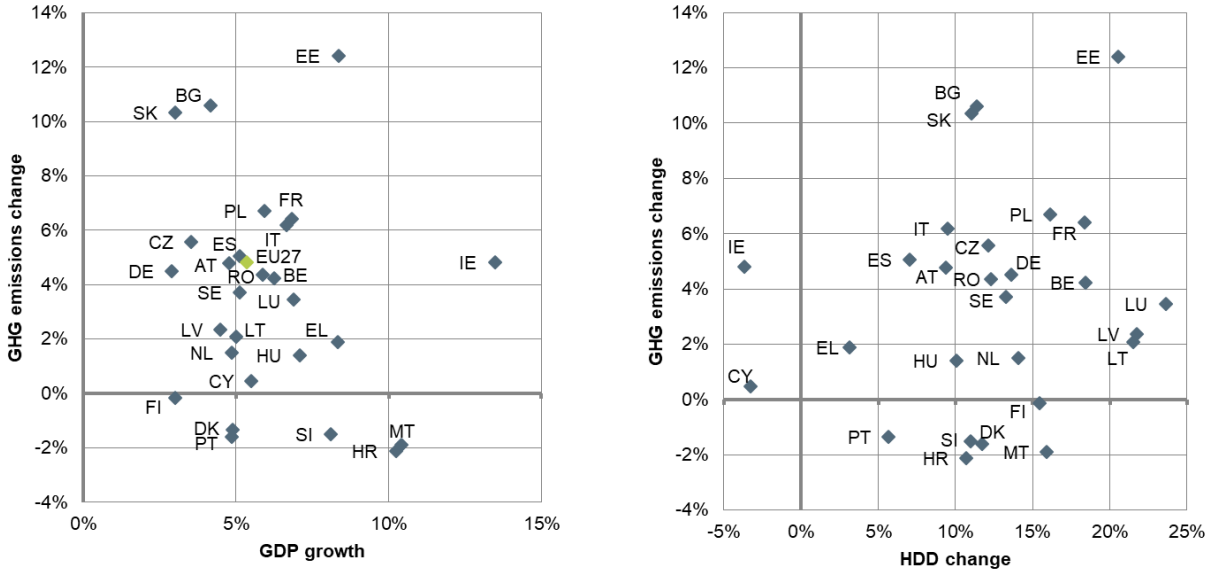


Source: The EEA's ETC CM, based on the 2022 Member States' GHG inventories submitted to UNFCCC for the years 1990-2020 and proxy estimates for 2021.

Note: Total GHG emissions without LULUCF including indirect CO_2 and international aviation

The trend shows 5.1 % increase in emissions for the EU27 (total with international aviation) since 2020 and the GDP growth is showing correspondingly positive trend of 5.4 % in the same year (Figure ES-2). It can be seen that Member States economics and GHG emissions as well aren't so strongly affected in 2021 by COVID-19 pandemic as in 2020. Only six Member States achieved decreases in emissions while all EU countries had positive GDP growth.

Figure ES-2 GHG emissions, GDP growth and heating degree days change 2020-2021



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.

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

Climatic factors have a significant effect on energy demand and GHG emission trends. The globally exceptionally warm years were 2015, 2016, 2017, 2018, 2019, 2020 and 2021. In Europe, the annual mean temperature in 2021 was 1°C lower than in 2020, the warmest year on record (Copernicus, 2022). Winter in 2021 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 higher heating demand in 2021 compared to 2020 when winter was exceptionally warm. The highest amount of cooling degree days in 2021 was observed for Malta, Cyprus and Greece, as it is to be expected for these countries. Figure ES-2 also shows that in the six Member States heating degree days increased while total emissions decreased and in two Member States heating degree days decreased while GHG emissions increased.

Changes in EU GHG emissions by sector

On a sectoral basis, the largest absolute emission increase in the EU occurred in the energy sector (i.e. all combustion activities and fugitive emissions). Energy related emissions increased by 153 Mt CO_2 eq. (+6.2 %) across the EU. Within the energy sector, emissions increased in all categories except 1.B Fugitive emissions from fuels. The most significant increase is for energy industries (+57 Mt CO_2 eq.), which are followed by transport (+56 Mt CO_2 eq.). Fugitive emissions from fuels decreased by 0.5 Mt CO_2 eq.

These changes in emissions in 2021 reflect large changes in the fuel mix. Primary fossil energy consumption increased in 2021, and the contribution of coal to the energy mix increased in 2021 while the share of gas and renewable fuels decreased. Solar (12.4 %) and solid biofuels (+ 7.9 %) contributed the most to the increase in renewable electricity, while wind (-3.1 %) and hydro (-1.4 %) decreased. Primary energy consumption of nuclear energy increased as well as its contribution to the energy mix.

The consumption of all fossil fuels; solid, liquid and gaseous; increased in 2021. The consumption of gaseous fuels increased by 3.8 %, consumption of liquid fuels increased more significantly by 4.4 % and solid fossil fuels consumption increased even more significantly by 13.7 % (EEA 2022 c).

The emissions from the sector Industrial Processes and Product Use increased by 2.6 % between 2020 and 2021 in the EU27. The largest contribution to this emission increase was from metal industry, which increased by 14.4 %.

Agriculture emissions decreased by 0.4 % mainly due to emission decreases from agricultural soils and also enteric fermentation, manure management and urea application.

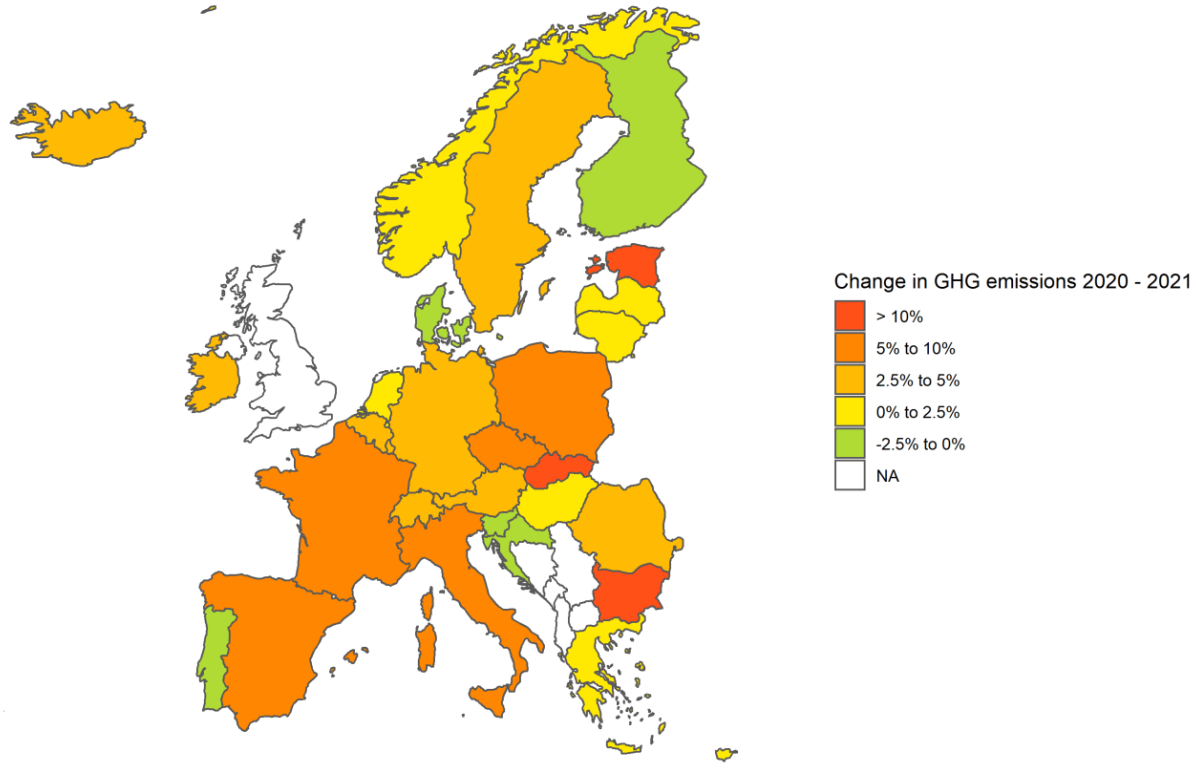
The trend in emissions from waste (−1.3 % compared to previous year) continues the decrease seen in previous years with largest reduction being in emissions from solid waste disposal.

Reporting under the Monitoring Mechanism Regulation requires separate detail for the EU ETS and non-ETS sectors. Between 2020 and 2021 the emissions increased by 6.8 % across stationary installations covered by the European Emissions Trading System for the EU, whereas emissions covered by the Effort Sharing legislation increased by 3.5 %.

Changes in member state's GHG emissions

Greenhouse gas emissions decreased only in six EU Member States in 2021. Figure ES-3 depicts the regional distribution of these changes which differ significantly between different regions.

Figure ES-3 Regional trends in total GHG emissions change 2020-2021



Comparing the changes across Member States (figure ES-4), the largest absolute emission change occurred in Germany, where emissions increased by 33 Mt CO_2 eq. Apparent increase in emissions occurred also for France (+25 Mt CO_2 eq.), Poland (+25 Mt CO_2 eq.), Italy (+24 Mt CO_2 eq.) and Spain (+14 Mt CO_2 eq.). The largest relative increases were in Estonia (+12.4 %), Bulgaria (+10.6 %) and Slovakia (10.3 %).

The largest relative declines in emissions compared to the previous year took place in Croatia (-2.1 %).

In the non-EU member countries of the EEA, emissions increased in Switzerland (+4.0 %, or +2 Mt CO_2 eq.), Iceland (+3.0 % or +0.1 Mt CO_2 eq.) and Norway (+0.2 % or +0.1 Mt CO_2 eq.).

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. Iceland is not an EU Member State but has to report its approximated inventory, where possible, as any other EU Member State. 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 Kyoto Protocol and the UNFCCC excluding the land use, land-use change and forestry (LULUCF) sector but including indirect CO_2.

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. The agriculture and waste sectors are based on GHG projections submitted by Member States in even years. The estimates assume no change in methodologies as compared to the latest official inventory submissions to the UNFCCC for the year *t*-2. 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 Decision/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 63% of the total EU emissions (EEA 2022).

The official submission of 2021 inventories to the United Nations Framework Convention on Climate Change (UNFCCC) will take place in 2023.

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 (draft) and 30 May(final)	*t*-2	EU and its 27 Member States + UK, Iceland	All gases and sectors (100% of emissions)	EU MMR (525/2013)
Approximated / Proxy GHG inventory	EEA, DG Climate Action	31 October	*t*-1	EU and its 27 Member States, Iceland and other EEA member countries when available	All gases and sectors (100% of emissions)	EU Regulation (2018/1999)
EU ETS	EEA, DG Climate Action	Early April, May and summer (between July and September)	*t*-1	EU27, UK, Iceland and other EEA member countries	About 9,500 installations (~39% of total emissions)	EU ETS Directive (2003/87/EC)
CO_2 early estimates from fossil fuel combustion	Eurostat	April / May	*t*-1	EU and its 27 Member States + UK	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	t-2	EU27 + UK	Six greenhouse gases including CO_2 and seven air pollutants	Regulation (EU) 691/2011 (Annex I)
EDGAR global database	DG JRC	August / September	*t*-1	Global coverage	All gases and sectors (100% of emissions)	JRC's work programme

2 European GHG emissions in 2021

A total of twenty-six Member States submitted preliminary 2021 GHG data to the European Commission and the EEA by 31 July 2022. 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[1] complete CRF Summary2 tables. The methodologies used for any gap-filling are described in chapter 4.4.

These 26 countries that submitted 2021 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 2021 GHG data by 31 July 2022: Iceland, Switzerland and Norway.[2]

Approximated GHG inventories in CRF Summary 2 table format are presented for the EU27 in chapter 2.1.5.

Annex 1: Detailed results for each Member State provides the CRF Summary 2 tables for each of the 27 EU Member States and also for Iceland, Switzerland and Norway.

Trend and overall results

2.1.1 Changes in GHG emissions across the EU

The estimates for 2021 indicate the change in trend. Emissions levelled off between 2014 and 2017 (Figure 2-1), then decreased strongly between 2017 and 2020 and the estimate for 2021 shows 5.1% increase compared to 2020 emissions level, but still continue the downward trend from 2019.

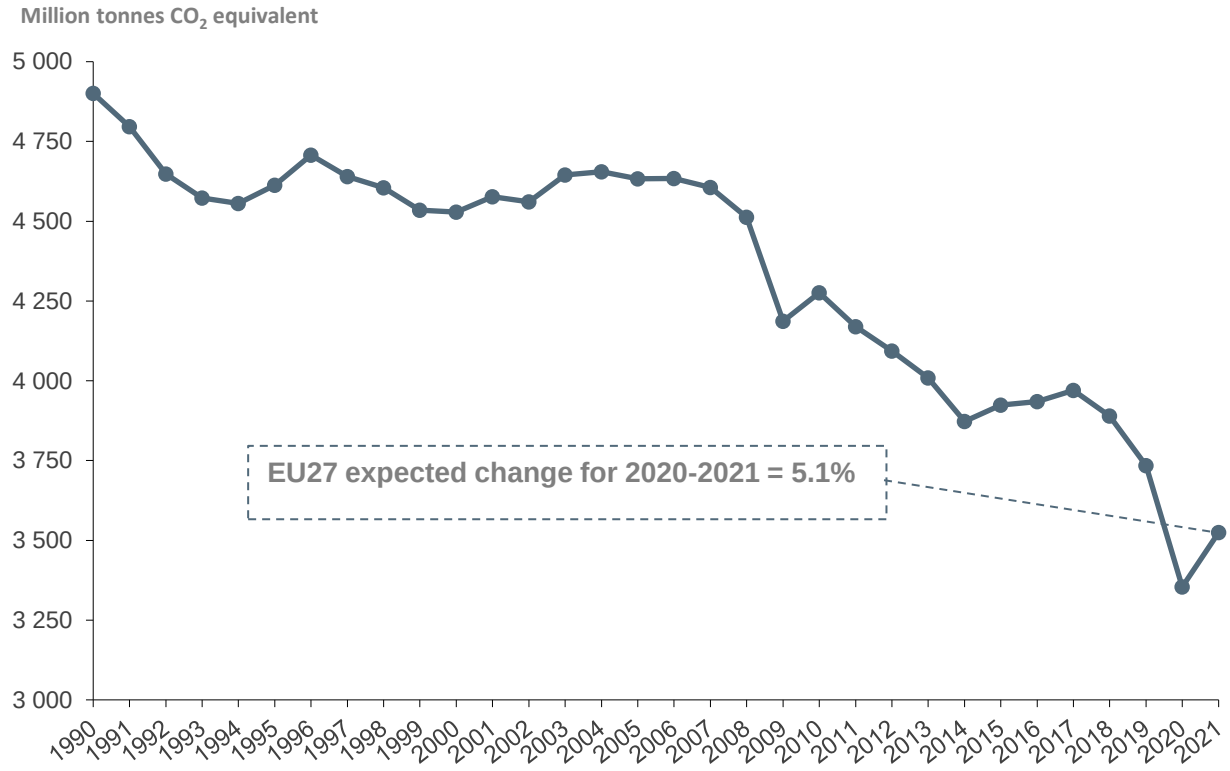
For EU27 the 2021 emissions are estimated to be 3525 million tonnes of CO_2 equivalents (Mt CO_2 eq.), which indicates an increase from 2020 of 171 million tonnes of CO_2 equivalents (Mt CO_2 eq.).

International aviation equalled for EU27 to 68 million tonnes of CO_2 equivalents in 2021, which shows an increase of 21.9% in comparison to the 2020 levels.

(1) 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.

(2) 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.

Figure 2-1 Trends in total GHG emissions, 1990-2021

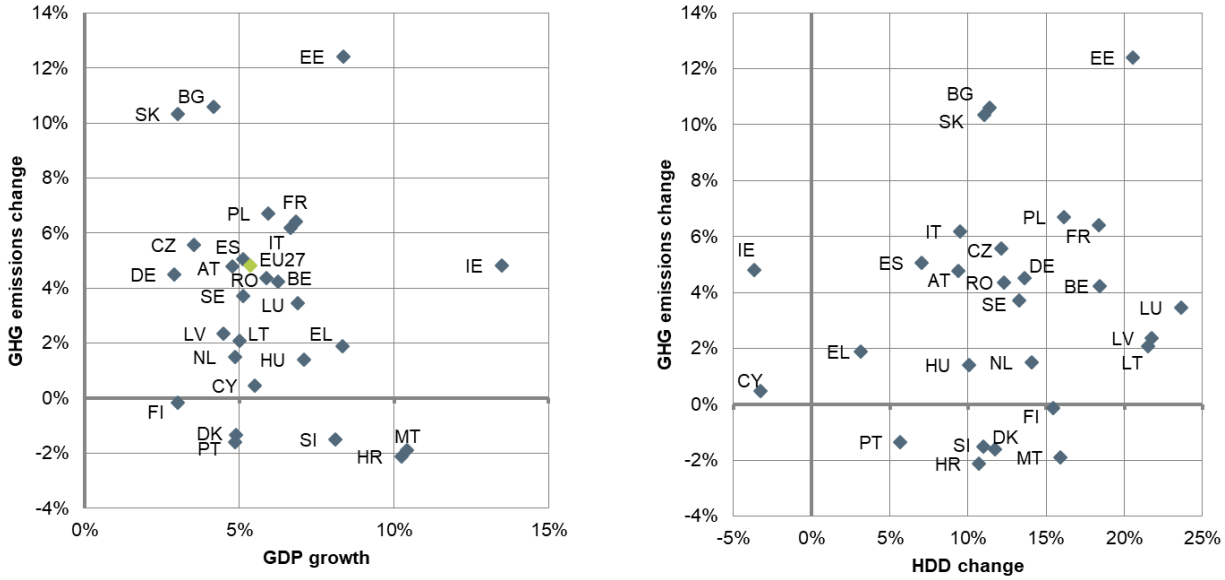


Note: Total GHG emissions without LULUCF including indirect CO_2 and international aviation

Source: The EEA's ETC CM, based on the 2022 Member States' GHG inventories submitted to UNFCCC for the years 1990-2020 and proxy estimates for 2021.

The trend shows 5.1% increase in emissions for the EU27 (total with international aviation) since 2020 and the GDP growth is showing correspondingly positive trend of 5.4% in the same year (Figure 2-2). It can be seen that Member States economics and GHG emissions as well aren't so strongly affected in 2021 by COVID-19 pandemic as in 2020. Only six Member States achieved decreases in emissions while all EU countries had positive GDP growth.

Figure 2-2 GHG emissions, GDP growth and heating degree days change 2020-2021



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 2015, 2016, 2017, 2018, 2019, 2020 and 2021. In Europe, the annual mean temperature in 2021 was 1°C lower than in 2020, the warmest year on record (Copernicus, 2022). Winter in 2021 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 higher heating demand in 2021 compared to 2020 when winter was exceptionally warm. The highest amount of cooling degree days in 2021 was observed for Malta, Cyprus and Greece, as it is to be expected for these countries. Figure 2-2 also shows that in the six Member States heating degree days increased while total emissions decreased and in two 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 increased by 153 Mt CO_2 eq. (+6.2%) across the EU. Within the energy sector, emissions increased in energy industries (+57 Mt CO_2 eq.), particularly in heat and electricity production, in manufacturing industries and construction (+24 Mt CO_2 eq.), in transport (+56 Mt CO_2 eq.), in residential and commercial (+16 Mt CO_2 eq.). Only fugitive emissions from fuels decreased (-0.5 Mt CO_2 eq.).

These changes in emissions in 2021 reflect changes in the fuel mix. Primary fossil energy consumption increased in 2021, and the contribution of coal to the energy mix increased in 2021 while the share of gas and renewable fuels decreased. Solar (+12.4%) and solid biofuels (+7.9%) contributed the most to the increase in renewable electricity while wind (-3.1%) and hydro (-1.4%) decreased. Primary energy consumption of nuclear energy increased as well as its contribution to the energy mix.

Consumption of coal, oil, gas and nuclear energy are primary energy consumption[3] values from the ETC energy efficiency proxy 2022. Renewable energy values are from the ETC RES proxy 2022. Hydro and wind are normalised. (EEA 2022a, EEA 2022b).

The consumption of all fossil fuels; solid, liquid and gaseous; increased in 2021. The consumption of gaseous fuels increased by 3.8% while consumption of liquid fuels increased more significantly by 4.4% and solid fossil fuels consumption increased even more significantly by 13.4%.

The gaseous fuels consumption increased in seventeen Member States with highest increases in Belgium (+12.6%), Slovakia (11.9%) and Latvia (8.0%). In eight Member States gaseous fuels consumption fell with the largest decrease in the Netherlands (-4.9%) followed by Portugal (−4.2%) and Ireland (-4.1%).

Liquid fossil fuels consumption increased in 22 Member States with the largest increases being in Italy (+16.2%), Hungary (+10.8%) and Czechia (+10.0%). In five Member States liquid fossil fuels consumption decreased with the largest decrease in Germany (-5.1%).

Seven Member States showed decreasing solid fossil fuel consumption. The largest decreases were in Portugal (-65.5%), Latvia (-24.4%) and Hungary (-18.5%). Solid fossil fuel consumption increased in nineteen Member States with highest increases in Cyprus (+196.1%), Ireland (+44.6%) and Denmark (+39.0%). 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.

Renewable electricity generation continues to play an important role in GHG mitigation efforts by the EU and its Member States. Hydroelectric generation decreased by -1.4% across the EU with twelve Member States experiencing higher hydro electricity production in 2021 than in 2020. Hydro production decreased in thirteen Member States. The largest absolute decreases in pure hydro generation without pumping were in France, Italy and Spain. The largest absolute increases in pure hydro generation without pumping were in Greece, Romania and Bulgaria.

Electricity production from renewable sources stayed stagnant. Gross electricity generation from wind energy decreased by -3.1% in the EU across fourteen Member States. The largest relative increases were in Croatia (+20.3%), Netherlands (+17.2%) and Greece (+12.6%). 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 (24) and production grew by 12.7% across Europe, with very large relative increases in Estonia (+148.7%), Poland (+101.7%) and Cyprus (+61.4%). The largest absolute generation from photovoltaics was in Germany followed by Italy and Spain.

In 2021 nuclear energy production across the EU increased by 7.1% compared to 2020. Nuclear electricity generation increased in seven Member States. The highest increase was in Belgium (+46.1%), followed by France (+7.5%), Sweden (+7.3%) and Germany (+7.3%). Nuclear electricity generation decreased in six Member States. The largest decreases in nuclear electricity generation occurred in Slovenia (−10.2%) followed by the Netherlands (-6.8%) and Spain (-3.0%).

The emissions from the sector Industrial Processes and Product Use increased by 2.6% between 2020 and 2021 in the EU27. The largest contribution to this emission increase was from metal industry, which increased by 9.3%.

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

Agriculture emissions decreased by 0.4% mainly due emission decreases from agricultural soils, and also enteric fermentation, manure management and urea application.

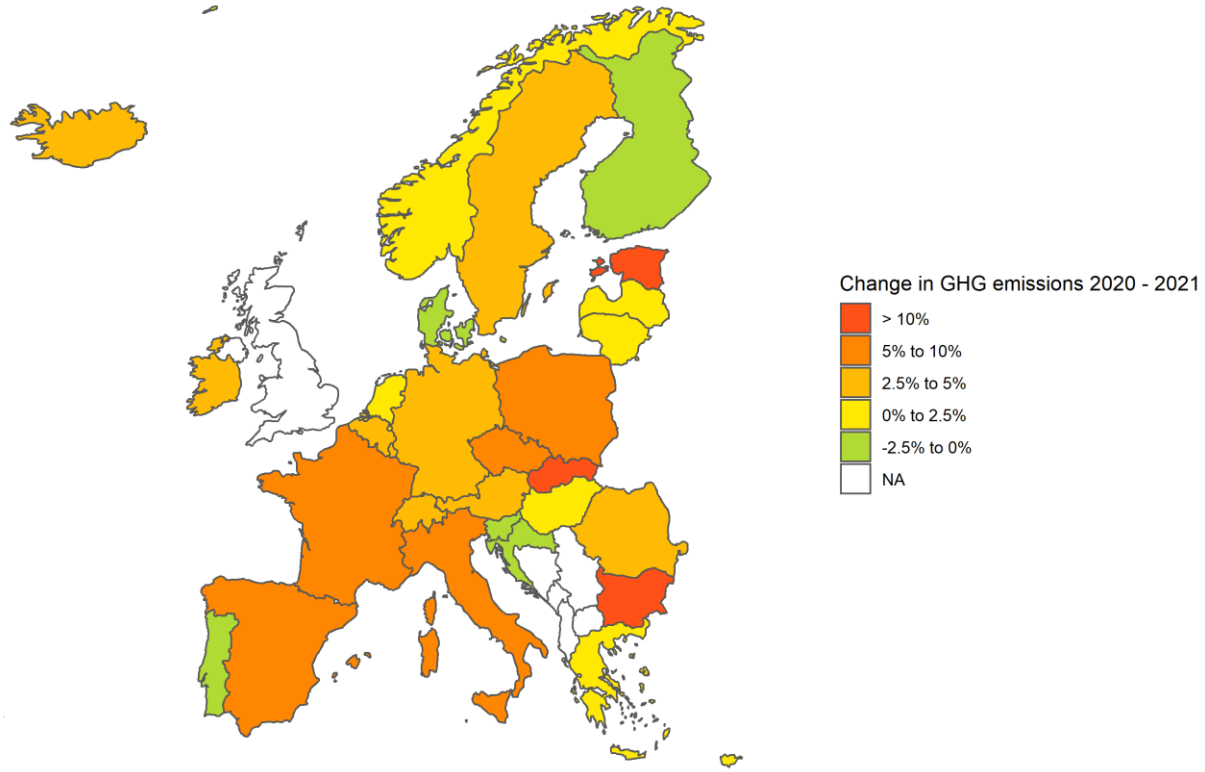
The trend in emissions from waste (−1.3% compared to previous year) continues the decrease seen in previous years with largest reduction being in emissions from solid waste disposal.

Between 2020 and 2021 the emissions increased by 6.8% across stationary installations covered by the European Emissions Trading System for the EU, whereas emissions covered by the Effort Sharing legislation increased by 3.5%.

2.1.3 Changes in member states GHG emissions 2020 to 2021

Greenhouse gas emissions decreased only in six EU Member States in 2021. 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 2020-2021

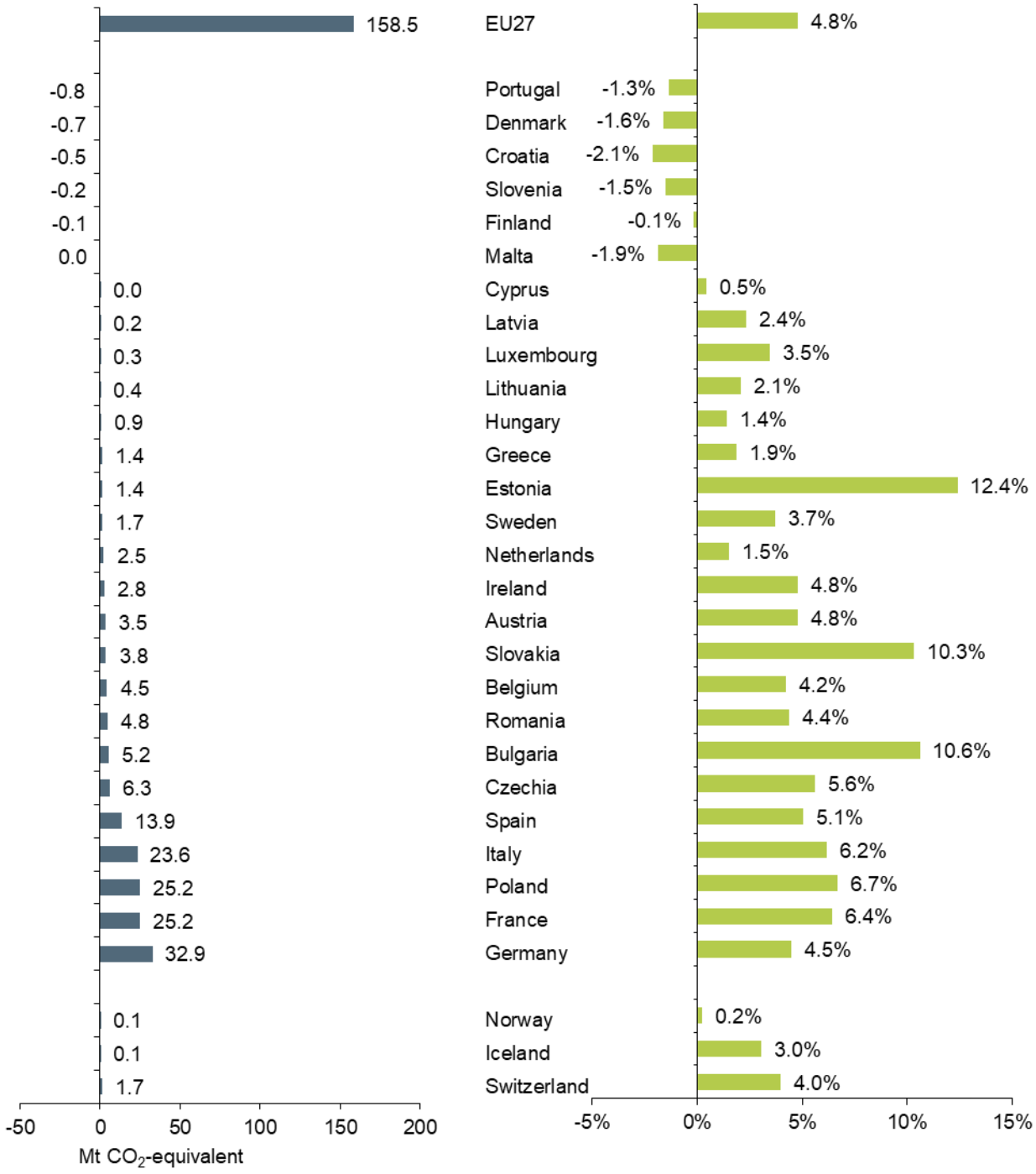


Comparing the changes across Member States (Figure 2-4), the largest absolute emission change occurred in Germany, where emissions increased by 33 Mt CO_2 eq. Apparent increase in emissions occurred also for France (+25 Mt CO_2 eq.), Poland (+25 Mt CO_2 eq.), Italy (+24 Mt CO_2 eq.) and Spain (+14 Mt CO_2 eq.). The largest relative increases were in Estonia (+12.4%), Bulgaria (-10.6%) and Slovakia (+10.3%).

The largest relative declines in emissions compared to the previous year took place in Croatia (-2.1%).

In the non-EU member countries of the EEA, emissions increased in Switzerland (+4.0%, or +2 Mt CO_2 eq.), Iceland (+3.0% or +0.1 Mt CO_2 eq.) and Norway (+0.2% or +0.1 Mt CO_2 eq.).

Figure 2-4 Member States' emissions, change 2020-2021



The following section examines the emission trends for the 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[4] values from the ETC

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

energy efficiency proxy 2022. Renewable energy values[5] are from the ETC RES proxy 2022. Hydro and wind are not normalised. Hydro is pure hydro without pumping. (EEA 2022a, EEA 2022b)

Member states with decreasing 2020 to 2021 emission trends

Only six Member States experienced emission decreases. The most apparent decrease was seen in Portugal. Emissions in Portugal decreased by 0.8 Mt CO_2 eq. or 1.3%. Consumption of solid fossil fuels decreased by 65.5%, consumption of natural gas by 4.2% and consumption of oil slightly increased by 0.9%. Consumption of renewable energies including hydro increased by 3.7% due the increases in photovoltaics (+28.0%) and wind (+6.9%) while hydro decreased (-6.7%). Emissions from 1.A.1 Energy industries fell the most (-2 Mt CO_2 eq. or -19.6%), followed by 1.A.2 Manufacturing industries and construction (-0.2 Mt CO_2 eq. or -2.2%). Emissions in the other energy sector categories increased. Emissions of Industrial processes and product use decreased only by 0.2 Mt CO_2 eq. (-3.3%), the decrease is driven mainly by 2.A Mineral industry. Emissions from Agriculture slightly increased (+0.1 Mt CO_2 eq. or +1.9%) and emissions change in Waste is insignificant (less than +0.01 Mt CO_2 eq. or +0.8%).

In Denmark, emissions decreased by 0.7 Mt CO_2 eq. or -1.6%. Consumption of solid fossil fuels increased by 39.0%, while consumption of natural gas decreased by 1.1% and consumption of oil by 4.3%. Consumption of renewable energy including hydro increased strongly by 16.1% mostly due the increases in solid biofuels in electricity (+65.8%), solid biofuels in heating and cooling (+28.4%) and photovoltaics (+10.9%) while hydro decreased (-4.5%). Emissions from 1.A.3 Transport decreased the most (-1.3 Mt CO_2 eq. or -10.8%) followed by the other energy sector categories except 1.A.1 Energy industries. Industrial processes and product use decreased as well (-0.1 Mt CO_2 eq. or -6.3%). There is expected no change for emissions from Agriculture and Waste.

In Croatia, emissions decreased by 0.5 Mt CO_2 eq. or -2.1%. Consumption of solid fossil fuels increased by 16.6% and consumption of oil increased by 9.4% while consumption of natural gas decreased by 3.8%. Consumption of renewable energy including hydro increased strongly by 11.0% mainly due the increases in solid biofuels in electricity (+27.6%) and solid biofuels in heating and cooling (+12.5%) and photovoltaics (+55.9%). Emissions from 1.A.2 Manufacturing industries and construction decreased the most (-0.3 Mt CO_2 eq. or -13.0%) followed by the other energy sector categories except 1.A.1 Energy industries. The highest decrease among Industrial processes sector categories was observed for 2.B Chemical industry (-0.2 Mt CO_2 eq. or -33.6%). Decreases in Agriculture and Waste sectors were rather insignificant (less than -0.1 Mt CO_2 eq. or -0.5% and -1.7% respectively).

Member states with increasing 2020 to 2021 emission trends

The largest absolute increase was seen in Germany, the largest GHG emitter in the European Union. Emissions in Germany increased by 33 Mt CO2 eq. or 4.5%. Consumption of oil decreased by 5.1%, on the contrary natural gas consumption increased by 3.9% and the consumption of solid fossil fuels increased by 18.0%. Consumption of renewable energy including hydro grew by 2.7% due the increase in solid biofuels in heating and cooling (+9.4%) while wind decreased (-13.8%). Nuclear energy increased by 7.3%. Emissions from 1.A.1 Energy industries increased the most (+27 Mt CO2 eq. or +12.9%) followed by an increase in 1.A.2 Manufacturing industries and construction (+7 Mt CO2 eq. or +6.4%) and the other energy sector categories (except 1.A.4 Other sectors and 1.B Fugitive emissions from fuels). Industrial processes and product use increased as well (+2 Mt CO2 eq. or +3.6%). On the contrary, emissions from Agriculture slightly decreased (-1 Mt CO2 eq. or -2.3%) as well as emissions from Waste (-0.4 Mt CO2 eq. or -4.3%).

(5) From 2021, the recast Renewable Energy Directive (EU) 2018/2001 modifies the statistical multipliers available to Member States to promote certain forms of renewable energy use in transport. The EEA early RES-T estimates shown in this report still use the old multipliers; the new approach will be incorporated starting with 2023.

In France, emissions increased by 25 Mt CO_2 eq. or 6.4%. Consumption of oil increased by 6.5% and natural gas consumption increased by 6.5% as well. The consumption of solid fossil fuels increased significantly by 37.0%. Consumption of renewable energy including hydro increased strongly by 11.9% mostly due the increases in solid biofuels in heating and cooling (+14.6%) and photovoltaics (+12.7%) while hydro decreased (-5.5%). Nuclear energy increased by 7.5%. Emissions from 1.A.3 Transport increased the most (+13 Mt CO_2 eq. or +12.0%) followed by the other energy sector categories. Industrial processes and product use increased as well (+2 Mt CO_2 eq. or +4.2%). Emissions from Agriculture increased very slightly (+0.1 Mt CO_2 eq. or 0.1%). Emissions from Waste slightly decreased (-0.1 Mt CO_2 eq. or -0.8%).

In Poland, emissions increased by 25 Mt CO_2 eq. or 6.7%. Natural gas consumption increased by 6.6%, oil consumption increased by 4.5% and solid fossil fuels consumption increased by 9.3%. Renewables including hydro decreased only slightly by 1.9%. Photovoltaics increased strongly (+101.7%), hydro grew (+12.0%) while solid biofuels in electricity fell (-7.2%). The largest increase in emissions is apparent for 1.A.1 Energy industries where the increase is 15 Mt CO_2 eq. or 10.7% followed by the other energy categories (except 1. B Fugitive emissions from fuels). The emissions from Industrial processes and product use slightly decreased by 0.7 Mt CO_2 eq. or -2.6% as well as in Agriculture (-0.6 Mt CO_2 eq. or -1.8%) and Waste (-0.1 Mt CO_2 eq. or -1.3%).

In Italy, GHG emissions increased by 24 Mt CO_2 eq. or 6.2%. Natural gas consumption increased by 7.3%, oil consumption increased significantly by 16.2% and solid fossil fuels consumption increased by 8.9%. Consumption of energy from renewable sources including hydro grew by 2.4%. Solid biofuels in heating and cooling increased (+5.7%), wind rose (+10.7%) while hydro fell (-4.6%). The largest emission increase was apparent in 1.A.3 Transport (+14 Mt CO_2 eq. or +16.2%). Emissions increased also in the other energy sector categories (except 1.A.5 Other and 1.B Fugitive emissions from fuels). In contrast the other sectors saw smaller changes in emissions. Industry sector increased very slightly (+0.8 Mt CO2 eq. or +2.7%). Emissions from Agriculture and Waste sector slightly decreased (-0.5 Mt CO_2 eq. or -1.6% and -0.3 Mt CO_2 eq. or -1.6%).

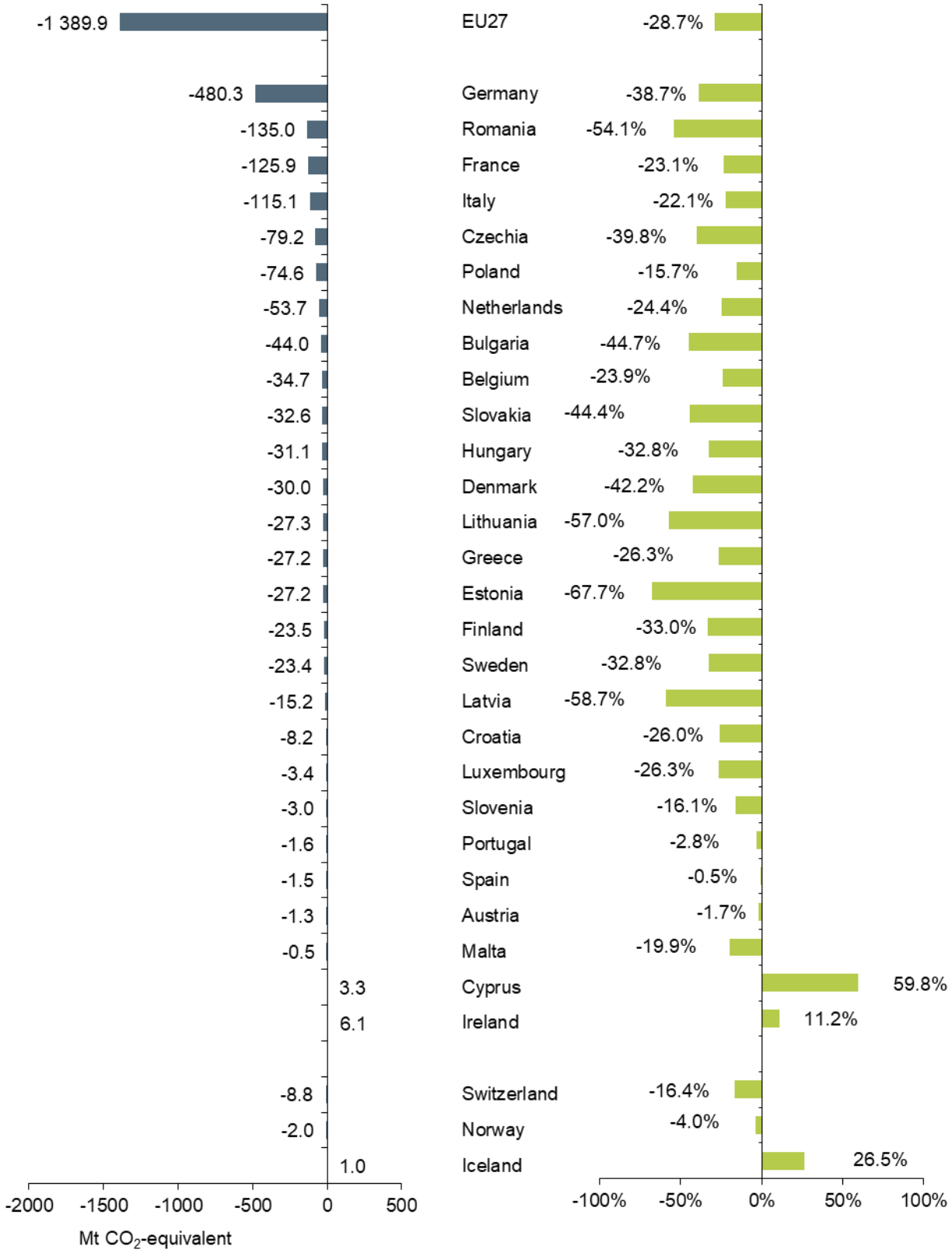
In Spain, GHG emissions increased by 14 Mt CO_2 eq. or 5.1%. There has been a strong increase in solid fossil fuels consumption (+29.9%). Oil consumption also increased (+9.6%) as well as the use of natural gas (+4.3%). Consumption of energy from renewable sources including hydro grew by 6.5% mainly due the increases in solid biofuels in electricity (+12.9%), wind (+9.9%) and photovoltaics (+37.7%) while hydro decreased (-8.1%). Nuclear energy decreased by 3.0%. The largest emission increase was apparent in 1.A.3 Transport (+10 Mt CO_2 eq. or +14.0%). Emissions increased also in the other energy sector categories (except 1.A.5 Other). Industry sector increased by +1 Mt CO2 eq. or +4.7%. Emissions from Agriculture increased very slightly (+0.2 Mt CO_2 eq. or +0.4%) and decrease in Waste is insignificant (less than -0.01 Mt CO_2 eq. or -0.1%).

The largest relative increase was seen in Estonia. Emissions in Estonia increased by 12.4%. On the sectoral basis, the most apparent change is noted for the Energy sector (+1.5 Mt CO_2 eq. or +15.7%) where the biggest relative increase of +21.4% is reported in 1.A.1 Energy industries. Consumption of energy from renewable sources including hydro grew by 14.2% in Estonia due to strong increases in solid biofuels in heating and cooling(+19.6%) and photovoltaics (+148.7%) while hydro decreased (-17.3%).

2.1.4 Changes in member states GHG emissions 1990 to 2021

Total EU27 GHG emissions in 2021 are estimated to be −28.7% or −1390 Mt CO_2 eq. below 1990 levels as shown in Figure 2-5. Total emissions including emissions from international aviation are estimated to be 28.1% below 1990 levels, showing a reduction of 1376 Mt CO_2 eq. Emissions for most EU27 Member States are lower than in 1990 while emissions in Cyprus and Ireland are higher than in 1990.

Figure 2-5 Member States' emissions change 1990-2021



The largest absolute decrease was in Germany, followed by Romania, France and Italy which all reduced their GHG emissions by more than 100 Mt CO_2 eq. since 1990. The largest absolute increase was experienced by Ireland with 6.1 Mt CO_2 eq., followed by Cyprus (3.3 Mt CO_2 eq.).
The largest relative emission decreases were in Estonia, Latvia, Lithuania and Romania, which all reduced their emissions by more than 50% compared to 1990. The relative emission decreases of further eight Member States are stronger than the EU27 as a whole.

Of the three non-EU member countries of the EEA considered in this report only Iceland had in 2021 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 in the totals. Table 2-1 summarises the emissions as CO_2 eq. and percentage changes. It should be noted, that in their proxy submissions, a number of Member States used the 2020 value for emissions from international aviation as an approximated value for 2021. 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 2021 proxy, this method was applied to four countries.

Table 2-1 Emissions including international aviation (kt CO2 eq.)

European Union (EU27)	1990	2020	2021	2021-2020	2021/2020	2021-1990	2021/1990
Total excl. LULUCF incl. indirect CO_2	4 846 617	3 298 236	3 456 699	158 463	4.80%	-1 389 918	-28.68%
International aviation	53 984	55 879	68 092	12 213	21.86%	14 108	26.13%
Total CO_2eq. including international aviation	4 900 600	3 354 115	3 524 790	170 675	5.09%	-1 375 810	-28.07%

Table 2-2 shows the detailed results for the EU27. Summary tables for 2021 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 2021 for EU27 (total emissions including indirect CO_2)

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 2021
Submission 2022
Country EU27
Geographical scope Sum of the 27 MS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total	ETS	non-ETS
	CO_2 equivalent (kt)									CO2 equivalent (Gg)	
Total (net emissions)[1]	2 562 240	378 117	221 323	73 680	1 889	4 571	1 586	63	3 243 469		
1. Energy	2 551 096	64 460	25 670						2 641 226		
A. Fuel combustion (sectoral approach)	2 531 546	22 803	25 482						2 579 831		
1. Energy industries	828 787	3 650	5 880						838 318		
2. Manufacturing industries and construction	424 028	2 330	3 726						430 084		
3. Transport (3)	767 288	1 464	8 206						776 959		
4. Other sectors	505 046	15 337	7 609						527 991		
5. Other	6 396	22	61						6 478		
B. Fugitive emissions from fuels	19 550	41 657	188						61 395		
1. Solid fuels	3 335	22 728	0						26 064		
2. Oil and natural gas	16 214	18 929	188						35 331		
C. CO_2 transport and storage	-								-		
2. Industrial processes and product use	231 048	1 484	7 689	73 680	1 889	4 571	1 586	63	322 009		
A. Mineral industry	103 504								103 504		
B. Chemical industry	45 075	1 271	4 799	513	604	2	51	8	52 323		
C. Metal industry	73 024	132	14	14	333	56	-	-	73 571		
D. Non-energy products from fuels and solvent use	8 819	1	5						8 825		
E. Electronic Industry				728	468	122	23	55	1 396		
F. Product uses as ODS substitutes				72 403	79	-	1 403	-	73 885		
G. Other product manufacture and use	574	71	2 778	17	405	4 386	-	-	8 231		
H. Other	52	9	94	5	1	5	109	-	274		
3. Agriculture	9 947	205 315	165 831						381 092		
A. Enteric fermentation		163 418							163 418		
B. Manure management		37 429	19 173						56 603		
C. Rice cultivation		2 452							2 452		
D. Agricultural soils		-	146 144						146 144		
E. Prescribed burning of savannas		-	-						-		
F. Field burning of agricultural residues		703	260						963		
G. Liming	5 373								5 373		
H. Urea application	3 762								3 762		
I. Other carbon-containing fertilizers	812								812		
J. Other	-	1 313	253						1 566		
4. Land use, land-use change and forestry[1]	- 232 877	7 793	13 330						- 211 754		
A. Forest land	- 286 752	3 395	5 042						- 278 315		
B. Cropland	35 525	664	3 298						39 487		
C. Grassland	8 556	2 260	733						11 549		
D. Wetlands	14 821	1 124	226						16 172		
E. Settlements	30 919	132	3 913						34 964		
F. Other land	797	-	64						860		
G. Harvested wood products	- 36 782								- 36 782		
H. Other	40	218	-						258		
5. Waste	3 027	99 066	8 803						110 896		
A. Solid waste disposal	-	78 398							78 398		
B. Biological treatment of solid waste		4 451	2 086						6 537		
C. Incineration and open burning of waste	3 004	374	483						3 861		
D. Waste water treatment and discharge		15 837	6 201						22 038		
E. Other	23	6	33						62		
6. Other *(as specified in summary 1.A)*	-	-	-	-	-	-	-	-	NO		

Memo items:											
International bunkers	182 928	304	1 780						185 012		
Aviation	67 489	12	591						68 092		
Navigation	115 445	286	1 189						116 920		
CO_2 emissions from biomass	450 188								443 160		
CO_2 captured	96								96		
Indirect CO_2 [2]	1 476										
Total CO_2 equivalent emissions without land use, land-use change and forestry									3 455 223	1 307 537	2 149 161
Total CO_2 equivalent emissions with land use, land-use change and forestry									3 243 469		
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									3 456 699		
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									3 244 945		

(1) For carbon dioxide (CO_2) 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

Sectoral results

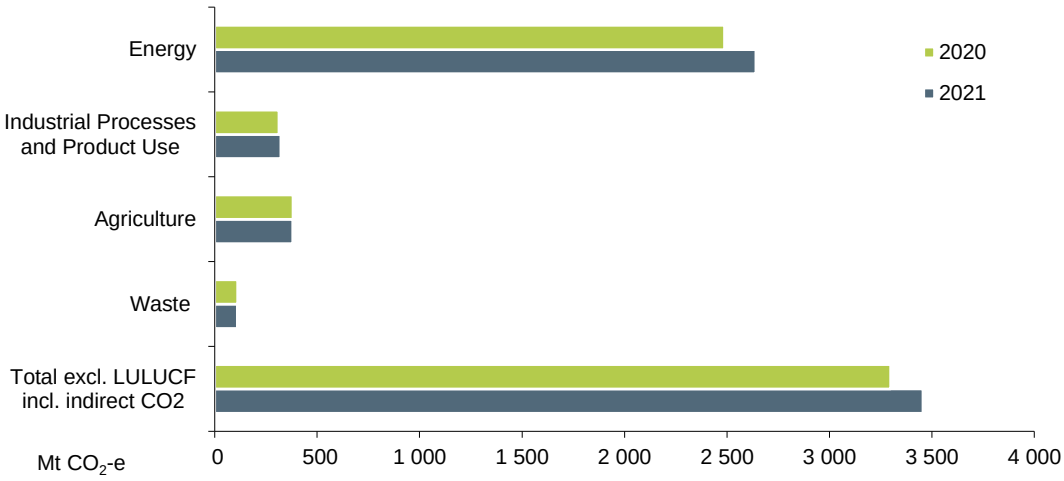
Table 2-3 and Figure 2-6 show the changes between 2020 and 2021 at the sectoral level for the EU27.

Table 2-3 Emissions by sector, change 2020-2021

Change 2020 / 2021, EU27	Mt CO_2 eq.	%
Energy	153.1	6.2%
Industrial Processes and Product Use	8.1	2.6%
Agriculture	-1.4	-0.4%
Waste	-1.4	-1.3%
Total excl. LULUCF incl. indirect CO_2	158.5	4.8%

Source: The EEA's ETC CM, based on the 2022 Member States' GHG inventories submitted to UNFCCC for the years 1990-2020 and proxy estimates for 2021.

Figure 2-6 Emissions by sector, EU27, 2020-2021



Source: The EEA's ETC CM, based on the 2022 Member States' GHG inventories submitted to UNFCCC for the years 1990-2020 and proxy estimates for 2021.

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 increased by 153 Mt CO_2 eq. (+6.2%) across the EU. More detailed explanations for the trends in the energy sector are provided in section 2.1.6.

The greenhouse gas emissions from Industrial Processes and Product Use increased by 8 Mt CO_2 eq. (+2.6%), the agricultural sector experienced a decrease of 1.4 Mt CO_2 eq. (-0.4%) and the waste sector indicated a decrease of 1.4 Mt CO_2 eq. (−1.3%).

2.1.6 Energy

Emissions from the energy sector contributed about 75% of total EU emissions in 2020 and is expected to have the share of 76% of total EU emissions for 2021. Emissions from fuel combustion saw an increase of 154 Mt CO_2 eq. or 6.3% compared to 2020. Table 2-4 shows that the largest change in fuel combustion emissions occurred in 1.A.1 Energy Industries with an increase of 57 Mt CO_2 eq. (+7.3%). In the sector 1.A.3 Transport, emissions also increased (+56 Mt CO_2 eq. or +7.7%) as well as emissions in 1.A.2 Manufacturing industries and construction (+24 Mt CO_2 eq. or +6.0%), 1.A.4 Other sectors (+16 Mt CO_2 eq. or +3.2%),

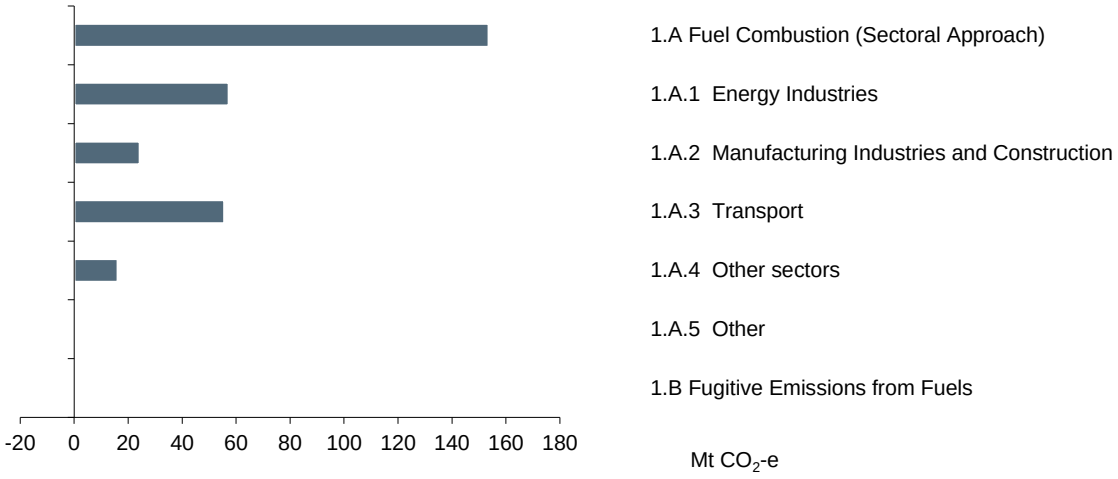
1.A.5 Other (+0.1 Mt CO_2 eq. or +1.5%). Only 1.B Fugitive emissions from fuels experienced a decrease (-0.5 Mt CO_2 eq. or −0.9%).

Table 2-4 Energy sector emissions, change 2020-2021

Change 2020 / 2021, EU27	Mt CO_2eq	%
1.A Fuel Combustion (Sectoral Approach)	153.6	6.3%
1.A.1 Energy Industries	57.3	7.3%
1.A.2 Manufacturing Industries and Construction	24.4	6.0%
1.A.3 Transport	55.7	7.7%
1.A.4 Other sectors	16.2	3.2%
1.A.5 Other	0.1	1.5%
1.B. Fugitive Emissions from Fuels	-0.5	-0.9%

Source: The EEA's ETC CM, based on the 2022 Member States' GHG inventories submitted to UNFCCC for the years 1990-2020 and proxy estimates for 2021.

Figure 2-7 Energy sector emissions, EU27 change 2020-2021



Source: The EEA's ETC CM, based on the 2022 Member States' GHG inventories submitted to UNFCCC for the years 1990-2020 and proxy estimates for 2021.

The largest increase in emissions for 1.A Fuel Combustion on Member States level was noted for Germany (+33 Mt CO_2 eq.), Poland (+27 Mt CO_2 eq.), Italy (+24 Mt CO_2 eq.) and France (+24 Mt CO_2 eq.). The largest emission decrease was in Portugal (−0.7 Mt CO_2 eq.) followed by Denmark (−0.5 Mt CO_2 eq.) and Croatia (−0.4 Mt CO_2 eq.).

Going to more detail in the subcategory 1.A.1 Energy Industries, the largest reduction was in Portugal (−2 Mt CO_2 eq.), followed by Hungary (−0.9 Mt CO_2 eq.) and Belgium (−0.7 Mt CO_2 eq.). The increases were more significant, with the largest change noted for Germany (+27 Mt CO_2 eq.) and Poland (+15 Mt CO_2 eq.).

Emissions changes in the sector 1.A.2 Manufacturing Industries and Construction were significantly smaller. The largest increase was in Germany (+7 Mt CO_2 eq.).

Changes in emissions from 1.A.3 Transport were more significant. The largest increase was in Italy (+14 Mt CO_2 eq.), France (+13 Mt CO_2 eq.) and Spain (+10 Mt CO_2 eq.). Decreases were identified only in five Member States. The most significant increase was in Denmark (-1 Mt CO_2 eq.).

In 1.A.4 Other Sectors (which include residential and commercial sectors) emissions decreased only in eight Member States. The largest decrease occurred in Germany (-4 Mt CO_2 eq.). The largest increase was in Poland (+5 Mt CO_2 eq.).

Changes in the sector 1.A.5 Other were less than ±0.4 Mt CO_2 eq in all Member States. For the subcategory 1.B Fugitive Emissions from fuels, the changes for all Member States is less then ±0.5 Mt CO_2 eq.

2.1.7 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 increased by 8 Mt CO_2 eq. in the EU (+2.6%). Table 2-5 and Figure 2-8 show the subsector contribution to this trend in emissions. The largest emission increase occurred in the subsector 2.C Metal industry followed by the 2.A Mineral Products. On the contrary, the largest decrease was in the subsector 2.F Product uses as substitutes for ODS followed by 2.B Chemical industry.

Table 2-5 Industrial Processes and Product Use emissions, change 2020-2021

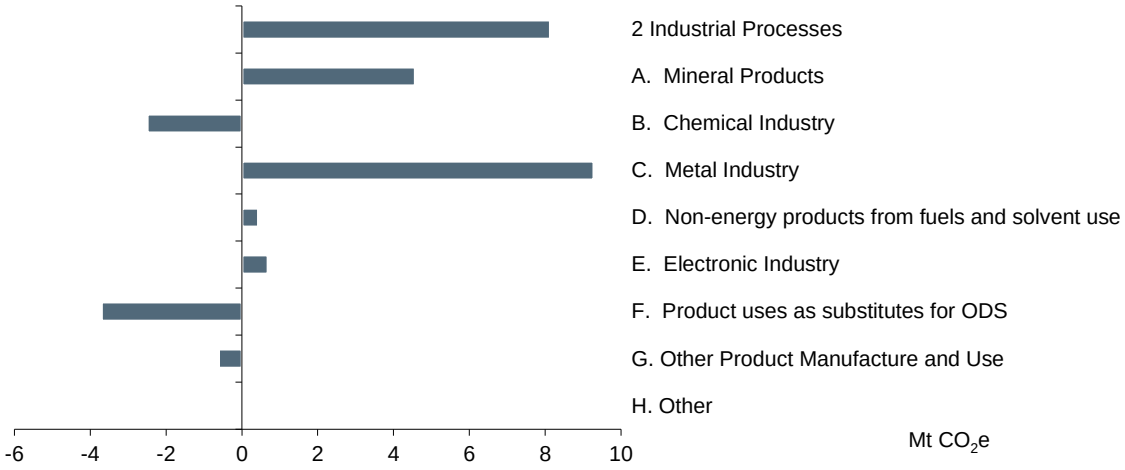
Change 2020 / 2021, EU27	Mt CO_2 eq.	%
2 Industrial Processes	8.1	2.6%
A. Mineral Products	4.6	4.6%
B. Chemical Industry	-2.5	-4.6%
C. Metal Industry	9.3	14.4%
D. Non-energy products from fuels and solvent use	0.4	5.2%
E. Electronic Industry	0.7	97.8%
F. Product uses as substitutes for ODS	-3.7	-4.8%
G. Other Product Manufacture and Use	-0.6	-6.9%
H. Other	0.0	-12.3%

Source: The EEA's ETC CM, based on the 2022 Member States' GHG inventories submitted to UNFCCC for the years 1990-2020 and proxy estimates for 2021.

In 15 of the EU27 Member States emissions from IPPU increased. The largest increase of IPPU emissions was in Germany (+2.0 Mt CO_2 eq.), Slovakia (+1.9 Mt CO_2 eq.) and France (+1.7 Mt CO_2 eq.) while the largest decreases were in Poland (−0.7 Mt CO_2 eq.) followed by Belgium (−0.5 Mt CO_2 eq.) and the Netherlands (−0.5 Mt CO_2 eq.). In the subcategory 2.A Mineral Products, emissions increased in the EU by 4.6 Mt CO_2, the highest increase is in Italy (+1.3 Mt CO_2 eq.), the largest decrease in Poland is only -0.2 Mt CO_2 eq. Emissions from 2.B Chemical Products decreased in the EU (-2.5 Mt CO_2 eq. or −4.6%). The largest increase were in Czechia (+0.7 Mt CO_2 eq.) while the largest decrease was in Belgium (−1.1 Mt CO_2 eq.). Emissions from 2.C Metal Industry increased by 9.3 Mt CO_2 eq. or 14.4% with the largest increase in France (+2.1 Mt CO_2 eq.) while the largest decrease occurred in Hungary (−0.3 Mt CO_2 eq.). The subsector 2.D Non-energy Products from Fuels and Solvent Use has had less significant increase in the emissions (+0.4 Mt CO_2 eq. or +5.2%). The changes in all Member States were less than ±0.1 Mt CO_2 eq. The subsector 2.E Electronic Industry showed slight absolute emission changes for the EU (+0.7 Mt CO_2 eq. or 97.8%). This change is mainly driven by increase in Ireland (+0.7 Mt CO_2 eq.). Emissions changes for the other Member States were within ±0.1 Mt CO_2 eq. The subsector 2.F Product uses as substitutes for ODS saw emissions decrease by 3.7 Mt CO_2 eq. (−4.8%). In eight Member States emissions increased in this source category, in 15 Member States emissions decreased and four Member States report no changes. The largest decrease of emissions was in France, where 2.F emissions fell by 1.0 Mt CO_2 eq., followed by Ireland (−0.7 Mt CO_2 eq.) and Czechia (−0.6 Mt CO_2 eq.). In contrast, emissions increased the most in Croatia

(+0.1 Mt CO_2 eq.). Emissions from 2.G Other Product Manufacture and Use decreased slightly for the EU (-0.6 Mt CO_2 eq. or -6.9%). The greatest emission change is reported by Germany (−0.5 Mt CO_2 eq.). Emission changes of the other Member States are less than ±0.1 Mt CO_2 eq. The decrease of emissions from 2.H Other is almost irrelevant by absolute terms (less than −0.1 Mt CO_2 eq.) but significant in relative terms (−12.3%).

Figure 2-8 Industrial Processes and Product Use emissions, EU27, change 2020-2021



Source: The EEA's ETC CM, based on the 2022 Member States' GHG inventories submitted to UNFCCC for the years 1990-2020 and proxy estimates for 2021.

2.1.8 Agriculture

Agriculture (excluding LULUCF) contributes to 11% of European GHG emissions. Emissions from agriculture decreased by 1 Mt CO_2 eq. or 0.4% since 2020. The largest greenhouse gas emitting activities within the sector are CH_4 from livestock and N_2O from soils. Enteric fermentation and soils contributed about 43% and 38% 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 and urea application contributed to this decrease as well.

Table 2-6 and Figure 2-9 show the subsector 2020-2021 change, with CH_4 and N_2O emissions shown as CO_2 equivalents (Mt CO_2 eq.).

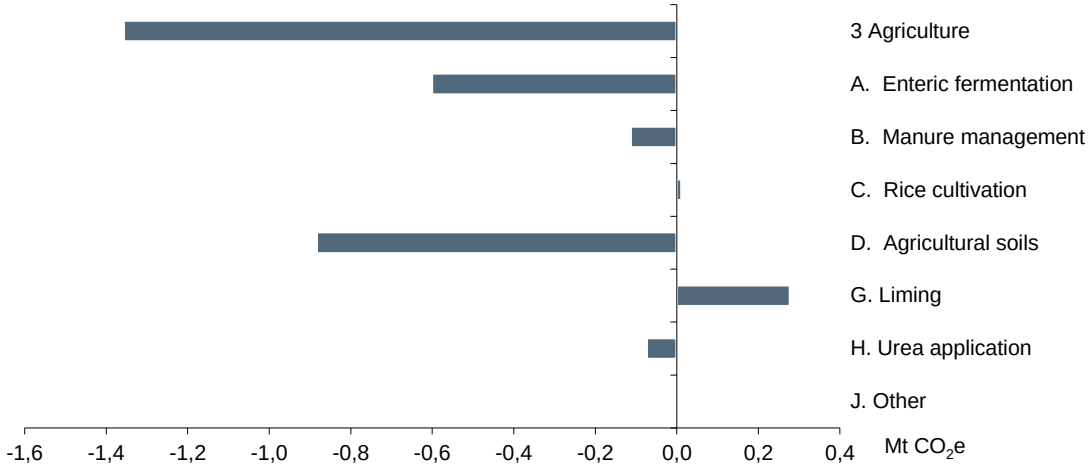
Table 2-6 Agriculture sector emissions, change 2020-2021

Change 2020/2021, EU27	Mt CO_2 eq.	%
3 Agriculture	-1.4	-0.4%
A. Enteric fermentation	-0.6	-0.4%
B. Manure management	-0.1	-0.2%
C. Rice cultivation	0.0	0.5%
D. Agricultural soils	-0.9	-0.6%
E. Prescribed burning of savannas	0.0	-
F. Field burning of agricultural residues	0.0	0.5%
G. Liming	0.3	5.5%
H. Urea application	-0.1	-1.9%

Change 2020/2021, EU27	Mt CO_2 eq.	%
I. Other carbon-containing fertilizers	0.0	2.6%
J. Other	0.0	0.0%

Source: The EEA's ETC CM, based on the 2022 Member States' GHG inventories submitted to UNFCCC for the years 1990-2020 and proxy estimates for 2021.

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



Source: The EEA's ETC CM, based on the 2022 Member States' GHG inventories submitted to UNFCCC for the years 1990-2020 and proxy estimates for 2021.

Emissions from Enteric Fermentation decreased by 0.6 Mt CO_2 eq. or 0.4%. The largest decreases were in Germany (-0.4 Mt CO_2 eq.). Emissions of CH_4 and N_2O from manure management contribute to about 15% of the agriculture sector and have decreased by 0.1 Mt CO_2 eq. or -0.2%. The largest increase was in Ireland (0.4 Mt CO_2 eq.) and the largest decrease was in Germany (-0.4 Mt CO_2 eq.). Agricultural soils contribute to about 38% of the emissions from agriculture and have decreased by 0.9 Mt CO_2 eq. or 0.6%. The largest increase was seen in Romania (0.8 Mt CO_2 eq.). The largest decrease was in Germany (-0.5 Mt CO_2 eq.).

2.1.9 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 (71% share on Waste emissions) and the ongoing effect of restrictions on landfilling of organic degradable waste that was implemented decades ago.

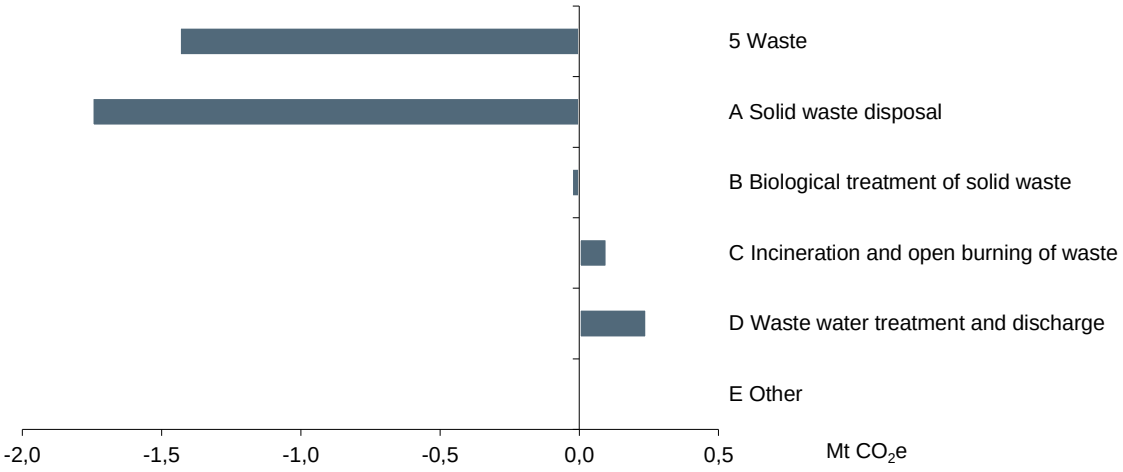
Emissions from the Waste sector decreased by −1 Mt CO_2 eq. compared to 2020. Table 2-7 and Figure 2-10 show the subsector contributions to this trend in emissions.

Table 2-7 Waste sector emissions, change 2020-2021

Change 2020/2021, EU27	Mt CO_2 eq.	%
5 Waste	-1.4	-1.3%
A Solid Waste Disposal	-1.7	-2.2%
B Biological Treatment of Solid Waste	0.0	-0.4%
C Incineration and Open burning of Waste	0.1	2.6%
D Waste Water Treatment and Discharge	0.2	1.1%

E Other	0.0	-0.4%

Figure 2-10 Waste sector emissions, EU27, change 2020-2021



The largest decrease of waste emissions was noted for Germany (-0.4 Mt CO_2 eq.). The trends of 5.A Solid Waste emissions generally dominate the waste sector. 17 Member States decreased emissions from solid waste (largest decrease in Italy with −0.5 Mt CO_2 eq.) while six Member States had an increase in emissions (the largest one in Czechia with less than +0.1 Mt CO_2 eq.) For the remaining Member States constant emissions were estimated.

ETS versus Effort Sharing emissions

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 Decision (ESD) which covered the period between 2013 and 2020, and since 2021 is followed by Effort Sharing Regulation (ESR). The LULUCF Regulation covers emissions and reductions in the LULUCF sector.

ESD emissions are calculated by deducting ETS emissions, CO_2 emissions from domestic aviation and NF_3 emissions from total emissions including indirect CO_2 emissions. LULUCF is excluded from ESD emissions. ESR emissions are calculated the same way, only NF_3 emissions are not deducted.

$$E_{ESD} = E_{total} - E_{ETS} - E_{1A3a,CO2} - E_{NF3}$$

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

E_{ESD}	Emission under Effort Sharing Decision
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
E_{NF3}	NF_3 emissions

Table 2-8 shows total, ETS, Effort Sharing emissions per country. ETS emissions are taken from the EEA ETS data viewer (EEA 2022c) for stationary installations. It is important to mention that 2020 ETS emissions are calculated using AR4 GWP whereas 2021 ETS emissions are calculated using AR5 GWP. This report respects

legislative changes, therefore Effort Sharing 2020 values are reviewed ESD emissions based on the annual ESD review and 2021 values are ESR emissions calculated as described in the formula above. Relative changes in emissions between the years 2020 and 2021 can be seen on the right.

Table 2-8 Total, ETS and ESD emissions 2020 and 2021, kt CO_2 eq.

MS	2020 GHG emissions			2021 GHG emissions			Change 2021 versus 2020		
	Total	ETS	ESD	Total	ETS	ESR	Total	ETS	ESR/ESD
AT	73 592	27 014	46 543	77 113	28 703	48 385	4.8%	6.3%	4.0%
BE	106 433	41 512	64 904	110 940	41 403	69 526	4.2%	-0.3%	7.1%
BG	49 186	23 845	25 736	54 398	28 903	25 481	10.6%	21.2%	-1.0%
CY	8 878	4 295	4 243	8 920	4 315	4 605	0.5%	0.5%	8.5%
CZ	113 339	54 676	58 650	119 671	57 871	61 787	5.6%	5.8%	5.3%
DE	728 738	320 280	407 411	761 591	355 082	405 655	4.5%	10.9%	-0.4%
DK	41 746	10 832	30 835	41 079	11 618	29 373	-1.6%	7.3%	-4.7%
EE	11 556	5 617	5 935	12 990	6 850	6 135	12.4%	21.9%	3.4%
ES	274 743	89 039	184 188	288 649	91 678	194 803	5.1%	3.0%	5.8%
FI	47 782	19 580	28 120	47 713	20 312	27 193	-0.1%	3.7%	-3.3%
FR	392 963	82 135	307 768	418 202	87 045	327 478	6.4%	6.0%	6.4%
EL	74 836	31 728	42 894	76 249	33 251	42 679	1.9%	4.8%	-0.5%
HR	23 756	7 324	16 518	23 253	6 997	16 233	-2.1%	-4.5%	-1.7%
HU	62 818	18 908	43 906	63 698	17 615	46 075	1.4%	-6.8%	4.9%
IE	57 716	13 296	44 721	60 494	15 320	45 155	4.8%	15.2%	1.0%
IT	381 248	126 029	254 001	404 849	131 447	271 678	6.2%	4.3%	7.0%
LT	20 183	6 138	14 043	20 603	5 976	14 626	2.1%	-2.6%	4.2%
LU	9 065	1 377	7 688	9 378	1 317	8 060	3.5%	-4.3%	4.8%
LV	10 460	2 022	8 436	10 707	2 065	8 642	2.4%	2.1%	2.4%
MT	2 122	810	1 311	2 082	771	1 309	-1.9%	-4.8%	-0.2%
NL	164 335	74 116	90 197	166 817	74 132	92 653	1.5%	0.0%	2.7%
PL	376 038	171 729	205 093	401 268	191 468	209 721	6.7%	11.5%	2.3%
PT	57 586	18 734	38 537	56 809	16 037	40 482	-1.3%	-14.4%	5.0%
RO	109 934	32 666	77 124	114 731	32 303	82 274	4.4%	-1.1%	6.7%
SE	46 285	16 706	29 384	48 001	18 476	29 336	3.7%	10.6%	-0.2%
SI	15 851	6 096	9 754	15 614	5 682	9 929	-1.5%	-6.8%	1.8%
SK	37 049	18 170	18 878	40 878	20 899	19 978	10.3%	15.0%	5.8%
EU27	3 298 236	1 224 672	2 066 819	3 456 699	1 307 537	2 139 250	4.8%	6.8%	3.5%
IS	4 510	1 780	2 716	4 647	1 844	2 789	3.0%	3.6%	2.7%
NO	49 273	23 729	24 830	49 392	22 967	25 711	0.2%	-3.2%	3.5%

Source: The EEA's ETC CM, based on the 2022 Member States' GHG inventories submitted to UNFCCC for the years 1990-2020, proxy estimates for 2021 totals. ETS data is from EUTL (verified emissions for 2020 and 2021, not from the Member States proxies). Value for domestic aviation (which is used for calculation of ESR emissions) was obtained from Eurocontrol.

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

In total, emissions changed by +4.8% within the EU between 2020 and 2021. Emissions increased in the ETS sector and in the Effort Sharing sectors but the increase in the Effort Sharing sectors (+3.5%) is less significant than in the ETS sector (+6.8%). Figure 2-11 illustrates all emission trend changes.

In absolute terms, the total emission increase in the EU was +158 Mt CO_2 eq. Of this increase 72 Mt CO_2 eq. occurred in the Effort Sharing sectors and 83 Mt CO_2 eq. in the ETS sector.

At Member State level the trend change in emissions separated between ETS and E Effort Sharing looks similar. ETS emissions decreased in nine Member States. The highest absolute as well as relative decrease can be observed in Portugal (-2.7 Mt CO_2 eq. or -14.4%).

In 18 EU Member States ETS emissions increased. The largest absolute increase was experienced in Germany (+34.8 Mt CO_2 eq.) followed by Poland (+19.7 Mt CO_2 eq.). Estonia saw the highest relative ETS emission increase (+21.9%).

Effort Sharing emissions decreased in eight Member States. The largest absolute decrease was in Germany (-1.8 Mt CO_2 eq.) and largest relative decrease can be observed in Denmark (-4.7%).

19 Member States saw increases in Effort Sharing emissions. The largest absolute Effort Sharing emission increases were in France (+19.7 Mt CO_2 eq.) followed by Italy (+17.7 Mt CO_2 eq.) and Spain (+10.6 Mt CO_2 eq.). The largest relative increase of Effort Sharing emissions was in Belgium (+7.1%).

Increases of both ETS and Effort Sharing emissions can be observed for twelve Member States. On the other hand, there are only two Member States which had decreases in both ETS and Effort Sharing emissions (Croatia and Malta).

In seven Member States emissions in the ETS sector decreased while emissions in the Effort Sharing sectors increased. A contrasting development can be observed in six Member States, where ETS emissions increased and Effort Sharing emissions decreased.

The emission trends both in the ETS and the Effort Sharing resemble the emission changes discussed in chapter 0.

Figure 2-11 ETS and Effort Sharing emissions, change 2020-2021

Note: ETS: 2020 ETS emission values are calculated according to AR4 and 2021 ETS emission values are calculated according AR5.

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.

Last year's proxy GHG estimates for 2020 overestimated the GHG emissions for the EU by 18.5 Mt CO_2 eq. or 0.6%.

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 2020 and final GHG inventory submission was only 0.3% for total emissions (including indirect CO_2, excluding LULUCF) for the EU.

Difference between MS proxy and final GHG inventories

The proxy submissions by Member States closely mirrored the slight decrease 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 CM 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 Cyprus (proxy 5.9% lower), followed by Bulgaria (proxy 5.2% higher) and Czechia (proxy 5.0% higher). In absolute terms the deviations were highest for Germany (overestimate by proxy of 10.8 Mt CO_2 eq.), Czechia (overestimate by proxy of 5.6 Mt CO_2 eq.) and Spain (underestimate by 3.2 Mt CO_2 eq.). By comparing the percentage changes in emission levels 2019/2020 as derived from the 2021 proxy GHG inventory[(6)] on the one hand and from the 2022 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 (for all MS decreasing) was estimated correctly.

After taking into account recalculations, the relative differences were largest for Bulgaria (+11.6%), Cyprus (-5.2%), Czechia (+5.2%), Sweden (+2.3%) and Malta (-2.2%).

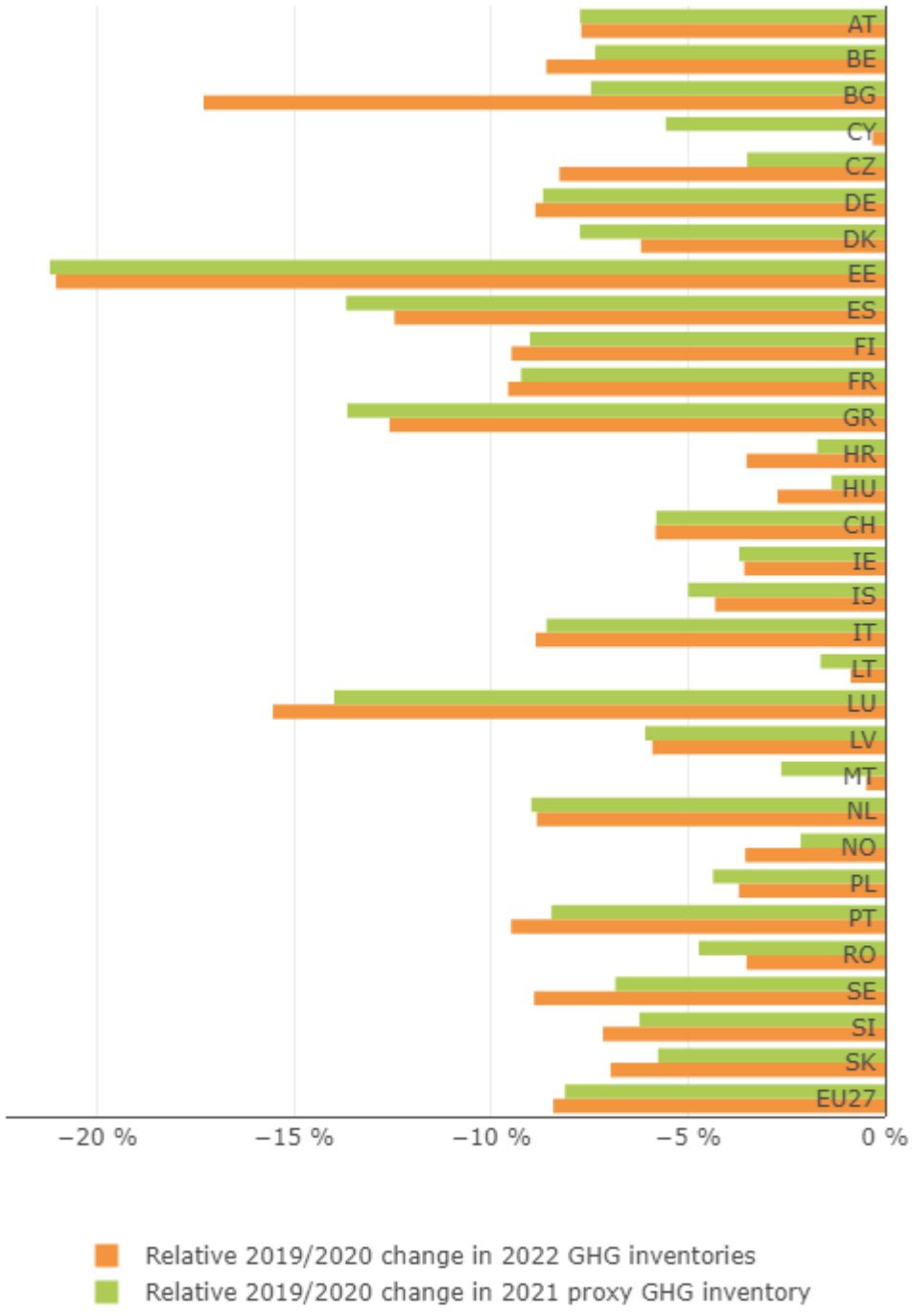
(6) The 2019 value used in this calculation comes from 2021 submission.

Table 3-1 Difference per Member State for year 2020 between proxy and final GHG inventories

MS	Inventory 2020 (Submission 2022)	Proxy 2020 (Submission 2021)	Deviation 2020		Recalcu-lations	Deviation 2020 cleared of impact of recalculations	Proxy calculated by
	kt CO_2 eq.			%			
AT	73 592	73 662	70	0.1	-0.1	0.0	MS
BE	106 433	108 070	1 636	1.5	-0.2	1.4	MS
BG	49 186	51 778	2 592	5.3	6.3	11.6	ETC CM
CY	8 878	8 357	-521	-5.9	0.6	-5.2	MS
CZ	113 339	118 981	5 642	5.0	0.2	5.2	MS
DE	728 738	739 495	10 757	1.5	-1.2	0.2	MS
DK	41 746	40 815	-931	-2.2	0.6	-1.6	MS
EE	11 556	11 583	27	0.2	-0.4	-0.2	MS
ES	274 743	271 506	-3 237	-1.2	-0.2	-1.4	MS
FI	47 782	48 289	507	1.1	-0.5	0.5	MS
FR	392 963	395 716	2 753	0.7	-0.3	0.4	MS
EL	74 836	73 941	-895	-1.2	0.0	-1.2	MS
HR	23 756	23 198	-558	-2.3	4.3	2.0	MS
HU	62 818	63 557	739	1.2	0.2	1.4	MS
IE	57 716	57 563	-153	-0.3	0.1	-0.1	MS
IT	381 248	382 340	1 092	0.3	0.0	0.3	MS
LT	20 183	20 034	-148	-0.7	0.0	-0.8	MS
LU	9 065	9 241	176	1.9	-0.1	1.8	MS
LV	10 460	10 466	7	0.1	-0.3	-0.2	MS
MT	2 122	2 117	-4	-0.2	-2.0	-2.2	MS
NL	164 335	164 509	174	0.1	-0.3	-0.2	MS
PL	376 038	373 675	-2 363	-0.6	-0.1	-0.7	MS
PT	57 586	58 238	652	1.1	0.0	1.1	MS
RO	109 934	108 484	-1 451	-1.3	0.1	-1.3	MS
SE	46 285	47 434	1 150	2.5	-0.2	2.3	MS
SI	15 851	16 002	150	0.9	0.1	1.0	MS
SK	37 049	37 689	640	1.7	-0.4	1.3	MS
EU27	3 298 236	3 316 738	18 502	0.6	-0.2	0.3	ETC CM

Source: Member States submissions to UNFCCC and proxy estimates for 2020.

Figure 3-1 Relative difference between proxy and submitted inventories by Member State 2019/2020



Source: Member States submissions to UNFCCC and proxy estimates for 2020.

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 1.A.3 Transport [Energy] (+7.7 Mt CO_2 eq.) and 1.A.4 Other sectors [Energy] (-6.2 Mt CO_2 eq.). The next largest differences were in 3.D Agricultural soils [Agriculture] (+4.5 Mt CO_2 eq.) and 1.A.2 Manufacturing industries and construction [Energy] (+3.7 Mt CO_2 eq.). 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] (+155.1%), 2.G Other product manufacture and use [IPPU] (-34.7%), 3.I Other carbon-containing fertilizers [Agriculture] (-29.4%), 1.A.5 Other [Energy] (-25.8%) and 3.F Field Burning of Agricultural Residues [Agriculture] (-25.4%), 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 2022 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 2022 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 2020 between proxy and final GHG inventories

Sector	Inventory 2020 (Submission 2022)	Proxy 2020 (Submission 2021)	Deviation 2020	Recalcu-lations	Deviation 2020 cleared of impact of recalculations
	kt CO_2eq			%	
Total incl. indirect CO_2 excl. LULUCF	**3 298 236**	**3 316 738**	**18 502**	**0.6**	**-0.2**	**0.3**
1 Energy	**2 488 114**	**2 496 122**	**8 008**	**0.3**	**-0.2**	**0.1**
1.A Fuel combustion	2 426 188	2 431 928	5 739	0.2	-0.2	0.0
1.A.1 Energy industries	780 981	782 774	1 793	0.2	0.6	0.9
1.A.2 Manufacturing industries	405 703	409 422	3 719	0.9	-1.5	-0.6
1.A.3 Transport	721 307	728 989	7 681	1.1	0.0	1.0
1.A.4 Other sectors	511 816	505 629	-6 188	-1.2	-0.8	-2.0
1.A.5 Other	6 376	5 115	-1 261	-19.8	-6.0	-25.8
1.B Fugitive emissions	61 925	64 194	2 268	3.7	-0.6	3.1
2 Industrial processes & product use	**313 872**	**320 562**	**6 690**	**2.1**	**1.0**	**3.2**
2.A Mineral products	97 253	97 522	269	0.3	0.3	0.6
2.B Chemical industry	54 220	55 561	1 340	2.5	-1.4	1.1
2.C Metal production	61 537	63 537	2 000	3.3	-1.9	1.4
2.D Non-energy products	8 020	8 087	66	0.8	-0.9	-0.1
2.E Electronic Industry	527	1 344	817	155.1	0.1	155.2
2.F Product uses as ODS substitutes	68 830	70 281	1 451	2.1	8.4	10.5
2.G Other product manufacture and use	8 708	5 873	-2 835	-32.6	-2.1	-34.7
2.H Other	48	43	-5	-9.8	5.4	-4.4
3 Agriculture	**382 450**	**384 418**	**1 969**	**0.5**	**-1.1**	**-0.6**
3.A Enteric fermentation	164 019	163 223	-796	-0.5	0.2	-0.3
3.B Manure management	56 716	55 619	-1 097	-1.9	1.1	-0.9
3.C Rice cultivation	2 441	2 618	177	7.2	-0.9	6.4
3.D Agricultural soils	147 028	151 548	4 521	3.1	-3.3	-0.2
3.F Field burning of agricultural residues	958	666	-292	-30.5	5.1	-25.4
3.G Liming	4 972	4 641	-331	-6.7	-1.4	-8.1
3.H Urea application	3 836	3 884	48	1.2	-0.9	0.3
3.I Other carbon-containing fertilizers	719	510	-209	-29.1	-0.4	-29.4

Sector	Inventory 2020 (Submission 2022)	Proxy 2020 (Submission 2021)	Deviation 2020		Recalcu-lations	Deviation 2020 cleared of impact of recalculations
	kt CO_2eq			%		
3.J Other	1 566	1 573	7	0.5	-0.5	0.0
5 Waste	**112 331**	**114 086**	**1 755**	**1.6**	**-1.7**	**-0.1**
5.A Solid waste disposal	79 569	80 332	763	1.0	-1.8	-0.8
5.B Biological treatment of solid waste	6 468	6 495	27	0.4	-0.2	0.2
5.C Incineration & open burning of waste	3 638	3 630	-8	-0.2	4.7	4.5
5.D Waste water treatment & discharge	21 569	22 523	954	4.4	-3.0	1.4
5.E Other	62	62	-1	-0.8	0.6	-0.3
Indirect CO_2	**1 470**	**1 551**	**81**	**5.5**	**-0.3**	**5.2**

In the Energy sector, deviations after recalculation are very small, except for 1.A.5 Other (-25.8%). For Energy sector overall deviations after recalculation is +0.1%.

In IPPU, there were considerable recalculations for some categories. The largest relative deviations occurred in 2.E Electronics industry (+155.1%), followed by category 2.G Other product manufacture and use where was also the largest absolute difference (-2.8 Mt CO_2 eq. or -32.6%). After taking into account the recalculations effect, the deviation increases for the 2.F Product Uses as Substitutes for ODS up to +10.5%. For the IPPU sector overall after allowing for recalculations the deviation is +3.2%.

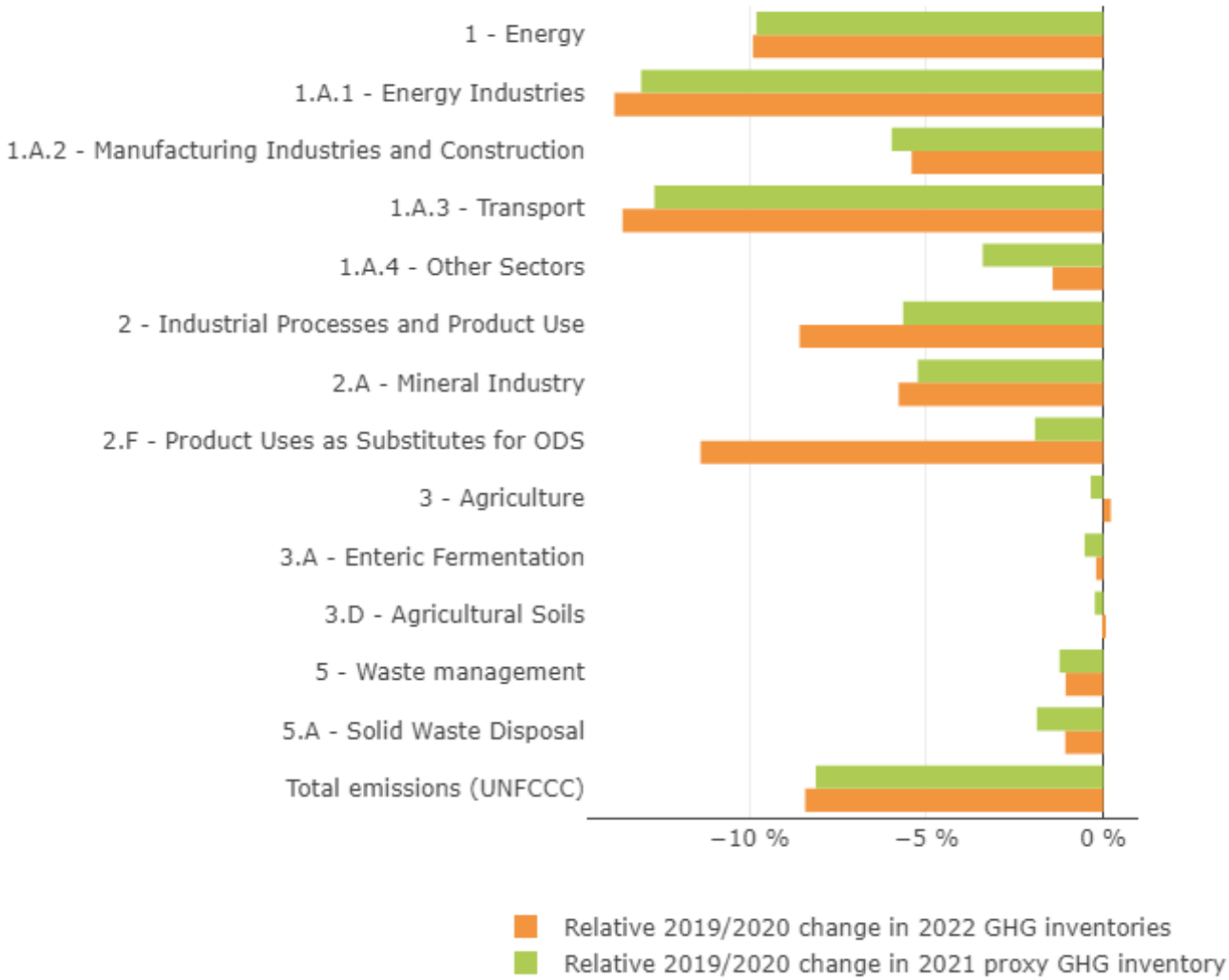
In the agricultural sector, deviation before allowing for recalculation is +0.5% and deviation after allowing for recalculations is -0.6%. This can indicate that some of the recalculations were already considered when approximated inventories were created. The largest absolute deviations were in 3.D Agricultural soils (+4.5 Mt CO_2 eq. resp. +3.1%). After considering recalculation effects the deviation for 3.A Enteric fermentation deviation decrease to -0.2%.

After taking the recalculations effect into consideration, the deviation for the waste sector indicates, that emissions in the waste sector were underestimated only by 0.1%. The deviations of all waste subsectors are less than +/- 1 Mt CO_2 eq. The largest deviation was found in subsector 5.D Wastewater treatment and discharge (+0.9 Mt CO_2 eq. or +4.4%). After considering recalculations the deviation of 5.A emissions decreased significantly (+1.4%).

The differences for estimates for indirect CO_2 are quite significant (+5.5% before and +5.2% after considering recalculation effects). However the absolute amounts of indirect CO_2 emissions have only a very small share in total EU emissions.

By comparing the percentage changes in emission levels 2019/2020 as derived from the 2021 proxy GHG inventory on the one hand and from the 2022 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 2019/2020



Source: Member States submissions to UNFCCC and proxy estimates for 2020.

Note: Only sectors with GHG emissions of more than 70 Mt CO_2 eq. in 2020 are shown.

4 Methodologies and data sources at Member State level

Description of different approaches

This report presents the estimated GHG emissions for 2021 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 were extrapolated from past trends, or 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 only missing from Bulgaria, which have a share less than 2% of the emissions of the whole EU. Previous year gap-filling for Bulgaria, which was done by a more simplified approach, had 5.3% deviation between the 2020 proxy and final GHG inventory of Bulgaria. This is mainly caused by the fact that effects of COVID-19 regulations were underestimated by ETC CM. Therefore, emissions for Bulgaria were gap-filled this year by ETC CM for EEA by a more thorough approach.

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 0.

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 MMR 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.

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
- Emission projections reported in 2021

Based on these data sources, emission estimates for year 2021 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
- 3. Agriculture
- 4. Land use, land use change and forestry
    - 4.A Forest Land
    - 4.B Cropland
    - 4.C Grassland
    - 4.D Wetlands
    - 4.E Settlements
    - 4.G Harvested wood products
- 5. Waste

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 4 August 2022 was used
Eurostat	Data as of 13 September 2022 was used
GHG inventory data from CRF files (via UNFCCC)	early June
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 2022 estimates for the 2021 proxy inventory were based on the national methodologies used for 2022 inventory submissions (covering emissions until 2020). Thus, revised methodologies and parameters at Member States level can result in differences between the final inventory and the proxy inventory.

4.1.1 Energy and IPPU emissions from selected categories

To estimate CO_2, CH_4 or N_2O emissions from 1.A.1 Energy industries, 2.A Mineral industry and 2.C Metal industry, the following calculation was performed.

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

E_{GHG}^{Y-1}	Emission of CO_2, CH_4 or N_2O 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_2O 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 CO_2, CH_4 or N_2O emissions from 1.A.2 Manufacturing industries and construction and 1.A.3 Transport, the following calculation was performed.

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

E_{GHG}^{Y-1} Emission of CO_2, CH_4 or N_2O 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_2O 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)

4.1.2 Emissions from Agriculture, LULUCF and Waste

For the proxy year estimation, the previous year value from each 3. Agriculture, 4. LULUCF and 5. Waste subsector from Summary 2 table was multiplied by the percentage change of emissions between 2020 and 2021 as estimated in 2021 Projections.

$$E_{GHG}^{Y-1} = E_{GHG}^{Y-2} \cdot \left(\frac{E_{GHG}^{Y-1}}{E_{GHG}^{Y-2}} \% \right)$$

E_{GHG}^{Y-1} Emission of CO_2, CH_4 or N_2O in source category in the proxy year
E_{GHG}^{Y-2} Emission of CO_2, CH_4 or N_2O in source category in the previous year
$\frac{E_{GHG}^{Y-1}}{E_{GHG}^{Y-2}}\%$ Change in the 2021 Projections between the previous year and the proxy year (EEA 2021)

4.1.3 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, SF_6, NF_3) previous year values were used as proxy estimates.

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. In some cases, there were only missing values which could be simply deduced from totals – for France and Lithuania this amendment was necessary.

4.1.4 Total CO_2 eq., including indirect CO_2, without LULUCF in ETS and non-ETS

Most Member States did report *Total CO_2 equivalent emissions, without LULUCF*. There has however been some ambiguity about how to report included indirect CO_2 emissions. In previous years, a total was included in cell J68 whether or not the total included indirect CO_2 emissions. Many MS leave this cell blank even if they do report indirect CO_2 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 CO_2 emissions.

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

4.1.5 F-gases

Emissions from fluorinated greenhouse gases (F-gases[7]) 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 0), 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.

4.1.6 Gap-filling LULUCF

Data from Member States' 2021 projections was applied to gap-fill LULUCF. Gap-filling was done for two Member States; Denmark and Croatia.

4.1.7 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 Estonia, Finland, France 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 Effort Sharing value.

4.1.8 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 2022). This database contains information about international maritime bunkers. International navigation was gap-filled for Bulgaria, Denmark and Portugal.

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(7) F-gas emissions include emission of the following gases or groups of gases: hydrofluorocarbons = HFCs; perfluorocarbons = PFCs; sulphur hexafluoride = SF_6; nitrogen triflouride =NF_3.

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Annex 1: Detailed results for each Member State

Country	Compiled by	Submission date
Austria	Member State	20 July 2022
Belgium	Member State	29 July 2022
Bulgaria	EEA, ETC CM	
Cyprus	Member State	14 July 2022
Czechia	Member State	21 July 2022
Germany	Member State	29 July 2022
Denmark	Member State	08 July 2022
Estonia	Member State	27 July 2022
Spain	Member State	15 July 2022
Finland	Member State	06 July 2022
France	Member State	25 July 2022
Greece	Member State	14 July 2022
Croatia	Member State	27 July 2022
Hungary	Member State	02 August 2022
Ireland	Member State	29 July 2022
Italy	Member State	30 July 2022
Lithuania	Member State	02 August 2022
Luxembourg	Member State	02 August 2022*
Latvia	Member State	28 July 2022
Malta	Member State	31 July 2022
Netherlands	Member State	14 July 2022
Poland	Member State	25 July 2022
Portugal	Member State	08 July 2022
Romania	Member State	22 July 2022
Sweden	Member State	26 July 2022
Slovenia	Member State	28 July 2022
Slovakia	Member State	11 July 2022
European Union (EU27)	**EEA, ETC CM**	
Iceland	Country	13 July 2022
Switzerland	Country	11 July 2022
Norway	Country	26 July 2022

*The MS prepared the submission on time, nevertheless technical issues occurred and caused the delay in submission.

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 2021
Submission 2022
Country Austria
Geographical scope[4]

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2[1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total	ETS	non-ETS
	CO_2 equivalent (kt)									CO2 equivalent (Gg)	
Total (net emissions)[1]	64403.73	5814.41	3658.59	1587.36	25.92	357.29	NO	12.78	75860.08	28703.35	48409.64
1. Energy	50961.51	544.21	627.71						52133.43	**14 166**	**37 967**
A. Fuel combustion (sectoral approach)	50852.26	324.52	627.71						51804.49	**14 166**	**37 638**
1. Energy industries	8624.60	24.98	96.60						8746.17	**7 292**	**1 454**
2. Manufacturing industries and construction	10997.76	19.10	118.95						11135.82	**6 497**	**4 639**
3. Transport (3)	21702.54	18.82	263.23						21984.59	**378**	**21 606**
4. Other sectors	9494.38	261.60	148.28						9904.25	**NO**	**9 904**
5. Other	32.98	0.03	0.65						33.66	**NO**	**34**
B. Fugitive emissions from fuels	109.25	219.69	0.00						328.94	**NO**	**329**
1. Solid fuels	NO	NO	NO						NO	**NO**	
2. Oil and natural gas	109.25	219.69	NO						328.94	**NO**	**329**
C. CO_2 transport and storage	NO								NO	**NO**	
2. Industrial processes and product use	14717.19	50.99	78.97	1587.36	25.92	357.29	NA	12.78	16830.49	**14 537**	**2 294**
A. Mineral industry	3023.29								3023.29	**3 023**	
B. Chemical industry	661.83	49.22	41.36	NA	NA	NA	NA	NA	752.41	**636**	**117**
C. Metal industry	10878.16	1.77	NO	NO	NO	4.56	NA	NO	10884.49	**10 878**	**6**
D. Non-energy products from fuels and solvent use	153.92	NA	NA						153.92	**NO**	**154**
E. Electronic Industry				3.46	25.92	14.57	NA	12.78	56.73	**NO**	**57**
F. Product uses as ODS substitutes				1583.89	NO	NO	NO	NO	1583.89	**NO**	**1 584**
G. Other product manufacture and use	NO	NO	37.61	NO	NO	338.16	NO	NO	375.77	**NO**	**376**
H. Other	NA	NA	NA	NO	NO	NO	NO	NO	NA	**NO**	
3. Agriculture	149.16	4309.04	2532.08						6990.27	**NO**	**6 990.27**
A. Enteric fermentation		3752.24							3752.24	**NO**	**3 752.24**
B. Manure management		556.38	527.05						1083.43	**NO**	**1 083.43**
C. Rice cultivation		NO							NO	**NO**	
D. Agricultural soils		NA	2004.98						2004.98	**NO**	**2 004.98**
E. Prescribed burning of savannas		NO	NO						NO	**NO**	
F. Field burning of agricultural residues		0.42	0.05						0.47	**NO**	**0.47**
G. Liming	101.05								101.05	**NO**	**101.05**
H. Urea application	22.64								22.64	**NO**	**22.64**
I. Other carbon-containing fertilizers	25.47								25.47	**NO**	**25.47**
J. Other	NA	NA	NA						NA	**NO**	
4. Land use, land-use change and forestry[1]	-1426.18	24.03	149.24						-1252.91		
A. Forest land	-2449.39	0.15	26.25						-2422.99		
B. Cropland	357.21	NO	44.35						401.56		
C. Grassland	304.97	23.79	NO						328.76		
D. Wetlands	58.98	0.09	0.03						59.09		
E. Settlements	231.87	NO	56.92						288.78		
F. Other land	242.80	NO	6.48						249.27		
G. Harvested wood products	-172.61								-172.61		
H. Other	NO	NO	NO						NO		
5. Waste	2.06	886.14	270.59						1158.80	**NO**	**1 158.80**
A. Solid waste disposal	NO	783.61							783.61	**NO**	**783.61**
B. Biological treatment of solid waste		79.94	100.14						180.08	**NO**	**180.08**
C. Incineration and open burning of waste	2.06	0.00	0.01						2.07	**NO**	**2.07**
D. Waste water treatment and discharge		22.59	170.45						193.05	**NO**	**193.05**
E. Other	NO	NO	NO						NA	**NO**	
6. Other *(as specified in summary 1.A)*	NO	NO	NO	NO	NO	NO	NO	NO	NA	NO	

Memo items:											
International bunkers	1279.93	0.22	12.17						1292.33		
Aviation	1220.10	0.20	8.56						1228.86		
Navigation	59.83	0.02	3.61						63.46		
CO_2 emissions from biomass	NE								NE		
CO_2 captured	NO								NO		
Indirect CO_2 [2]	NO										
Total CO_2 equivalent emissions without land use, land-use change and forestry									77112.99	28703.35	48409.64
Total CO_2 equivalent emissions with land use, land-use change and forestry									75860.08		
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									NA		
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									NA		

(1) For carbon dioxide (CO_2) 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.
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 2020-2021 in fuel consumption by type of fuel are: Transport diesel sales increased by +3.2% and gasoline sales increased by +5.5% (approx. +1 Mt of CO2 from diesel and gasoline). Gasoil consumption increased by +9% (approx. +0.3 Mt of CO2) Natural gas consumption (other than non energy use) increased by 7% (approx. +1.1 Mt of CO2) (http://www.e-control.at/de/statistik/gas) CO2 from coal power plants decreased by -0.4 Mt CO2 Industrial processes: CO2 emissions from iron and steel industries (1.A.2.a and 2.C.1) increased by +14% (approx +1.6 Mt CO2) due to an increase in crude steel production (+18%). CO2 emissions from Non Metallic Mineral Products (2.A.1) increased by +0.2 Mt CO2. (https://www.worldsteel.org/steel-by-topic/statistics.html) International bunkers: Kerosin consumption increased by +17% (+0.2 Mt CO2) Agriculture: Fertilizer Use: two-year mean value increased by 3.9% (https://www.ama.at/Marktinformationen/Getreide-und-Olsaaten/Dungemittel) Animals numbers: total cattle increased by 0.8%; milk cows increased by 0.3 % while milk yield decreased by 0.5%; swine number decreased by 0.7% (https://www.ama.at/Marktinformationen/Vieh-und-Fleisch/Produktion; https://www.statistik.at/statistiken/land-und-forstwirtschaft/tiere-tierische-erzeugung/viehbestand/viehbestand-jaehrlich) F-Gases: -11% due to decreased imports of refrigerant substances.

Belgium (submitted by member state)

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	Belgium		
							Geographical scope[4]				
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	**CO_2[1]**	**CH_4**	**N_2O**	**HFCs**	**PFCs**	**SF_6**	**Unspecified mix of HFCs and PFCs**	**NF_3**	**Total**	**ETS**	**non-ETS**
	CO_2 equivalent (kt)									**CO2 equivalent (Gg)**	
Total (net emissions)[1]	95167.81	7093.39	5421.93	2648.34	175.42	89.14	NO	8.51	110604.53		
1. Energy	80416.35	1015.92	579.19						82011.46	**26 159**	**55 852**
A. Fuel combustion (sectoral approach)	80317.80	509.54	579.19						81406.53	**26 061**	**55 345**
1. Energy industries	18096.80	37.19	143.98						18277.97	**16 151**	**2 126**
2. Manufacturing industries and construction	13188.89	47.98	87.85						13324.72	**9 751**	**3 573**
3. Transport (3)	24215.45	15.52	239.51						24470.48	**97**	**24 373**
4. Other sectors	24712.48	408.70	106.81						25227.99	**61**	**25 167**
5. Other	104.17	0.15	1.05						105.37	**0**	**105**
B. Fugitive emissions from fuels	98.55	506.38	NO						604.93	**98**	**507**
1. Solid fuels	NO	39.88	NO						39.88	**0**	**40**
2. Oil and natural gas	98.55	466.50	NO						565.05	**98**	**467**
C. CO_2 transport and storage											
2. Industrial processes and product use	14766.88	25.67	680.61	2648.34	175.42	89.14	NO	8.51	18394.57	**14 902**	**3 492**
A. Mineral industry	4235.24								4235.24	**4 235**	**0**
B. Chemical industry	6815.94	16.47	626.78	129.53	165.86	1.27	NA	7.57	7763.43	**7 057**	**707**
C. Metal industry	3585.42	9.20	NO						3594.61	**3 585**	**9**
D. Non-energy products from fuels and solvent use	105.41	NO	NO						105.41	**0**	**105**
E. Electronic Industry				4.49	9.54	5.13	NO	0.94	20.10	**0**	**20**
F. Product uses as ODS substitutes				2514.32	0.03				2514.34	**0**	**2 514**
G. Other product manufacture and use	NO	NO	53.83	NO	NO	82.74	NO	NO	136.56	**0**	**137**
H. Other	24.87	NO	NO	NO	NO	NO	NO	NO	24.87	**25**	**0**
3. Agriculture	184.22	5226.28	3907.27						9317.77		
A. Enteric fermentation		4035.75							4035.75		
B. Manure management		1190.52	647.32						1837.84		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NA	3259.95						3259.95		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		NO	NO						NO		
G. Liming	132.09								132.09		
H. Urea application	52.14								52.14		
I. Other carbon-containing fertilizers	NO								NO		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry[1]	-452.88	NO	117.02						-335.86		
A. Forest land	-2001.25	NO	0.03						-2001.22		
B. Cropland	634.42	NO	51.02						685.44		
C. Grassland	292.25	NO	20.58						312.82		
D. Wetlands	-3.74	NO	0.03						-3.71		
E. Settlements	503.50	NO	24.01						527.51		
F. Other land	NO	NO	NO						NO		
G. Harvested wood products	121.94								121.94		
H. Other	NO	NO	NO						NO		
5. Waste	253.24	825.52	137.84						1216.60		
A. Solid waste disposal	NO	574.58							574.58		
B. Biological treatment of solid waste		23.24	35.45						58.69		
C. Incineration and open burning of waste	253.24	0.00	0.08						253.32	**231.76**	**21.56**
D. Waste water treatment and discharge		227.70	102.30						330.00		
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	24076.97	3.88	189.34						24270.18		
Aviation	3606.47	0.53	30.22						3637.22		
Navigation	20470.49	3.36	159.12						20632.97		
CO_2 emissions from biomass	12656.77								12656.77		
CO_2 captured	NO								NO		
Indirect CO_2 [2]	NO										
Total CO_2 equivalent emissions without land use, land-use change and forestry									110940.39	41293.43	69646.96
Total CO_2 equivalent emissions with land use, land-use change and forestry									110604.53		
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									110940.39	41293.43	69646.96
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									110604.53		

(1) For carbon dioxide (CO_2) 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 2021, despite COVID-related restrictions, road transport resumed significantly with an estimated increase in CO2 emissions of almost 14%. However, net emissions increased overall by only 4.2%. 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 2021 an emission of 109 ktCO2 is involved. In Wallonia, first estimates of the emissions for the year 2021 indicate a increase of the total GHG emissions (even weakly without considering transport). This increase is evenly due to the ETS sector (mainly energy sectors) and a colder winter (residential and tertiary sectors), 2020 being the warmest year currently measured in Belgium. In the case of the Brussels-Capital region, first estimates of the emissions for the year 2021 indicate an increase of the total GHG emissions. This proxy is based on an estimate of the real energy consumption in the building sector. This evolution could be explained by a combination of factors such as colder temperatures in 2021 than 2020, and the reopening of the activities in the tertiary sector that were very limited in 2020 due to the COVID 19 pandemic. In The Flemish region, first estimates of the emissions for the year 2021 indicate a increase of the total GHG emissions (even without considering transport). Although emissions in the chemical industry decreases in 2021 compared to 2020, a significant increase in emissions is determined in the residential and commercial sectors a.o. due to a colder 2021 year. ETS-emissions also increased in 2021 in this region.

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 2021
Submission 2022
Country BULGARIA
Geographical scope[4]

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2[1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total	ETS	non-ETS
	CO_2 equivalent (kt)									CO2 equivalent (Gg)	
Total (net emissions)[1]	32236.27	5718.54	5089.57	1704.49	0.01	19.84	NO, NA	NO, NA	44768.72		
1. Energy	38528.10	1327.58	334.09						40189.76		
A. Fuel combustion (sectoral approach)	37843.87	388.73	333.36						38565.96		
1. Energy industries	21990.53	22.15	108.01						22120.69		
2. Manufacturing industries and construction	4474.11	16.17	37.71						4527.98		
3. Transport (3)	9969.51	20.58	97.74						10087.83		
4. Other sectors	1396.37	329.83	89.79						1815.99		
5. Other	13.35	0.00	0.11						13.47		
B. Fugitive emissions from fuels	684.22	938.85	0.73						1623.81		
1. Solid fuels	18.05	672.35	NO						690.40		
2. Oil and natural gas	666.17	266.51	0.73						933.40		
C. CO_2 transport and storage	NO								0.00		
2. Industrial processes and product use	3527.40	0.00	93.36	1704.49	0.01	19.84	NO, NA	NO, NA	5345.09		
A. Mineral industry	2218.59								2218.59		
B. Chemical industry	1046.34	NO,NA	81.80	NA	NA	NA	NA	NA	1128.14		
C. Metal industry	155.29	NO,NA	NA	NA	NA	NA	NA	NA	155.29		
D. Non-energy products from fuels and solvent use	83.74	NO,NA	NO,NA						83.74		
E. Electronic Industry				NO	NO	NO	NO	NO	0.00		
F. Product uses as ODS substitutes				1704.49	0.01	NO	NO	NO	1704.50		
G. Other product manufacture and use	23.43	NO	11.55		NO	19.84			54.83		
H. Other	IE,NA	NA	NA						0.00		
3. Agriculture	33.48	1952.55	4291.08						6277.11		
A. Enteric fermentation		1502.12							1502.12		
B. Manure management		314.12	289.88						604.00		
C. Rice cultivation		111.92							111.92		
D. Agricultural soils		NO	3993.90						3993.90		
E. Prescribed burning of savannas		NO	NO						0.00		
F. Field burning of agricultural residues		24.39	7.30						31.69		
G. Liming	NO								0.00		
H. Urea application	33.48								33.48		
I. Other carbon-containing fertilizers	NO								0.00		
J. Other									0.00		
4. Land use, land-use change and forestry[1]	-9864.06	12.23	222.30						-9629.53		
A. Forest land	-8690.66	12.23	31.49						-8646.93		
B. Cropland	283.72	NO,NE	79.17						362.89		
C. Grassland	-1219.91	NO,NE	28.47						-1191.45		
D. Wetlands	208.49	NO	23.86						232.36		
E. Settlements	589.61	NO	59.31						648.92		
F. Other land	NO	NO	NO						0.00		
G. Harvested wood products	-1035.32								-1035.32		
H. Other									0.00		
5. Waste	11.36	2426.18	148.75						2586.29		
A. Solid waste disposal	NO	2019.39							2019.39		
B. Biological treatment of solid waste		17.01	12.34						29.35		
C. Incineration and open burning of waste	11.36	0.00	0.88						12.24		
D. Waste water treatment and discharge		389.79	135.52						525.31		
E. Other	NO	NO	NO						NO		
6. Other *(as specified in summary 1.A)*									NO		
Memo items:											
International bunkers	755.37	0.71	6.20						762.28		
Aviation	489.48	0.08	4.08						493.65		
Navigation	265.89	0.62	2.12						268.63		
CO_2 emissions from biomass											
CO_2 captured											
Indirect CO_2 [2]	NO										
Total CO_2 equivalent emissions without land use, land-use change and forestry									54398.25	28903.33	25494.92
Total CO_2 equivalent emissions with land use, land-use change and forestry									44768.72		
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									54398.25		
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									44768.72		

(1) For carbon dioxide (CO_2) 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

Cyprus (submitted by member state)

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	Cyprus		
								Geographical scope[4]			
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	**CO_2[1]**	**CH_4**	**N_2O**	**HFCs**	**PFCs**	**SF_6**	**Unspecified mix of HFCs and PFCs**	**NF_3**	**Total**	**ETS**	**non-ETS**
	CO_2 equivalent (kt)									**CO2 equivalent (Gg)**	
Total (net emissions)[1]	6952.30	973.28	259.42	359.40	NO	18.26	NO	NO	8562.67	4315.00	4247.67
1. Energy	6393.46	18.26	35.09						6446.81	**3 460**	**2 987**
A. Fuel combustion (sectoral approach)	6393.46	18.26	35.09						6446.81	**3 460**	**2 987**
1. Energy industries	3037.26	3.03	7.17						3047.46	**3 078**	**-30**
2. Manufacturing industries and construction	919.76	2.82	4.76						927.34	**382**	**545**
3. Transport (3)	1909.51	2.60	21.07						1933.17		**1 933**
4. Other sectors	500.34	9.73	2.03						512.09		**512**
5. Other	26.60	0.09	0.06						26.74		**27**
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	909.93	0.00	6.78	359.40	NO	18.26	NO	NO	1294.38	**855**	**439**
A. Mineral industry	906.37								906.37	**855**	**51**
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	3.56	NE	NE						3.56		**4**
E. Electronic Industry				NO	NO	NO	NO	NO	NO		
F. Product uses as ODS substitutes				359.40	NO	NO	NO	NO	359.40		**359**
G. Other product manufacture and use	IE	NE	6.78			18.26			25.04		**25**
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO		
3. Agriculture	0.22	357.67	196.56						554.46		
A. Enteric fermentation		295.67							295.67		
B. Manure management		61.60	70.31						131.91		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NE	126.13						126.13		
E. Prescribed burning of savannas		NO							NO		
F. Field burning of agricultural residues		0.40	0.12						0.52		
G. Liming	NO								NO		
H. Urea application	0.22								0.22		
I. Other carbon-containing fertilizers	NO								NO		
J. Other	NO								NO		
4. Land use, land-use change and forestry[1]	-351.31	0.65	0.23						-350.44		
A. Forest land	-133.91	0.65	0.23						-133.04		
B. Cropland	-134.05	NO	NE						-134.05		
C. Grassland	-118.55	NO	NE						-118.55		
D. Wetlands	-0.88	NO	NO						-0.88		
E. Settlements	12.89	NO	NO						12.89		
F. Other land	NO	NO	NO						NO		
G. Harvested wood products	23.19								23.19		
H. Other	NO	NO	NO						NO		
5. Waste	NO	596.70	20.77						617.47		
A. Solid waste disposal	NO	543.99							543.99		
B. Biological treatment of solid waste		5.95	4.21						10.16		
C. Incineration and open burning of waste	NO	NO	NO						NO		
D. Waste water treatment and discharge		46.76	16.55						63.31		
E. Other	NO								NO		
6. Other *(as specified in summary 1.A)*	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Memo items:											
International bunkers	1206.72	1.68	12.54						1220.95		
Aviation	328.17	0.06	2.74						330.97		
Navigation	878.55	1.63	9.81						889.98		
CO_2 emissions from biomass	414.46								414.46		
CO_2 captured	NO								NO		
Indirect CO_2 [2]	6.90										
Total CO_2 equivalent emissions without land use, land-use change and forestry									8913.11	4314.996	4598.113
Total CO_2 equivalent emissions with land use, land-use change and forestry									8562.67		
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									8920.01	4314.996	4604.978
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									8569.57		

(1) For carbon dioxide (CO_2) 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

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 2021
Submission 2022
Country Czechia
Geographical scope[4] Czechia

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2[1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total	ETS	non-ETS
	CO_2 equivalent (kt)									CO2 equivalent (Gg)	
Total (net emissions)[1]	105173.41	11772.68	5323.50	3376.59	0.77	63.94	0.00	2.40	125713.29	57858.17	67855.13
1. Energy	86384.54	3337.91	680.63						90403.08	**48 544**	**41 859**
A. Fuel combustion (sectoral approach)	86330.92	1125.41	680.60						88136.92	**48 456**	**39 681**
1. Energy industries	41897.95	34.86	236.86						42169.68	**40 678**	**1 492**
2. Manufacturing industries and construction	12300.00	56.51	77.60						12434.11	**7 731**	**4 703**
3. Transport (3)	19822.97	24.14	195.00						20042.10	**NO**	**20 042**
4. Other sectors	12000.00	1009.04	160.55						13169.59	**47**	**13 123**
5. Other	310.00	0.86	10.59						321.45	**NO**	**321**
B. Fugitive emissions from fuels	53.62	2212.50	0.03						2266.15	**89**	**2 177**
1. Solid fuels	50.02	1570.00	NO						1620.02	**IE**	
2. Oil and natural gas	3.60	642.50	0.03						646.13	**IE**	
C. CO_2 transport and storage	NO								NO	**NO**	
2. Industrial processes and product use	11813.60	59.27	438.26	3376.59	0.77	63.94	0.00	2.40	15754.83	**9 314**	**6 441**
A. Mineral industry	3443.96								3443.96	**3 396**	**48**
B. Chemical industry	2105.51	45.09	214.76	NO	NO	NO	NO	NO	2365.35	**413**	**1 952**
C. Metal industry	6105.81	14.18	NA	NO	NO	NO	NO	NO	6119.99	**5 504**	**616**
D. Non-energy products from fuels and solvent use	157.70	NO	NO						157.70	**NO**	**158**
E. Electronic Industry				NO	0.46	2.60	NO	2.40	5.46	**NO**	**5**
F. Product uses as ODS substitutes				3376.51	0.31	NO	NO	NO	3376.81	**NO**	**3 377**
G. Other product manufacture and use	NO	NO	223.50	NO	NO	61.34	NO	NO	284.84	**NO**	**285**
H. Other	0.63	NO	NO	0.08	NO	NO	NO	NO	0.71	**1**	**0**
3. Agriculture	310.07	3527.28	3906.78						7744.13		
A. Enteric fermentation		3185.32							3185.32		
B. Manure management		341.96	434.87						776.83		
C. Rice cultivation		NO							0.00		
D. Agricultural soils		NO	3471.91						3471.91		
E. Prescribed burning of savannas		NO	NO						0.00		
F. Field burning of agricultural residues		NO	NO						0.00		
G. Liming	154.10								154.10		
H. Urea application	155.97								155.97		
I. Other carbon-containing fertilizers	NO								0.00		
J. Other	NO	NO	NO						0.00		
4. Land use, land-use change and forestry[1]	6555.89	24.28	18.40						6598.58		
A. Forest land	8572.60	24.28	16.01						8612.88		
B. Cropland	29.74	NO	2.40						32.14		
C. Grassland	-508.31	NO	NO						-508.31		
D. Wetlands	27.08	NO	NO						27.08		
E. Settlements	166.10	NO	NO						166.10		
F. Other land	NO	NO	NO						0.00		
G. Harvested wood products	-1731.31								-1731.31		
H. Other	NO	NO	NO						0.00		
5. Waste	109.30	4823.95	279.43						5212.69		
A. Solid waste disposal	0.00	3344.82							3344.82		
B. Biological treatment of solid waste		661.64	81.93						743.56		
C. Incineration and open burning of waste	109.30	3.16	3.68						116.14		
D. Waste water treatment and discharge		814.34	193.82						1008.17		
E. Other	NO	NO	NO						0.00		
6. Other *(as specified in summary 1.A)*	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	

Memo items:											
International bunkers	376.26	0.64	3.05						379.94		
Aviation	376.26	0.64	3.05						379.94		
Navigation	NO	NO	NO						NO		
CO_2 emissions from biomass	20241.39								20241.39		
CO_2 captured	NO								0.00		
Indirect CO_2 [2]	556.49										
Total CO_2 equivalent emissions without land use, land-use change and forestry									119114.72	57858.17	61256.55
Total CO_2 equivalent emissions with land use, land-use change and forestry									125713.29		
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									119671.21	0	0
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									126269.78		

[1] For carbon dioxide (CO_2) 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.

Energy

Stationary

CO2 emissions for Energy industries were calculated according EU ETS data, where should be most of the companies from this category. CH4 and N2O emissions for Energy industries were calculated from linear regression for the last 5 years and then adjusted to correspond with CO2 emissions from EU ETS. Emissions for Manufacturing industries and construction, Other sectors and Other categories were calculated from linear regression for the last 5 years and then adjusted according to data published by CzSO and Ministry of Industry and Trade (MIT). Fugitive emissions were calculated from the Energy statistics from the MIT, where are listed preliminary data about coal, gas and oil.

Mobile

Road transport is calculated by COPERT 5 program, which is based on the EMEP/EEA Emission Inventory Guidebook 2019 (EIG 2019) and the IPCC 2006 Guidelines. CO2 is calculated at Tier 2 and other pollutants at Tier 3 level. Other modes of transport are calculated by the CDV model, which is based on national specific EFs, EFs from EIG 2019 and from the IPCC 2006 Guidelines. In 2021, a new methodological approach was applied to calculate emissions from aviation and rail transport. Emission calculation method is now at Tier 3 level for IFR flights and at Tier 2 level for rail transport liquid fuels. For the rest, it remains at Tier 1 level with updated EFs according to EIG 2019.

IPPU

Mineral industry estimation is based on ETS data value for year 2021 and correlation of previous years values between ETS and NIR data. The ETS data results for 2021 was used to calculate production changes in sector 2C. Sector 2B is based partly on ETS data and partly on regression function estimation. Obtained data from 2B are then compiled and corrected into the final values. Category 2E+2G were estimated according to the trend in last decade. Prediction model produces predicted values for 2F, obtained by evaluating the regression function in the selected time frame (in most cases time series 2012-2020). Standard errors of the predictions are also calculated. For more accurate estimations outliers from the activity data were removed, also overall trend across whole time series was checked. In some cases, input for prediction model was based on expert judgement, mainly in cases where trend change was observed and it is expected that new trend remains (Category 2H3 contains HFO-1234yf emission estimates related to category 2.F.1.e). Category 2H1 was interpolated by using data from last year and ETS 2021 value for this category.

Agriculture

The estimated emissions are about 1% lower compared to the 2022 submission. Two methodological changes are prepared for the 2023 submission: 1. Revision and updating of activity data and equations used in this category. This revision caused an increase in emissions by approx. 4% on average in this category. 2. The N content of crop residues and forage was newly estimated using the CS approach. The drop in estimated emissions is 2-3% in this category.

LULUCF

Approximate estimates for 2021 were prepared by a mix of approaches depending on availability of new (2021) AD. The decisive categories in LULUCF sector are 4A and 4G. The estimates for 4A were prepared using the known actual harvest as a proxy variable for CSC in living biomass, deadwood, litter and soil, based on the trends observed for the period 2001 to 2020. 4G emission contribution was considered identical as in 2020 after some minor corrections due to the revised AD at FAO. We observe a massive decrease in emissions from LULUCF by almost 50 % due to decreased applicable harvest and wood removals from forests in 2021. We expect declining emissions from the LULUCF sector due to the successive stabilization of forestry in the country.

Waste

The calculation of Almost all emissions was based on linear extrapolation of the waste treated or/and gas produced. Data on inhabitants, sewer connection etc. in 5.D have been available. Since detailed data on treatment weren't available yet, the approximation for 5.A and 5.C has higher uncertainty but it is expected that emissions will increase. The planned recalculations were taken into account: 5.D emission factors and 5.A waste composition. The effect of changed waste composition on emissions in 5.A is not so clear. In category 5.C, emissions from open burning of waste will be newly calculated in the inventory and thus will contribute to the increase in total emissions from this area.

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 2021
Submission 2022
Country Germany
Geographical scope[4]

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2[1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total	ETS	non-ETS
	CO_2 equivalent (kt)									CO2 equivalent (Gg)	
Total (net emissions)[1]	659868.59	49712.20	29389.99	8249.39	189.79	2536.59	160.24	11.18	750117.97		
1. Energy	627268.47	8729.01	4966.62						640964.10	**303 908**	**337 056**
A. Fuel combustion (sectoral approach)	625380.41	3929.84	4965.68						634275.94	**303 595**	**330 680**
1. Energy industries	235473.57	2306.83	2009.81						239790.21	**207 761**	**32 029**
2. Manufacturing industries and construction	122746.45	290.69	814.77						123851.91	**94 446**	**29 406**
3. Transport (3)	146967.64	210.24	1688.24						148866.13	**809**	**148 057**
4. Other sectors	119263.64	1120.63	448.44						120832.70	**489**	**120 344**
5. Other	929.11	1.46	4.42						934.99	**91**	**844**
B. Fugitive emissions from fuels	1888.06	4799.16	0.94						6688.16	**313**	**6 376**
1. Solid fuels	684.85	139.31	NA						824.16	**IE**	**824**
2. Oil and natural gas	1203.21	4659.86	0.94						5864.01	**313**	**5 864**
C. CO_2 transport and storage	NO								NO	**NO**	
2. Industrial processes and product use	44965.33	600.55	729.93	8249.39	189.79	2536.59	160.24	11.18	57443.01	**51 306**	**6 137**
A. Mineral industry	19830.04								19830.04	**19 693**	**137**
B. Chemical industry	5556.52	572.73	459.44	IE	IE	IE	IE	IE	6588.70	**4 429**	**2 159**
C. Metal industry	17567.47	6.47	13.60	IE	IE	IE	IE	IE	17587.54	**27 184**	**-9 596**
D. Non-energy products from fuels and solvent use	2011.30	NA	1.43						2012.74	**NA**	
E. Electronic Industry				IE	IE	IE	IE	IE	IE	**NA**	
F. Product uses as ODS substitutes				IE	IE	IE	IE	IE	IE	**NA**	
G. Other product manufacture and use	NA	21.35	255.46	IE	IE	IE	IE	IE	276.81	**NA**	
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	**NA**	
3. Agriculture	2588.01	30919.99	21285.02						54793.02		
A. Enteric fermentation		23418.01							23418.01		
B. Manure management		6189.06	2815.78						9004.85		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NA	18216.47						18216.47		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		NO	NO						NO		
G. Liming	2006.37								2006.37		
H. Urea application	399.48								399.48		
I. Other carbon-containing fertilizers	182.16								182.16		
J. Other	NA	1312.93	252.76						1565.69		
4. Land use, land-use change and forestry[1]	-14953.23	1878.52	1601.69						-11473.01		
A. Forest land	-51632.84	43.09	380.57						-51209.18		
B. Cropland	17154.18	125.05	694.86						17974.08		
C. Grassland	18999.09	948.02	119.27						20066.39		
D. Wetlands	4610.19	695.58	43.58						5349.35		
E. Settlements	2057.78	66.78	363.42						2487.98		
F. Other land	NO	NO	NO						NO		
G. Harvested wood products	-6141.63								-6141.63		
H. Other	NO	NO	NO						NO		
5. Waste	0.00	7584.12	806.73						8390.85		
A. Solid waste disposal	NA	6383.93							6383.93		
B. Biological treatment of solid waste		715.01	309.74						1024.75		
C. Incineration and open burning of waste	NO	NO	NO						NO		
D. Waste water treatment and discharge		482.77	463.66						946.43		
E. Other	NE	2.41	33.33						35.74		
6. Other *(as specified in summary 1.A)*	NO	NO	NO	NO	NO	NO	NO	NO	NO		

Memo items:											
International bunkers	21247.10	3.03	212.30						21462.43		
Aviation	18122.24	2.26	170.88						18295.38		
Navigation	3124.86	0.77	41.43						3167.06		
CO_2 emissions from biomass	110209.25								110209.25		
CO_2 captured	NO								NO		
Indirect CO_2 [2]	NO										
Total CO_2 equivalent emissions without land use, land-use change and forestry									761590.99		
Total CO_2 equivalent emissions with land use, land-use change and forestry									750117.97		
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry											
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry											

[1] For carbon dioxide (CO_2) 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.

see our description within press release underhttps://www.umweltbundesamt.de/en/press/pressinformation/greenhouse-gas-emissions-rose-45-percent-in-2021

comment 2.C: In terms of iron & steel the agregation level of ETS data is considerably higher compared to inventory data. Therefore a pricise allocation to process emissions and combustion related emissions is not possible in many cases. Actually a part of the ETS emissions in source category 2.C.1 would have to be allocated to source category 1.A.2.a

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 2021
Submission 2022
Country Denmark
Geographical scope[4] Denmark excl. Greenland and the Faroe Island

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2[1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total	ETS	non-ETS
	CO_2 equivalent (kt)									CO2 equivalent (Gg)	
Total (net emissions)[1]	27718.74	7127.06	5721.18	260.80	0.01	14.89	NA	NA	40842.69		
1. Energy	25935.15	276.60	350.05						26561.80	**10 314**	**16 248**
A. Fuel combustion (sectoral approach)	25823.04	223.36	328.88						26375.27	**10 203**	**16 172**
1. Energy industries	8164.43	95.52	86.06						8346.01	**7 868**	**478**
2. Manufacturing industries and construction	3283.53	21.33	51.17						3356.03	**2 309**	**1 047**
3. Transport (3)	10602.88	7.83	116.28						10726.99	**0**	**10 727**
4. Other sectors	3529.01	98.42	72.77						3700.20	**27**	**3 674**
5. Other	243.18	0.26	2.60						246.04	**0**	**246**
B. Fugitive emissions from fuels	112.11	53.24	21.18						186.53	**111**	**76**
1. Solid fuels	NA	NA	NA						NA	**NA**	
2. Oil and natural gas	112.11	53.24	21.18						186.53	**111**	**76**
C. CO_2 transport and storage	NO								NO	**NA**	
2. Industrial processes and product use	1506.28	2.54	19.02	260.80	0.01	14.89	NA	NA	1803.54	**1 305**	**499**
A. Mineral industry	1336.19								1336.19	**1 305**	**31**
B. Chemical industry	1.43	NA	NA	NA	NA	NA	NA	NA	1.43	**0**	**1**
C. Metal industry	0.09	NO	NO	NO	NO	NO	NO	NO	0.09	**0**	**0**
D. Non-energy products from fuels and solvent use	168.38	0.48	0.14						169.00	**0**	**169**
E. Electronic Industry				NO	NO	NO	NO	NO	0.00	**0**	**0**
F. Product uses as ODS substitutes				260.80	0.01	NA	NA	NA	260.81	**0**	**261**
G. Other product manufacture and use	0.18	2.06	18.88	NA	NA	14.89	NA	NA	36.01	**0**	**36**
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	**NA**	
3. Agriculture	254.35	5881.17	5132.12						11267.64		
A. Enteric fermentation		3679.58							3679.58		
B. Manure management		2197.74	673.08						2870.82		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NE	4457.86						4457.86		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		3.84	1.19						5.03		
G. Liming	249.60								249.60		
H. Urea application	0.93								0.93		
I. Other carbon-containing fertilizers	3.83								3.83		
J. Other	NO	NO	NO						NO		
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	22.96	966.76	219.98						1209.71		
A. Solid waste disposal	NO	536.79							536.79		
B. Biological treatment of solid waste		374.22	72.86						447.08		
C. Incineration and open burning of waste	NA	0.02	0.27						0.29		
D. Waste water treatment and discharge		52.90	146.85						199.76		
E. Other	22.96	2.82	NA						25.79		
6. Other *(as specified in summary 1.A)*	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		
CO_2 emissions from biomass	NE								NE		
CO_2 captured	NE								NE		
Indirect CO_2 [2]	236.75										
Total CO_2 equivalent emissions without land use, land-use change and forestry									40842.69		
Total CO_2 equivalent emissions with land use, land-use change and forestry									NE		
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									41079.43		
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									NE		

(1) For carbon dioxide (CO_2) 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.
The short term trend in Danish greenhouse gas emissions is dominated by the trend in the energy sector. This is caused by the open electricity market and especially the import/export of electricity within the Nordic electricity market. Changes in production of renewable energy (mainly hydropower) in the Nordic countries influences directly the need for fossil power generation in Denmark. In 2021, the energy use increased by 4.8 % to 688 PJ and especially the consumption of coal increased significantly by 39 % counteracted by small declines in consumption of oil and natural gas with 4.3 and 1.1 % respectively. There was a lower electricity import compared to 2020 and an increase in the production of renewable energy. The overall result is that emissions from fuel combustion are expected to be higher in 2021 compared to 2020. More information on the preliminary energy statistics is available from the Danish Energy Agency (https://ens.dk/sites/ens.dk/files/Statistik/statistikdkeng.xlsx). The split between subsectors in fuel combustion has been done using the change in gasoline and diesel consumption as a proxy for the transport sector, while utilising ETS data as a proxy for manufacturing industries. For other sectors (mainly heating of buildings), the emission has been assumed constant at the 2020 level. It should be noted that the uncertainty of the split is much higher that for the total estimate for fuel combustion. For industrial processes, most emissions of CO2, CH4 and N2O have been assumed constant at 2020 levels. However, 2021 ETS infomation has been taken into account for mineral industry. For f-gases, the emissions of HFCs are expected to continue to decrease due to the measures in place to reduce the use of HFCs. For SF6, the emissions have peaked, this is caused by the fact that SF6 was used in double glazed windows and according to the model the lifetime of these windows started to expire in 2011 causing the remaining SF6 to be emitted. Hence, the emissions of SF6 increased since 2011 and now they decrease again. Emissions from agriculture and waste have been kept constant at 2020 levels for the purpose of this proxy.

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 2021
Submission 2022
Country Estonia
Geographical scope[4]

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2[1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total	ETS	non-ETS
	CO_2 equivalent (kt)									CO2 equivalent (Gg)	
Total (net emissions)[1]	10828.85	1057.80	918.37	182.35	NO	2.97	NO	NO	12990.33		
1. Energy	10718.51	138.35	86.57						10943.44	**6 797**	**4 147**
A. Fuel combustion (sectoral approach)	10718.48	117.39	86.57						10922.45	**6 797**	**4 126**
1. Energy industries	7052.45	15.03	30.28						7097.77	**6 705**	**393**
2. Manufacturing industries and construction	507.99	1.15	2.12						511.26	**83**	**428**
3. Transport (3)	2426.67	3.03	24.18						2453.88	**5**	**2 449**
4. Other sectors	731.37	98.17	30.00						859.54	**3**	**856**
5. Other	NO	NO	NO						NO	**NO**	
B. Fugitive emissions from fuels	0.03	20.96	NO						20.99	**NO**	**21**
1. Solid fuels	NO	NO	NO						NO	**NO**	
2. Oil and natural gas	0.03	20.96	NO						20.99	**NO**	**21**
C. CO_2 transport and storage	NO								NO	**NO**	
2. Industrial processes and product use	93.98	NO	2.69	182.35	NO	2.97	NO	NO	281.99	**59**	**223**
A. Mineral industry	58.83								58.83	**59**	**0**
B. Chemical industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	**NO**	
C. Metal industry	2.99	NO	NO	NO	NO	NO	NO	NO	2.99	**NO**	**3**
D. Non-energy products from fuels and solvent use	32.17	NO	NO						32.17	**NO**	**32**
E. Electronic Industry				NO	NO	NO	NO	NO	NO	**NO**	
F. Product uses as ODS substitutes				182.35	NO	NO	NO	NO	182.35	**NO**	**182**
G. Other product manufacture and use	NO	NO	2.69	NO	NO	2.97	NO	NO	5.66	**NO**	**6**
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	**NO**	
3. Agriculture	15.86	683.73	784.37						1483.96	**NO**	**1 483.96**
A. Enteric fermentation		523.13							523.13		
B. Manure management		160.60	72.60						233.20		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NO	711.77						711.77		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		NO	NO						NO		
G. Liming	15.73								15.73		
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]	932.21	66.26	293.23						1291.70	**NO**	**1 291.70**
A. Forest land	-193.38	66.03	266.52						139.17		
B. Cropland	413.74	NO	3.26						417.00		
C. Grassland	63.87	0.13	0.14						64.15		
D. Wetlands	1128.40	0.10	2.27						1130.78		
E. Settlements	375.84	NO	18.73						394.57		
F. Other land	65.98	NO	2.30						68.28		
G. Harvested wood products	-922.24								-922.24		
H. Other	NO	NO	NO						NO		
5. Waste	0.49	235.72	44.73						280.95	**NO**	**280.95**
A. Solid waste disposal	NO	164.83							164.83		
B. Biological treatment of solid waste		18.20	13.02						31.22		
C. Incineration and open burning of waste	0.49	0.24	0.05						0.78		
D. Waste water treatment and discharge		52.45	31.67						84.12		
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	1125.11	2.51	8.62						1136.24		
Aviation	198.38	0.35	1.65						200.37		
Navigation	926.73	2.16	6.97						935.87		
CO_2 emissions from biomass	6408.49								6408.49		
CO_2 captured	NO								NO		
Indirect CO_2 [2]	IE										
Total CO_2 equivalent emissions without land use, land-use change and forestry									12990.33	6855.367	6134.967
Total CO_2 equivalent emissions with land use, land-use change and forestry											
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									12990.33	6855.367	6134.967
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry											

(1) For carbon dioxide (CO_2) 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 emissions: Total GHG emissions in 2021 are estimated to increase 12.4% compared to 2020 mainly due to increased emissions in Energy sector (connected with cold temperatures in winter and lifting COVID-19 pandemic restrictions). ETS emission have increased by 21.9% in 2021 compared to 2020. According to the Proxy estimates non-ETS emissions have increased by 3.5% compared to 2020. Activity data for calculating 2021 LULUCF emissions will become available by the end of 2022 and therefore 2022 March submission emission information is reported. Due to this, the LULUCF emissions are not included in the total GHG estimation, as they do not represent approximated GHG emissions for the year 2021. Energy: 2021 total GHG emissions in the Energy sector are estimated to increase by 15.7% compared to 2020 due to increasing emissions in the Energy industries in the public electricity and heat production, as a consequence of colder temperatures in winter and reduced movement restrictions from COVID-19 pandemic. Emissions are estimated to increase in the Transport sector by 9.9% as a result of lifting COVID-19 pandemic movement restrictions and increase in diesel fuel demand in road transportation (lowered diesel fuel tax). Although alternative fuel consumption has increased, the lowered diesel fuel tax had a bigger impact on increasing the emissions in the transport sector. In the ETS and non-ETS section in the table above CO2 emissions from domestic aviation have been presented under the ETS column. The proxy estimation for Energy sector is based on short term fuel consumption statistics provided by Statistics Estonia (mini Joint Questionnaires) which are preliminary estimations for 2021. However, the national inventory report is based on annual Joint Questionnaires, which is compiled in autumn and is more detailed, therefore changes in the final emission estimations are foreseen. IPPU: 2021 year´s preliminary emissions from IPPU sector decreased by 4.6% in comparison to 2020 year´s emissions (according to the 2022 submission). Emission decreased by 16.3% in the mineral industry subsector because clinker production stopped in March 2020. The emission of HFC-s decreased 1.3%. Some changes in the final emission estimations of HFC-s are foreseen. Under memo items indirect CO2 emissions from NMVOC from solvent use and road paving with asphalt (ca 24.74 kt CO2) are included into 2.D Agriculture: Total emissions from Agriculture sector in 2021 are estimated to idecrease by 1.62% compared to 2020. The main decrease of emissions occurred in 3.D Agricultural Soils subcategory, where emissions are estimated to decreased by 2.96%. This is mainly caused by the decrease in crop production quantities (for the most crop categories, production and yield decreased) compared to the previous year. Emissions from 3.A Enteric Fermentation and from 3.B Manure Management are estimated to decrease slightly, 0.1% and 1% respectively. This is mainly due to the fact that animal numbers from all animal categories decreased slightly compared to the previous year. For 3.G Liming the emissions are identical with the previous year because activity data is not yet available for calculating 2021 emissions. Emissions from 3.H Urea application has remained at the same level since 2018 as there is no national data gathered for urea application in Estonia. LULUCF: Activity data for calculating 2021 LULUCF emissions will become available by the end of 2022 and therefore 2022 March submission emission information is reported. Waste: Total emissions from waste sector in 2021 are estimated to decrease by 3.3% compared to 2020. Waste activity data for calculating 2021 waste sector is under inspection by the Estonian Environment Agency and is not yet available. Due to this, waste activity data from 2022 submission is used together with updated population and GDP data. In addition, information on different wastewater system for 2021 was also updated. Plant specific data was used for industrial wastewater emission calculation. Any recaclulation has been made compared to the 2022 submisson.

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 2021
Submission 2022
Country Spain
Geographical scope[4]

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2[1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total	ETS	non-ETS
	CO_2 equivalent (kt)									CO2 equivalent (Gg)	
Total (net emissions)[1]	191679.28	38306.93	18470.26	3749.27	35.49	230.64	1403.12	NO	253875.01		
1. Energy	208030.86	2130.96	1791.07						211952.90	**78 559**	**133 394**
A. Fuel combustion (sectoral approach)	204470.32	1914.69	1791.05						208176.06	**75 741**	**132 435**
1. Energy industries	43276.97	135.18	407.44						43819.58	**40 014**	**3 805**
2. Manufacturing industries and construction	40748.57	861.75	212.62						41822.94	**33 508**	**8 315**
3. Transport (3)	83627.90	113.09	910.49						84651.48	**2 008**	**82 643**
4. Other sectors	36381.62	804.38	256.75						37442.75	**210**	**37 233**
5. Other	435.26	0.29	3.76						439.31	**0**	**439**
B. Fugitive emissions from fuels	3560.54	216.28	0.02						3776.84	**2 818**	**958**
1. Solid fuels	25.55	15.31	NA						40.86	**0**	**41**
2. Oil and natural gas	3534.99	200.97	0.02						3735.97	**2 818**	**918**
C. CO_2 transport and storage	NO								NO	**NO**	
2. Industrial processes and product use	18236.87	118.47	1057.98	3749.27	35.49	230.64	1403.12	NO	24831.85	**15 128**	**9 704**
A. Mineral industry	11400.78								11400.78	**11 061**	**340**
B. Chemical industry	3403.19	102.44	398.43	NO	NO	NO	NO	NO	3904.06	**1 600**	**2 304**
C. Metal industry	2641.42	16.03	NA	NO	28.36	NO	NO	NA	2685.81	**2 467**	**219**
D. Non-energy products from fuels and solvent use	791.48	NA	NA						791.48	**0**	**791**
E. Electronic Industry				NO	NO	NO	NO	NO	NO	**NO**	
F. Product uses as ODS substitutes				3749.27	7.14	NO	1403.12	NO	5159.53	**0**	**5 160**
G. Other product manufacture and use	NO	NO	659.47	NO	NO	230.64	NO	NO	890.11	**0**	**890**
H. Other	IE	IE	0.07	NA	NA	NA	NA	NA	0.07	**0**	**0**
3. Agriculture	622.09	24092.16	13924.16						38638.41		
A. Enteric fermentation		16156.65							16156.65		
B. Manure management		7496.70	1686.58						9183.29		
C. Rice cultivation		418.58							418.58		
D. Agricultural soils		IE	12231.33						12231.33		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		20.22	6.25						26.47		
G. Liming	30.37								30.37		
H. Urea application	529.23								529.23		
I. Other carbon-containing fertilizers	62.49								62.49		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry[1]	-35210.53	178.57	258.12						-34773.85		
A. Forest land	-31780.74	167.14	153.99						-31459.61		
B. Cropland	-3721.42	6.15	36.59						-3678.69		
C. Grassland	520.78	5.27	8.54						534.59		
D. Wetlands	74.72	0.00	0.00						74.72		
E. Settlements	1263.31	NO	59.01						1322.32		
F. Other land	NO	NO	NO						NO		
G. Harvested wood products	-1567.18								-1567.18		
H. Other	NO	NO	NO						NO		
5. Waste	NO	11786.78	1438.92						13225.70		
A. Solid waste disposal	NO	9478.80							9478.80		
B. Biological treatment of solid waste		320.07	212.51						532.58		
C. Incineration and open burning of waste	NO	271.09	313.26						584.35		
D. Waste water treatment and discharge		1716.31	913.15						2629.46		
E. Other	NA	0.50	NA						0.50		
6. Other *(as specified in summary 1.A)*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	

Memo items:											
International bunkers									27469.94		
Aviation									9472.29		
Navigation									17997.66		
CO_2 emissions from biomass									27225.83		
CO_2 captured									NO		
Indirect CO_2 [2]											
Total CO_2 equivalent emissions without land use, land-use change and forestry									288648.85	93686.64	194962.2
Total CO_2 equivalent emissions with land use, land-use change and forestry									253875.01		
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									NA	NA	
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									NA		

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.

CRF1+CRF2: Increased of ETS emissions of +3%. http://www.eea.europa.eu/data-and-maps/data/data-viewers/emissions-trading-viewer
1A1a: Increased of electricity generation (+3.6%). Increased participation of renewable energies in the mix (Wind: +10.2%, Solar photovoltaic: +36.9%). https://www.ree.es/es/balance-diario/nacional/2021/12/31#
1A1b: Increased of ETS emissions in refinery sector (+1.8%). http://www.eea.europa.eu/data-and-maps/data/data-viewers/emissions-trading-viewer
1A2: Increased of industrial activity (+4% in emissions).
1A3: Increased of national aviation kerosene consumption (+38.8%); increased of road fossil fuels (+11.9 % diesel; +24.3% gasoline). Source: http://www.cores.es/es/estadisticas
1A4: Increased +1%. [Several sources]
2F: decrease of fluorinated gas consumption (-0.3%).
3A-3B: cattle rise (Non dairy: +1.1% and swine: +4.2%). https://www.mapa.gob.es/es/estadistica/temas/estadisticas-agrarias/ganaderia/encuestas-ganaderas/#para4

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 2021
Submission 2022
Country Finland
Geographical scope[4]

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2[1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total	ETS	non-ETS
	CO_2 equivalent (kt)									CO2 equivalent (Gg)	
Total (net emissions)[1]	37151.73	5110.80	6724.03	915.70	1.72	19.13	NO	NO	49923.12		
1. Energy	33223.73	284.00	549.76						34057.48	**16 338**	**17 512**
A. Fuel combustion (sectoral approach)	33135.74	259.00	549.00						33943.74		
1. Energy industries	12590.00	31.00	242.00						12863.00		
2. Manufacturing industries and construction	6490.00	23.00	152.00						6665.00		
3. Transport (3)	9985.00	12.00	86.00						10083.00		
4. Other sectors	3090.00	190.00	62.00						3342.00		
5. Other	980.74	3.00	7.00						990.74		
B. Fugitive emissions from fuels	87.98	25.00	0.76						113.73		
1. Solid fuels	NO	NO	NO						NO		
2. Oil and natural gas	87.98	25.00	0.76						113.73		
C. CO_2 transport and storage	NO								NO		
2. Industrial processes and product use	4234.30	1.26	263.31	915.70	1.72	19.13	NO	NO	5435.42	**3 990**	**1 446**
A. Mineral industry	1039.11								1039.11		
B. Chemical industry	979.04	1.13	246.78	NO	NO	NO	NO	NO	1226.94		
C. Metal industry	2082.14	0.00	NO	NO	NO	NO	NO	NO	2082.14		
D. Non-energy products from fuels and solvent use	134.01	0.13	0.76						134.91		
E. Electronic Industry				NO	NO	NO	NO	NO	NO		
F. Product uses as ODS substitutes				911.26	0.79	NO	NO	NO	912.05		
G. Other product manufacture and use	NO	NO	15.77	NO	NO	13.96	NO	NO	29.73		
H. Other	NO	NO	NO	4.43	0.93	5.17	NO	NO	10.54		
3. Agriculture	205.49	2516.44	3770.53						6492.46		
A. Enteric fermentation		2072.35							2072.35		
B. Manure management		444.09	267.45						711.55		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NE	3503.07						3503.07		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		NO	NO						0.00		
G. Liming	203.93								203.93		
H. Urea application	1.56								1.56		
I. Other carbon-containing fertilizers	NA								NA		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry[1]	-511.79	765.67	2022.30						2276.18		
A. Forest land	-9141.27	694.03	1894.22						-6553.01		
B. Cropland	8251.40	IE	7.21						8258.61		
C. Grassland	767.41	0.02	0.65						768.08		
D. Wetlands	2034.79	71.62	98.22						2204.63		
E. Settlements	712.38	NE	20.26						732.65		
F. Other land	NO	NA	NA						NO		
G. Harvested wood products	-3136.50								-3136.50		
H. Other	NA	NA	NA						NA		
5. Waste	NO	1543.44	118.14						1661.58		
A. Solid waste disposal	NO	1310.23							1310.23		
B. Biological treatment of solid waste		71.56	43.35						114.92		
C. Incineration and open burning of waste	NO	NO	NO						NO		
D. Waste water treatment and discharge		161.65	74.79						236.43		
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	1711.60	1.90	13.00						1726.50		
Aviation	824.06	0.11	6.71						830.88		
Navigation	887.54	1.79	6.29						895.62		
CO_2 emissions from biomass	43279.59								43279.59		
CO_2 captured	96.26								96.26		
Indirect CO_2 [2]	65.95										
Total CO_2 equivalent emissions without land use, land-use change and forestry									47646.94	20327.68	27111.69
Total CO_2 equivalent emissions with land use, land-use change and forestry									49923.12		
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									47712.89	20327.68	27177.65
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									49989.07		

[1] For carbon dioxide (CO_2) 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.

According to instant preliminary data, Finland's total greenhouse gas emissions without land use, land use change and forestry (LULUCF) sector in 2021 amounted to 47.7 mill. tonnes of CO2 eq., which was 0.07 mill. tonnes less than in 2020. The energy sector is Finland's largest source of emissions, significantly affecting the annual variation of total emissions. The energy sector's emissions in 2021 were 34.1 mill. tonnes of CO2 equivalent, which is close on one per cent less than in the year before. Among the reasons for the reduction in emissions were decreased use of peat and growth in the bioshare of transport fuels.

Emissions not included in the EU ETS amounted to around 27.2 mill. tonnes of CO2 eq. in 2021, and they fell by three per cent from the previous year. Emissions included in the EU ETS grew by four per cent from the previous year, being 20.3 mill. tonnes of CO2 eq.

The LULUCF sector was for the first time a net source of emissions, 2.3 million tonnes of CO2 equivalent, that is, the sector's emissions exceeded the amount of carbon sequestrated to various stocks during the year. The sector's emissions exceeded the net sink of -6.6 mill. tonnes of CO2 equivalent in the forest land and the net sink of -3.1 mill. tonnes of CO2 in the harvested wood products. The change in the sector from a net sink into a net source of emissions were due to fellings implemented at a high level and the falling trend of annual increment of growing stock observed in the National Forest Inventory.

For more information on trends, see https://stat.fi/en/publication/cktlcpwag38sg0c5561iqop0y

Quantitative assessment of the UC of the approximated LULUCF estimates were not carried out. Compared to UCs of GHGI estimates, the UCs can be assessed to be higher because preliminary statistics are used as activity data. The gain of living tree biomass was estimated based on the new national forest inventory increment results of three years measurements. In the GHGI, a five years' increments are used. The carbon loss in living tree biomass was estimated using preliminary statistics on total drain of growing stock in 2021, including harvest removals. Other reasons to the higher UCs are:

- For harvested wood products and carbon stock changes from soil in cropland, preliminary statistics were used; For activity data, the 2020 areas were employed.
- For emissions and removals in grassland, wetlands, settlements, all land-use changes and non-CO2 emissions, the estimates for 2020 were used.

Note 1: The preliminary estimate for transport includes a preliminary estimate also for domestic aviation: 207.57 kt CO2. Please use this estimate when publishing data on emissions trends for EU MS to provide a more accurate estimate for the non-ETS sector emissions.

Note 2: Emissions are reported with GWP values from the IPCC's 4th Assessment report. The verified EU ETS emissions are reported with the GWP values from the IPCC's 5th Assessment report. Therefore, ETS emissions according to approximated inventory do not completely add up to the verified EU ETS emissions.

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 2021
Submission 2022
Country France
Geographical scope[4] FR UE perimeter

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2[1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total	ETS	non-ETS
	CO_2 equivalent (kt)									CO2 equivalent (Gg)	
Total (net emissions)[1]	297572.14	55758.63	39421.06	10694.86	560.26	347.27	NO	9.94	404364.17	87808.32	316555.85
1. Energy	282447.12	2299.52	3620.34						288366.98	**55 929**	**232 438**
A. Fuel combustion (sectoral approach)	280190.98	1399.50	3469.01						285059.49	**53 694**	**231 366**
1. Energy industries	39693.04	47.97	261.73						40002.74	**28 812**	**11 191**
2. Manufacturing industries and construction	44370.43	96.08	508.76						44975.28	**24 338**	**20 637**
3. Transport (3)											
4. Other sectors	73372.51	1090.24	1424.71						75887.46	**219**	**75 669**
5. Other	1551.19	2.02	8.69						1561.89		**1 562**
B. Fugitive emissions from fuels	2256.14	900.02	151.33						3307.49	**2 235**	**1 072**
1. Solid fuels	NO	25.56	NO						25.56		**26**
2. Oil and natural gas	2256.14	874.46	151.33						3281.93	**2 235**	**1 047**
C. CO_2 transport and storage	NO								NO		
2. Industrial processes and product use	29378.87	63.16	818.34	10694.86	560.26	347.27	NO	9.94	41872.71	**31 879**	**9 993**
A. Mineral industry	9687.84								9687.84	**9 136**	**552**
B. Chemical industry	6169.60	32.37	682.48	94.45	NO	NO	NO	NO	6978.90	**6 862**	**116**
C. Metal industry	11913.32	30.52	NO	NO	65.42	7.66	NO	NO	12016.92	**15 819**	**-3 802**
D. Non-energy products from fuels and solvent use	1142.66	0.27	2.23						1145.15	**57**	**1 088**
E. Electronic Industry				7.70	90.08	4.75	NO	9.94	112.48		**112**
F. Product uses as ODS substitutes				10592.12	NA	NA	NA	NA	10592.12		**10 592**
G. Other product manufacture and use	465.36	NO	133.63	0.59	404.76	334.86	NA	NA	1339.20	**4**	**1 335**
H. Other	0.10	NO	NO	NA	NA	NA	NA	NA	0.10	**0**	**0**
3. Agriculture	1858.83	37064.74	31528.56						70452.12		
A. Enteric fermentation		33202.49							33202.49		
B. Manure management		3795.76	2350.47						6146.24		
C. Rice cultivation		38.23							38.23		
D. Agricultural soils		NO	29169.35						29169.35		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		28.26	8.73						36.99		
G. Liming	640.81								640.81		
H. Urea application	1036.18								1036.18		
I. Other carbon-containing fertilizers	181.84								181.84		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry[1]	-17810.40	1115.87	2856.89						-13837.65		
A. Forest land	-31238.35	597.02	382.32						-30259.01		
B. Cropland	11507.10	109.50	1639.81						13256.41		
C. Grassland	-8543.35	123.86	109.26						-8310.23		
D. Wetlands	494.83	8.92	0.73						504.48		
E. Settlements	10743.98	58.41	724.77						11527.15		
F. Other land	NO	NO	NO						NO		
G. Harvested wood products	-814.43								-814.43		
H. Other	39.82	218.17	NA						257.99		
5. Waste	1697.72	15215.35	596.94						17510.01		
A. Solid waste disposal	NA	11687.24							11687.24		
B. Biological treatment of solid waste		1132.62	215.35						1347.97		
C. Incineration and open burning of waste	1697.72	38.87	63.24						1799.83		
D. Waste water treatment and discharge		2356.63	318.34						2674.97		
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	11846.17	8.27	94.61						11949.05		
Aviation	8716.68	0.76	70.69						8788.13		
Navigation	3129.49	7.51	23.92						3160.92		
CO_2 emissions from biomass	61688.18								61688.18		
CO_2 captured	NO								NO		
Indirect CO_2 [2]											
Total CO_2 equivalent emissions without land use, land-use change and forestry									418201.82	87808.32	330393.5
Total CO_2 equivalent emissions with land use, land-use change and forestry									404364.17		
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									NA		
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									NA		

(1) For carbon dioxide (CO_2) 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.

2020 has been a very special year due to the global pandemic Covid-19 crisis with specific health measures (more or less strict during the months of 2020). these health measures impacted more the sectors of transport and industrie. During 2021, the pandemic Covid-19 crisis continued but with less health measures, so a rebound of activities especially in transport and industry appeared explaning a significant increase of the GHG proxy emissions in 2021 versus 2020 (more than 6% vs 2020 but lower than 2019 emissions). More detailed information can be avilable in the Citepa web site : https://www.citepa.org/fr/secten/

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 2021
Submission 2022
Country
Geographical scope[4]

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2[1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total	ETS	non-ETS
	CO_2 equivalent (kt)									CO2 equivalent (Gg)	
Total (net emissions)[1]	53060.24	9611.77	4338.13	5100.00	115.82	5.00	0.00	0.00	72230.97		
1. Energy	52182.55	701.37	456.18						53340.10		
A. Fuel combustion (sectoral approach)	52177.55	276.37	456.08						52910.00		
1. Energy industries	25543.08	8.18	77.20						25628.45	**25 274**	**355**
2. Manufacturing industries and construction	4284.48	6.14	55.88						4346.50	**3 295**	**1 052**
3. Transport (3)	15500.00	62.00	220.00						15782.00		**15 782**
4. Other sectors	6500.00	200.00	100.00						6800.00		**6 800**
5. Other	350.00	0.05	3.00						353.05		**353**
B. Fugitive emissions from fuels	5.00	425.00	0.10						430.10		
1. Solid fuels	NO	295.00	NA						295.00		**295**
2. Oil and natural gas	5.00	130.00	0.10						135.10		**135**
C. CO_2 transport and storage	NO										
2. Industrial processes and product use	4892.19	0.30	144.64	5100.00	115.82	5.00	0.00	0.00	10257.95		
A. Mineral industry	3559.49								3559.49	**3 546**	**13**
B. Chemical industry	424.62		4.64						429.26	**429**	
C. Metal industry	733.08	0.30	NO		85.82				819.20	**683**	**136**
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				5100.00	30.00				5130.00		**5 130**
G. Other product manufacture and use	85.00	NA	140.00		NO	5.00			230.00		**230**
H. Other	NA	NA	NA								
3. Agriculture	40.00	4405.00	3400.00						7845.00		
A. Enteric fermentation		3600.00							3600.00		**3 600.00**
B. Manure management		640.00	290.00						930.00		**930.00**
C. Rice cultivation		140.00							140.00		**140.00**
D. Agricultural soils		NE	3100.00						3100.00		**3 100.00**
E. Prescribed burning of savannas		NO	NO						0.00		
F. Field burning of agricultural residues		25.00	10.00						35.00		**35.00**
G. Liming	NO								0.00		
H. Urea application	40.00								40.00		**40.00**
I. Other carbon-containing fertilizers	NO								0.00		
J. Other									0.00		
4. Land use, land-use change and forestry[1]	-4059.50	25.00	16.32						-4018.18		
A. Forest land	-2200.00	10.00	1.00						-2189.00		
B. Cropland	-100.00	NO	1.30						-98.70		
C. Grassland	-2000.00	15.00	1.00						-1984.00		
D. Wetlands	0.50	NO	0.02						0.52		
E. Settlements	130.00	NO	7.00						137.00		
F. Other land	80.00	NO	6.00						86.00		
G. Harvested wood products	30.00								30.00		
H. Other	NO	NO	NO						0.00		
5. Waste	5.00	4480.10	321.00						4806.10		**3 621.00**
A. Solid waste disposal	NO	3300.00							3300.00		**100.00**
B. Biological treatment of solid waste		80.00	20.00						100.00		**6.10**
C. Incineration and open burning of waste	5.00	0.10	1.00						6.10		**1 400.00**
D. Waste water treatment and discharge		1100.00	300.00						1400.00		
E. Other	NO	NO	NO						0.00		
6. Other *(as specified in summary 1.A)*	NO	NO	NO	NO	NO	NO	NO	NO	0.00		

Memo items:											
International bunkers	7000.00	15.50	190.00						7205.50		
Aviation	1500.00	0.50	20.00						1520.50		
Navigation	5500.00	15.00	170.00						5685.00		
CO_2 emissions from biomass											
CO_2 captured											
Indirect CO_2 [2]											
Total CO_2 equivalent emissions without land use, land-use change and forestry									76249.15	33227.45	43342.7
Total CO_2 equivalent emissions with land use, land-use change and forestry									72230.97		
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry											
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry											

(1) For carbon dioxide (CO_2) 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.

The ETS in column L does not include aviation. The emissions from national aviation are included in column M (non-ETS). The estimation of emissions from categories 1 (power sector, refineries and industry) and 2 is based on ETS data. The estimation of emissions from the rest sectors is based on extrapolation of historic emissions and expert judgement.

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 2021
Submission 2022
Country Croatia
Geographical scope[4]

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2[1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total	ETS	non-ETS
	CO_2 equivalent (kt)									CO2 equivalent (Gg)	
Total (net emissions)[1]	16323.36	3423.82	1676.46	1820.33	NA	8.85	NA	NA	23252.82		
1. Energy	14387.02	481.58	215.72						15084.31	**5 208**	**9 877**
A. Fuel combustion (sectoral approach)	14111.16	341.52	215.57						14668.25	**5 208**	**9 461**
1. Energy industries	3686.84	10.65	26.14						3723.64	**3 553**	**171**
2. Manufacturing industries and construction	2072.99	3.94	6.74						2083.66	**1 655**	**429**
3. Transport (3)	5705.40	8.32	60.33						5774.06	**NO**	**5 774**
4. Other sectors	2645.93	318.60	122.36						3086.89	**NO**	**3 087**
5. Other	NO	NO	NO						NO	**NO**	
B. Fugitive emissions from fuels	275.86	140.06	0.15						416.06	**NO**	**416**
1. Solid fuels	NO	NO	NO						NO	**NO**	
2. Oil and natural gas	275.86	140.06	0.15						416.06	**NO**	**416**
C. CO_2 transport and storage	NO								NO	**NO**	
2. Industrial processes and product use	1848.40	NA	55.24	1820.33	NA	8.85	NA	NA	3732.82	**1 789**	**1 944**
A. Mineral industry	1372.22								1372.22	**1 372**	
B. Chemical industry	362.69	NA	36.28	NA	NA	NA	NA	NA	398.96	**399**	
C. Metal industry	17.88	NA	NA	NA	NA	NA	NA	NA	17.88	**18**	
D. Non-energy products from fuels and solvent use	95.61	NA	NA						95.61	**NO**	**96**
E. Electronic Industry				NO	NO	NO	NO	NO	NO	**NO**	
F. Product uses as ODS substitutes				1820.33	NO	NA	NA	NA	1820.33	**NO**	**1 820**
G. Other product manufacture and use	NA	NA	18.97	NA	NA	8.85	NA	NA	27.82	**NO**	**28**
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	**NO**	
3. Agriculture	87.95	1286.28	1305.57						2679.80	**NO**	
A. Enteric fermentation		933.85							933.85		
B. Manure management		352.43	138.18						490.61		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NA	1167.39						1167.39		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		NO	NO						NO		
G. Liming	0.00								0.00		
H. Urea application	87.95								87.95		
I. Other carbon-containing fertilizers	NA								NA		
J. Other	NO	NO	NO						NO		
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	1655.96	99.94						1755.90		
A. Solid waste disposal	NA	1203.13							1203.13		
B. Biological treatment of solid waste		17.51	8.43						25.93		
C. Incineration and open burning of waste	NO	5.57	1.53						7.10		
D. Waste water treatment and discharge		429.75	89.98						519.73		
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	227.53	0.18	1.85						229.56		
Aviation	163.82	0.03	1.35						165.19		
Navigation	63.71	0.15	0.51						64.37		
CO_2 emissions from biomass	6383.96								6383.96		
CO_2 captured	NO								NO		
Indirect CO_2 [2]	NO										
Total CO_2 equivalent emissions without land use, land-use change and forestry									23252.82	6996.693	16256.13
Total CO_2 equivalent emissions with land use, land-use change and forestry									NE		
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									NA		
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									NA		

(1) For carbon dioxide (CO_2) 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.
1. Energy 1A1 - 90% of total CO2 emissisons is from ETS, according to 2020. It is assumed that the distribution stayed the same in 2020. For CH4 and N2O emissions is assumed that ratio CH4/CO2 and N2O/CO2 in 2021 is the same as for 2020. 1A2 -It is assumed that the distribution stayed the same in 2021 as it was in 2020. For CH4 and N2O emissions is assumed that ratio CH4/CO2 and N2O/CO2 in 2021 is the same as for 2020 1A3 - Transport, 1A4. Other Sectors, 1B2. Oil and Natural Gas all GHG were extrapolated based on emissions from 2016-2020 1B2 - all GHG are extrapolated based on emissions from 2016-2020 2. Industrial processes and product use 2.A: verified ETS CO2 emission provided by Ministry of economy and sustainable development (includes 2.A.1; 2.A.2; 2.A.3; 2.A.4.a and 2.A.4.d). 2.B.1 - ETS: natural gas consumption as fuel and feedstock in ammonia production is included. Verified ETS CO2 emission provided by Ministry of economy and sustainable development. 2.B.2 - ETS: Verified ETS N2O emission (based on measurements) is provided by Ministry of economy and sustainable development. 2.C.1 - ETS: Verified CO2 emission. Data are provided by Ministry of economy and sustainable development. 2.D.1; 2.D.2; 2.D.3 - non-ETS: CO2 emission estimated by linear extrapolation, according to emissions trend from 2016 to 2020 2.E - Activities are not present in the country. 2.F - non-ETS: HFC emissions estimated by linear extrapolation, according to emissions trend from 2016 to 2020. PFC emissions not present. 2.G.1 - non-ETS: SF6 emission estimated by linear extrapolation, according to emissions trend from 2016 to 2020. 2.G.3 - non-ETS: N2O emission estimated by linear extrapolation, according to emissions trend from 2016 to 2020. 2.H.1; 2.H.2; 2.H.3 - non-ETS: Only information on CO2 emission of non-biogenic origin should be reported. 3. Agriculture 3.A-3.H. linear extrapolation is based on trend from 2016 to 2020 5. Waste 5.A.1; 5.A.2 CH4 emissions are assessed by extrapolation, according to emissions trend from 2018 to 2020, due to the lack of the information. 5.B.1; 5.B.2 CH4 and N2O emissions are assessed by extrapolation, according to emissions trend from 2018 to 2020, due to the lack of the information. 5.C.1 CO2 emission is assessed according to data for 2020 as NO, due to the lack of the information.There was no incineration of clinical waste without energy recovery in 2021. 5.C.2 CH4 and N2O emissions are assessed by extrapolation, according to emissions trend from 2016 to 2020, due to the lack of the information. 5.D.1 CH4 emission is assessed by extrapolation, according to emissions trend from 2016 to 2020, due to the lack of the information. 5.D.1 N2O emission is assessed by extrapolation, according to emissions trend from 2016 to 2020, due to the lack of the information. 5.D.2 CH4 emission is assessed by extrapolation, according to emissions trend from 2016 to 2020, due to the lack of the information.

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 2021
Submission 2022
Country Hungary
Geographical scope[4]

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2[1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total	ETS	non-ETS
	CO_2 equivalent (kt)									CO2 equivalent (Gg)	
Total (net emissions)[1]	41917.93	8233.06	4998.10	2173.53	3.56	110.74	NO	NO	57436.93		
1. Energy	43100.87	2211.63	333.59						45646.09	**13 044**	**32 602**
A. Fuel combustion (sectoral approach)	42952.89	554.14	333.31						43840.34	**13 022**	**30 818**
1. Energy industries	11332.81	25.67	52.71						11411.18	**10 740**	**671**
2. Manufacturing industries and construction	5095.32	14.01	32.81						5142.14	**2 211**	**2 931**
3. Transport (3)	13362.75	21.80	150.38						13534.93	**52**	**13 483**
4. Other sectors	13093.65	492.58	97.14						13683.37	**18**	**13 665**
5. Other	68.36	0.09	0.28						68.72		**69**
B. Fugitive emissions from fuels	147.98	1657.50	0.28						1805.76	**22**	**1 784**
1. Solid fuels	6.80	31.65	0.00						38.46	**7**	**32**
2. Oil and natural gas	141.17	1625.84	0.28						1767.30	**15**	**1 752**
C. CO_2 transport and storage	NO								NO		
2. Industrial processes and product use	4869.14	48.91	227.10	2173.53	3.56	110.74	NO	NO	7432.97	**4 571**	**2 862**
A. Mineral industry	1335.30								1335.30	**1 331**	**4**
B. Chemical industry	2604.04	45.97	32.69	NO	NO	NO	NO	NO	2682.70	**2 440**	**243**
C. Metal industry	800.19	2.93	NO	NO	NO	NO	NO	NO	803.12	**800**	**3**
D. Non-energy products from fuels and solvent use	129.62	NO	NO						129.62		**130**
E. Electronic Industry				NO	NO	NO	NO	NO	0.00		**0**
F. Product uses as ODS substitutes				2173.53	3.56	NO	NO	NO	2177.08		**2 177**
G. Other product manufacture and use	NO	NO	194.41	NO	NO	110.74	NO	NO	305.15		**305**
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO		
3. Agriculture	233.91	2755.91	4267.93						7257.74		
A. Enteric fermentation		2095.00							2095.00		
B. Manure management		642.36	437.02						1079.38		
C. Rice cultivation		18.35							18.35		
D. Agricultural soils		NA	3830.84						3830.84		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		0.20	0.06						0.26		
G. Liming	3.92								3.92		
H. Urea application	126.50								126.50		
I. Other carbon-containing fertilizers	103.49								103.49		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry[1]	-6311.30	11.05	39.40						-6260.85		
A. Forest land	-6274.66	10.00	9.00						-6255.66		
B. Cropland	-28.76	0.24	19.71						-8.81		
C. Grassland	-101.30	0.81	0.88						-99.60		
D. Wetlands	63.96	NO	0.48						64.44		
E. Settlements	227.26	NO	9.32						236.57		
F. Other land	1.20	NO	NO						1.20		
G. Harvested wood products	-199.00								-199.00		
H. Other	NA	NA	NA						NA		
5. Waste	25.31	3205.57	130.09						3360.96		
A. Solid waste disposal	NO	2873.35							2873.35		
B. Biological treatment of solid waste		99.74	45.30						145.04		
C. Incineration and open burning of waste	25.31	0.09	0.37						25.77		
D. Waste water treatment and discharge		232.39	84.42						316.80		
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	393.71	0.07	3.23						397.01		
Aviation	393.71	0.07	3.23						397.01		
Navigation	NO	NO	NO						NO		
CO_2 emissions from biomass	11957.46								11957.46		
CO_2 captured	NO								NO		
Indirect CO_2 [2]	NE										
Total CO_2 equivalent emissions without land use, land-use change and forestry									63697.78	17615.14	46082.63
Total CO_2 equivalent emissions with land use, land-use change and forestry									57436.93		
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									NE	NE	
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									NE		

(1) For carbon dioxide (CO_2) 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 increased by 1.4% in 2021. ETS emissions decreased by 6.8% especially due to decreased coal-based electricity production and significant reduction in the iron and steel sector. ENERGY (+2.8%) Larger decrease (around 7.5%) in energy indutries is expected. Electricity production increased by 3.4% but relevant emissions decreased due to decreasing coal-based and increasing gas- and renewables-based production. Natural gas consumption increased generally but especially in the residential sector due to increased heating demand. Fuel (gasoline and diesel) consumption increased also in the transport sector by 7-10%. IPPU (-3.9%) Pig iron and steel production of the BOF steel producing company decreased by about 33% causing 28% decrease in the emissions of 2C1 sector. AGRICULTURE (-0.5%) The key drivers determining the trend in emissions, N fertiliser use and cattle herd size, did not change significantly. In addition, the small increase (1.6%) in the N content of fertiliser used was offset by a slight decrease in the cattle population (-0.3%). LULUCF (-8.2%) The lower sink (preliminary value) is most probably due to increased harvest in 2021 relative to 2020. (The difference between the values for 2021 and 2020 for HWP cannot be interpreted because the latter value is developed from a trend extrapolation and not calculated from activity data.) WASTE (-1.2%) The decreasing trend is expected to continue.

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 2021
Submission 2022
Country Ireland
Geographical scope[4]

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2[1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total	ETS	non-ETS
	CO_2 equivalent (kt)									CO2 equivalent (Gg)	
Total (net emissions)[1]	44510.07	15824.44	7060.24	690.24	73.47	18.52	NO	1.61	68178.59	15312.02	52866.58
1. Energy	34353.30	267.42	326.25						34946.96	**13 060**	**21 887**
A. Fuel combustion (sectoral approach)	34352.87	177.08	326.25						34856.20	**13 060**	**21 796**
1. Energy industries	10063.42	10.40	107.39						10181.22	**9 514**	**667**
2. Manufacturing industries and construction	4570.98	8.66	14.35						4594.00	**3 490**	**1 104**
3. Transport (3)	10790.54	7.37	126.80						10924.71	**0**	**10 925**
4. Other sectors	8927.93	150.65	77.70						9156.28	**56**	**9 100**
5. Other	IE	IE	IE						IE	**NO**	
B. Fugitive emissions from fuels	0.43	90.33	0.00						90.76	**NO**	**91**
1. Solid fuels	NO	17.45	NO						17.45	**NO**	**17**
2. Oil and natural gas	0.43	72.89	0.00						73.32	**NO**	**73**
C. CO_2 transport and storage	NO								NO	**NO**	
2. Industrial processes and product use	2420.00	NO	44.80	690.24	73.47	18.52	NO	1.61	3248.64	**2 252**	**997**
A. Mineral industry	2253.17								2253.17	**2 252**	**1**
B. Chemical industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	**NO**	
C. Metal industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	**NO**	
D. Non-energy products from fuels and solvent use	166.83	NO	NO						166.83	**NO**	**167**
E. Electronic Industry				690.24	73.47	12.39	NO	1.61	777.71	**NO**	**778**
F. Product uses as ODS substitutes				NO	NO	NO	NO	NO	0.00	**NO**	**0**
G. Other product manufacture and use	NO	NO	44.80	NO	NO	6.13	NO	NO	50.93	**NO**	**51**
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	**NO**	
3. Agriculture	699.45	14361.59	6371.70						21432.74		
A. Enteric fermentation		12511.47							12511.47		
B. Manure management		1850.12	714.25						2564.37		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NE	5657.45						5657.45		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		NO	NO						NO		
G. Liming	597.41								597.41		
H. Urea application	102.04								102.04		
I. Other carbon-containing fertilizers	NO								NO		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry[1]	7008.07	483.11	193.64						7684.82		
A. Forest land	-434.03	IE	IE						-434.03		
B. Cropland	-9.94	0.00	0.00						-9.94		
C. Grassland	7171.33	263.82	88.54						7523.69		
D. Wetlands	1744.77	219.29	11.62						1975.68		
E. Settlements	135.91	NO	63.90						199.81		
F. Other land	9.49	NO	29.58						39.07		
G. Harvested wood products	-1609.47								-1609.47		
H. Other	NO	NO	NO						NO		
5. Waste	29.25	712.33	123.85						865.43		
A. Solid waste disposal	NO	631.69							631.69		
B. Biological treatment of solid waste		30.03	18.95						48.97		
C. Incineration and open burning of waste	29.25	0.14	0.31						29.70		
D. Waste water treatment and discharge		50.47	104.60						155.07		
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	1826.57	1.43	14.81						1842.82		
Aviation	1314.93	0.21	10.65						1325.80		
Navigation	511.65	1.22	4.15						517.02		
CO_2 emissions from biomass	2889.66								2889.66		
CO_2 captured	NO								NO		
Indirect CO_2 [2]	NE										
Total CO_2 equivalent emissions without land use, land-use change and forestry									60493.77	15312.02	45181.76
Total CO_2 equivalent emissions with land use, land-use change and forestry									68178.59		
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									60493.77	15312.02	45181.76
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									68178.59		

(1) For carbon dioxide (CO_2) 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

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 2021
Submission 2022
Country Italy
Geographical scope[4] Italy

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2[1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total	ETS	non-ETS
	CO_2 equivalent (kt)									CO2 equivalent (Gg)	
Total (net emissions)[1]	291425.19	43277.69	20022.89	15589.49	538.62	318.42	22.86	16.31	371211.47	131580.66	239630.82
1. Energy	311684.88	6317.16	4485.81						322487.85	**118 163**	**204 325**
A. Fuel combustion (sectoral approach)	309634.69	2867.63	4477.83						316980.15	**114 510**	**202 471**
1. Energy industries	85714.67	120.05	327.90						86162.62	**84 780**	**1 383**
2. Manufacturing industries and construction	49295.66	284.39	771.28						50351.34	**28 321**	**22 031**
3. Transport (3)	98165.11	195.44	932.31						99292.86	**703**	**98 590**
4. Other sectors	76159.79	2266.81	2438.97						80865.57	**706**	**80 160**
5. Other	299.46	0.95	7.36						307.77	**0**	**308**
B. Fugitive emissions from fuels	2050.19	3449.52	7.98						5507.70	**3 653**	**1 855**
1. Solid fuels	0.00	25.05	0.00						25.05	**0**	**25**
2. Oil and natural gas	2050.19	3424.47	7.98						5482.65	**3 653**	**1 829**
C. CO_2 transport and storage	0.00								0.00	**0**	**0**
2. Industrial processes and product use	14749.88	37.95	614.70	15589.49	538.62	318.42	22.86	16.31	31888.23	**13 418**	**18 470**
A. Mineral industry	11043.16								11043.16	**10 660**	**383**
B. Chemical industry	1013.91	3.60	105.38	0.90	417.54	0.00	0.00	0.00	1541.33	**597**	**944**
C. Metal industry	1614.82	34.35	0.00	5.01	0.00	0.00	0.00	0.00	1654.18	**1 536**	**118**
D. Non-energy products from fuels and solvent use	1077.98	0.00	0.00						1077.98	**625**	**453**
E. Electronic Industry				8.87	121.08	48.13	22.86	16.31	217.25	**0**	**217**
F. Product uses as ODS substitutes				15574.72	0.00	0.00	0.00	0.00	15574.72	**0**	**15 575**
G. Other product manufacture and use	0.00	0.00	509.32	0.00	0.00	270.29	0.00	0.00	779.61	**0**	**780**
H. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0**	**0**
3. Agriculture	503.40	18953.15	12692.78						32149.33		
A. Enteric fermentation		13290.71							13290.71		
B. Manure management		4079.63	2039.91						6119.53		
C. Rice cultivation		1567.70							1567.70		
D. Agricultural soils		0.00	10649.03						10649.03		
E. Prescribed burning of savannas		0.00	0.00						0.00		
F. Field burning of agricultural residues		15.11	3.84						18.95		
G. Liming	9.98								9.98		
H. Urea application	471.95								471.95		
I. Other carbon-containing fertilizers	21.47								21.47		
J. Other	0.00	0.00	0.00						0.00		
4. Land use, land-use change and forestry[1]	-35609.67	1440.65	531.12						-33637.89		
A. Forest land	-33825.10	917.48	3.44						-32904.18		
B. Cropland	2278.25	5.28	1.98						2285.51		
C. Grassland	-7434.02	517.89	194.02						-6722.12		
D. Wetlands	110.86	0.00	0.00						110.86		
E. Settlements	3581.04	0.00	331.69						3912.73		
F. Other land	0.00	0.00	0.00						0.00		
G. Harvested wood products	-320.70								-320.70		
H. Other	0.00	0.00	0.00						0.00		
5. Waste	96.70	16528.78	1698.48						18323.96		
A. Solid waste disposal	0.00	13738.67							13738.67		
B. Biological treatment of solid waste		109.40	471.79						581.18		
C. Incineration and open burning of waste	96.70	54.67	19.52						170.90		
D. Waste water treatment and discharge		2626.04	1207.17						3833.21		
E. Other	0.00	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	10417.74	13.67	81.87						10513.28		
Aviation	5012.25	0.90	41.27						5054.42		
Navigation	5405.49	12.77	40.59						5458.86		
CO_2 emissions from biomass	45985.77								45985.77		
CO_2 captured	0.00								0.00		
Indirect CO_2 [2]	0.00										
Total CO_2 equivalent emissions without land use, land-use change and forestry									404849.37	131580.7	273268.7
Total CO_2 equivalent emissions with land use, land-use change and forestry									371211.47		
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									404849.37	131580.7	273268.7
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									371211.47		

(1) For carbon dioxide (CO_2) 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 increase in 2021 with respect 2020 (6.2%) as a consequence of the reprise of the economy after the lockdown due to COVID 19. In particular emissions fromtransport are expected to increase (+16.2%) and close the 2019 emission levels

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 2021
Submission 2022
Country Lithuania
Geographical scope[4]

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2[1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total	ETS	non-ETS
	CO_2 equivalent (kt)									CO2 equivalent (Gg)	
Total (net emissions)[1]	7836.18	2798.01	3192.15	545.41	NO	12.25	NO	NO	14384.00	5976.00	14625.49
1. Energy	11587.17	447.82	175.76						12210.74	**3 382**	**8 829**
A. Fuel combustion (sectoral approach)	11369.53	198.80	175.75						11744.08	**3 166**	**8 578**
1. Energy industries	2711.31	30.25	48.18						2789.73	**2 467**	**323**
2. Manufacturing industries and construction	1213.76	5.67	13.45						1232.88	**696**	**537**
3. Transport (3)	6050.46	7.22	72.75						6130.43	**0**	**6 130**
4. Other sectors	1366.33	155.66	41.15						1563.14	**3**	**1 560**
5. Other	27.66	0.00	0.23						27.90	**NA**	**28**
B. Fugitive emissions from fuels	217.64	249.01	0.01						466.66	**216**	**251**
1. Solid fuels	NO	NO	NO						NO	**NA**	
2. Oil and natural gas	217.64	249.01	0.01						466.66	**216**	**251**
C. CO_2 transport and storage	NO								NO	**NO**	
2. Industrial processes and product use	2490.77	NO	159.70	545.41	NO	12.25	NO	NO	3208.13	**2 594**	**614**
A. Mineral industry	655.59								655.59	**653**	**3**
B. Chemical industry	1775.32	NO	156.02	NO	NO	NO	NO	NO	1931.34	**1 941**	**-10**
C. Metal industry	0.04	NO	NO	NO	NO	NO	NO	NO	0.04	**NO**	**0**
D. Non-energy products from fuels and solvent use	59.82	NO	NO						59.82	**NO**	**60**
E. Electronic Industry				NO	NO	11.76	NO	NO	11.76	**NO**	**12**
F. Product uses as ODS substitutes				545.41	NO	NO	NO	NO	545.41	**NO**	**545**
G. Other product manufacture and use	NO	NO	3.68	NO	NO	0.49	NO	NO	4.17	**NO**	**4**
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	**NO**	
3. Agriculture	74.05	1650.03	2682.29						4406.36		
A. Enteric fermentation		1417.33							1417.33		
B. Manure management		232.70	178.80						411.50		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NA	2503.49						2503.49		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		NO	NO						NO		
G. Liming	57.06								57.06		
H. Urea application	16.98								16.98		
I. Other carbon-containing fertilizers	NE								NE		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry[1]	-6317.69	0.15	98.12						-6219.42		
A. Forest land	-6429.42	0.14	0.10						-6429.18		
B. Cropland	255.97	0.00	48.06						304.03		
C. Grassland	-880.76	0.01	0.21						-880.54		
D. Wetlands	857.95	NO	0.00						857.95		
E. Settlements	664.43	NO	45.81						710.24		
F. Other land	49.31	NO	3.95						53.26		
G. Harvested wood products	-835.17								-835.17		
H. Other	NO	NO	NO						NO		
5. Waste	1.89	700.01	76.28						778.18		
A. Solid waste disposal	NO	519.40							519.40		
B. Biological treatment of solid waste		71.10	29.12						100.22		
C. Incineration and open burning of waste		0.00	0.06						1.95		
D. Waste water treatment and discharge		109.50	47.10						156.60		
E. Other		NO	NO						NO		
6. Other *(as specified in summary 1.A)*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	

Memo items:											
International bunkers	778.37	1.41	6.24						786.02		
Aviation	185.20	0.03	1.54						186.77		
Navigation	593.17	1.38	4.70						599.25		
CO_2 emissions from biomass	6392.85								6392.85		
CO_2 captured	NO								NO		
Indirect CO_2 [2]	NE										
Total CO_2 equivalent emissions without land use, land-use change and forestry									20603.41	5976.002	14625.49
Total CO_2 equivalent emissions with land use, land-use change and forestry									14384.00		
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									NA	NA	
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									NA		

(1) For carbon dioxide (CO_2) 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.
ENERGY: GHG emissions increased in energy sector in 2021, mostly in residential sector and in heat plants, where growing natural gas consumption was observed. The main reason for this was lower average ambient temperatures in all three winter months in 2021, compared to 2020. Therefore, more heat was needed, and natural gas was consumed in heat plants to fulfill heat demand during the lowest ambient temperatures. IPPU: Emissions from IPPU sector in 2021 have decreased by 4 % compared to 2020 due to decrease of production in mineral and chemical industry. AGRICULTURE: Emissions from agriculture sector in 2021 have decreased by 1% compared to 2020. Emissions from enteric fermentation and manure management has decreased due to decrease in livestock population which are responsible for the biggest share of agriculture emissions from these categories. Decrease of agriculture soils emissions is related mainly to the decrease of crop harvest and area harvested. LULUCF: Despite the decrease of CO2 removals in forest land, overall removals in LULUCF sector increased due to most recent and accurate activity data on areas of cropland remaining cropland where no tillage and cover crop practices were applied which resulted in significantly reduced emissions in cropland category. WASTE: Emissions from the waste sector in 2021 have decreased approximately 5% compared to 2020. The decrease is projected mainly due to the planned reduction of disposed of waste in landfills and the increase in the number of popuation connected to centralized sewerage networks. The data on waste deposited in landfills and composted will be available in December 2022. For the estimations, the average of three last years was used.

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 2021
Submission 2022
Country Luxembourg
Geographical scope[4]

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2[1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total	ETS	non-ETS
	CO_2 equivalent (kt)									CO2 equivalent (Gg)	
Total (net emissions)[1]	7892.56	572.89	332.65	55.45	NA	9.97	NA	NA	8863.51	1317.50	7546.01
1. Energy	7892.88	52.03	78.45						8023.35	**844**	**7 179**
A. Fuel combustion (sectoral approach)	7892.84	21.74	78.45						7993.02	**844**	**7 148**
1. Energy industries	246.07	6.38	10.10						262.55	**57**	**206**
2. Manufacturing industries and construction	1093.27	2.12	9.48						1104.86	**787**	**318**
3. Transport (3)	4892.25	3.28	54.75						4950.28	**NA**	**4 950**
4. Other sectors	1661.13	9.97	4.11						1675.20	**NA**	**1 675**
5. Other	0.11	0.00	0.00						0.12	**NA**	**0**
B. Fugitive emissions from fuels	0.04	30.29	NA						30.33	**NA**	**30**
1. Solid fuels	NO	NO	NO						NO	**NO**	
2. Oil and natural gas	0.04	30.29	NA						30.33	**NA**	**30**
C. CO_2 transport and storage	NO								NO	**NO**	
2. Industrial processes and product use	506.00	NA	5.46	55.45	NA	9.97	NA	NA	576.88	**474**	**103**
A. Mineral industry	382.02								382.02	**382**	**0**
B. Chemical industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	**NO**	
C. Metal industry	91.53	NA	NA	NA	NA	NA	NA	NA	91.53	**92**	**0**
D. Non-energy products from fuels and solvent use	32.45	NA	NA						32.45	**NA**	**32**
E. Electronic Industry				NO	NO	NO	NO	NO	NO	**NO**	
F. Product uses as ODS substitutes				52.30	NO	NO	NO	NO	52.30	**NA**	**52**
G. Other product manufacture and use	NO	NO	5.46	3.15	NO	9.97	NO	NO	18.58	**NA**	**19**
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	**NO**	
3. Agriculture	14.54	455.70	232.91						703.14		
A. Enteric fermentation		393.89							393.89		
B. Manure management		61.81	28.10						89.91		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NA	204.81						204.81		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		NO	NO						NO		
G. Liming	10.63								10.63		
H. Urea application	0.00								0.00		
I. Other carbon-containing fertilizers	3.90								3.90		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry[1]	-520.86	NO	6.26						-514.60		
A. Forest land	-557.55	NO	NO						-557.55		
B. Cropland	27.69	NO	2.45						30.14		
C. Grassland	-28.30	NO	0.07						-28.23		
D. Wetlands	2.06	NO	0.19						2.25		
E. Settlements	39.78	NO	3.55						43.33		
F. Other land	0.17	NO	0.00						0.17		
G. Harvested wood products	-4.72								-4.72		
H. Other	NO	NO	NO						NO		
5. Waste	NA	65.17	9.58						74.74		
A. Solid waste disposal	NA	45.64							45.64		
B. Biological treatment of solid waste		17.85	5.13						22.98		
C. Incineration and open burning of waste	IE	IE	IE						IE		
D. Waste water treatment and discharge		1.68	4.44						6.12		
E. Other	NO	NO	NO						NO		
6. Other *(as specified in summary 1.A)*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	

Memo items:											
International bunkers	NE	NE	NE						NE		
Aviation	NE	NE	NE						NE		
Navigation	NE	NE	NE						NE		
CO_2 emissions from biomass	NE								NE		
CO_2 captured	NO								NO		
Indirect CO_2 [2]	NO										
Total CO_2 equivalent emissions without land use, land-use change and forestry									9378.12	1317.496	8059.996
Total CO_2 equivalent emissions with land use, land-use change and forestry									8863.51		
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									NE	NE	
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									NE		

(1) For carbon dioxide (CO_2) 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 2021, excl. LULUCF, are based on the preliminary energy balance and are 3.46% higher than the inventory emissions for 2020. The key drivers for the changes in GHG emissions in 2021 compared to 2020 are: - higher natural gas consumption (+7.77%), mainly in the sectors 1A1a and 1A4a - higher gasoline consumption (+21.5%), mainly in the sector 1A3b - higher fossil diesel oil consumption (+4.27%), mainly in the sector 1A3b - lower heating gasoil consumption (-4.45%) - lower IPPU emissions (-8.45%), mainly in the sectors 2A and 2C - lower agriculture emissions (-1.29%) No information about uncertainties associated with the estimations for the LULUCF sector.

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 2021
Submission 2022
Country Latvia
Geographical scope[4] Latvia

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2[1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total	ETS	non-ETS
	CO_2 equivalent (kt)									CO2 equivalent (Gg)	
Total (net emissions)[1]	7222.13	1718.80	1483.26	257.77	NA	12.10	NA	NA	10694.06	2065.44	8627.13
1. Energy	6541.50	282.46	190.15						7014.11	**1 492**	**5 520**
A. Fuel combustion (sectoral approach)	6541.49	181.92	190.15						6913.57	**1 492**	**5 420**
1. Energy industries	1391.98	17.75	28.02						1437.75	**1 177**	**261**
2. Manufacturing industries and construction	605.05	15.64	37.67						658.36	**304**	**354**
3. Transport (3)	3176.43	3.20	37.47						3217.10	**NA**	**3 216**
4. Other sectors	1353.31	145.29	86.88						1585.48	**11**	**1 574**
5. Other	14.72	0.03	0.12						14.87	**NO**	**15**
B. Fugitive emissions from fuels	0.01	100.53	NA						100.54	**NO**	**101**
1. Solid fuels	NO	NO	NA						NA	**NO**	
2. Oil and natural gas	0.01	100.53	NO						100.54	**NA**	**101**
C. CO_2 transport and storage	NO								NO	**NO**	
2. Industrial processes and product use	597.73	NO	4.10	257.77	NA	12.10	NA	NA	871.70	**573**	**299**
A. Mineral industry	547.02								547.02	**573**	
B. Chemical industry	NO	NO	NO	NO	NO	NO	NO	NO	NA	**NA**	
C. Metal industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	**NO**	
D. Non-energy products from fuels and solvent use	50.71	NO	NO						50.71	**NA**	**51**
E. Electronic Industry				NO	NO	NO	NO	NO	NO	**NO**	
F. Product uses as ODS substitutes				257.77	NO	NO	NO	NO	257.77	**NA**	**258**
G. Other product manufacture and use	NO	NO	4.10	NO	NO	12.10	NO	NO	16.20	**NO**	**16**
H. Other	NO	NO	NO	NA	NA	NA	NA	NA	NA	**NA**	
3. Agriculture	82.87	934.24	1234.96						2252.07		
A. Enteric fermentation		845.62							845.62		
B. Manure management		88.63	73.74						162.37		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NE	1161.22						1161.22		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		NO	NO						NO		
G. Liming	73.76								73.76		
H. Urea application	9.10								9.10		
I. Other carbon-containing fertilizers	NE								NE		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry[1]	-88.00	801.06	1197.69						1910.75		
A. Forest land	-1572.29	383.39	500.86						-688.04		
B. Cropland	1230.87	113.35	481.04						1825.26		
C. Grassland	1097.54	201.76	95.65						1394.95		
D. Wetlands	1320.54	95.70	6.62						1422.86		
E. Settlements	230.26	6.86	113.52						350.64		
F. Other land	NO	NA	NA						NA		
G. Harvested wood products	-2394.92								-2394.92		
H. Other	NA	NA	NA						NA		
5. Waste	0.03	502.10	54.05						556.18		
A. Solid waste disposal	NA	380.00							380.00		
B. Biological treatment of solid waste		43.09	21.58						64.67		
C. Incineration and open burning of waste	0.03	NA	0.00						0.03		
D. Waste water treatment and discharge		79.01	32.47						111.48		
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	888.79	0.96	76.30						966.05		
Aviation	238.80	0.08	2.36						241.24		
Navigation	649.99	0.88	73.94						724.81		
CO_2 emissions from biomass	7027.69								NO		
CO_2 captured	NO								NO		
Indirect CO_2 [2]	12.77										
Total CO_2 equivalent emissions without land use, land-use change and forestry									10694.06	2065.44	8627.131
Total CO_2 equivalent emissions with land use, land-use change and forestry									12604.81		
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									10706.84	2065.44	8639.905
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									12617.59		

[1] For carbon dioxide (CO_2) 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.
General Latvia`s approximate GHG emissions for 2021 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 2020 level. Compared to GHG inventory (1990 – 2020) submission to UNFCCC on 14th of April 2022 Latvia`s total GHG emissions excluding LULUCF, including indirect CO2 have increased by 2.3% in 2021. Latvia`s total GHG emissions including LULUCF and indirect CO2 have increased by 13.6% in 2021. 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 2021. Very minor differences occur also for glass production due to the same reason and rounding. Energy Total GHG emissions in Energy sector (excluding Transport) have increased by 3.4% in 2021, compared to 2020. In 2021, emissions in sector 1A1 Energy Industries have increased by 5.1%, compared to 2020 due to increase use of all fuels. In sector 1A2 Manufacturing Industries and Construction emissions have decreased by 0.6%, compared to 2020. In 2021, emissions in sector 1A4 Other Sectors have increased by 3.8%, compared to 2020. In 2021, use of all fuels have increased with exception of solid fossil fuels which decreased by 5%, compared to 2020. Transport Total transport emissions in 2021 have increased by around 3.5%, compared to 2020. The overall increase in transport emissions was driven by an increase in road transport emissions. Fossil fuel consumption in 2021 have increased by 3.9% in road transport, compared to 2020. As international air traffic recovered in 2021, fuel consumption and GHG emissions increased by around 34% in 2021 compared to 2020. IPPU Emissions from IPPU sector in 2020 are increased by 0.4% compared to 2020 due to an increase 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 didn`t 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 increased by 3.5% compared to 2020.Solvents Activity data for the solvent use sector was not available in 2021. There is a stability in trends of CO2 emissions from Solvent use sector in later 3 years either, therefore emissions in 2021 were assumed were extrapolated taking into account emission rates from these previous years (average). There is an increase in emissions compared with the previous year (+11.76%). For N2O from product use activity data wasn't available in 2021. There is a stability in trends of N2O emissions from N2O from the product use sector in later 3 years therefore emissions were extrapolated taking into account emission rates from previous years (average). There is an increase in emissions compared with the previous year (+13.25%).Agriculture In 2021, emissions in agriculture increased by 0.1%. Compared to 2020, the total utilized agricultural area in the country grew by 1.1 thousand ha or 0.1%, reaching 1 970.1 thousand ha in 2021. In 2021, 776.4 thousand hectares were covered with cereals, an increase of 22.7 thousand hectares or 3.0% compared to the previous year, however in general crops average yields decreased. The persistent heat and drought affected the volume of mineral fertilisers used on agricultural crops in 2021.The use of mineral fertilisers (expressed as 100 % of nutrients) has risen by only 0.6% compared to the year before, while the sown area increased by 2.0%. At the end of 2021 the number of cattle decreased by 5.5 thousand or 1.4%. The number of dairy cows keeps reducing – at the end of 2021 there were 131.2 thousand dairy cows, which is 4.8 thousand or 3.6% fewer than a year ago. Last year, the total number of cattle accounted for 393.5 thousand. During the year the number of pigs has increased by 20.2 thousand or 6.6%, number of poultry by 19.8 thousand or 0.3%, of horses by 0.1 thousand or 2.0%. Decline, in turn, was observed in the number of sheep (of 1.6 thousand or 1.7%) and goats (of 0.1 thousand or 0.7%). LULUCF Net GHG emissions in LULUCF sector in 2021 followed to a trend of reduction of the CO2 removals due reduction of the net increment in forest lands. This trend is associated with increase of harvest rate in forests and removal of woody vegetation from non-forest lands, e.g. roadsides, ditches, naturally afforested areas; as well as due to ageing of forest lands resulting in the increase of natural mortality. GHG emissions in other land use categories has not been significantly changed, except continuous increase of GHG emissions due to deforestation and land conversion to settlements, cropland and grassland. Waste In 2021 emissions is increased by 1.6% compared to 2020. In waste disposal, waste biological treatment and waste incineration sectors emissions changes are not significant. In waste water treatment and discharge sector slight increase of CH4 emissions are due to higher percentage of uncollected domestic wastewater and increase of percentage of population receiving poor biological treatment.

Malta (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 2021
Submission 2022
Country Malta
Geographical scope[4]

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2[1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total	ETS	non-ETS
	CO_2 equivalent (kt)									CO2 equivalent (Gg)	
Total (net emissions)[1]	1530.14	197.73	53.47	298.41	0.00	0.40	NO	NO	2080.16	771.04	1308.57
1. Energy	1526.91	2.25	4.93						1534.09	**771**	**761**
A. Fuel combustion (sectoral approach)	1526.91	2.25	4.93						1534.09	**771**	**761**
1. Energy industries	771.63	0.38	0.50						772.51	**771**	**2**
2. Manufacturing industries and construction	53.62	0.05	0.11						53.78	**0**	**54**
3. Transport (3)	543.63	0.89	3.92						548.44	**0**	**546**
4. Other sectors	158.03	0.93	0.40						159.36	**0**	**159**
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	4.48	NO	2.08	298.41	0.00	0.40	NO	NO	305.37	**0**	**305**
A. Mineral industry	0.17								0.17	**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	**NA**	
D. Non-energy products from fuels and solvent use	4.31	NA	NA						4.31	**0**	**4**
E. Electronic Industry				NO	NA	NO	NA	NA	NO	**NA**	
F. Product uses as ODS substitutes				298.41	NA	NA	NA	NA	298.41	**NA**	**298**
G. Other product manufacture and use	NA	NA	2.08	NA	0.00	0.40	NA	NA	2.48	**NA**	**2**
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	**NO**	
3. Agriculture	NO	38.22	39.50						77.72		
A. Enteric fermentation		33.46							33.46		
B. Manure management		4.76	15.81						20.57		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NA	23.69						23.69		
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]	-1.70	NO	0.12						-1.58		
A. Forest land	-0.29	NO	NO						-0.29		
B. Cropland	-0.65	NO	0.07						-0.58		
C. Grassland	-1.32	NO	NO						-1.32		
D. Wetlands	-0.07	NO	NO						-0.07		
E. Settlements	0.08	NO	0.01						0.09		
F. Other land	0.55	NO	0.05						0.60		
G. Harvested wood products	NO								NO		
H. Other	NO	NO	NO						NO		
5. Waste	0.45	157.26	6.84						164.55		
A. Solid waste disposal	NA	150.49							150.49		
B. Biological treatment of solid waste		1.14	NO						1.14		
C. Incineration and open burning of waste	0.45	0.00	0.16						0.61		
D. Waste water treatment and discharge		5.63	6.68						12.31		
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	6276.23	14.26	50.48						6340.97		
Aviation	258.65	0.05	2.09						260.79		
Navigation	6017.58	14.21	48.39						6080.18		
CO_2 emissions from biomass	37.82								37.82		
CO_2 captured	NO								NO		
Indirect CO_2 [2]	NO										
Total CO_2 equivalent emissions without land use, land-use change and forestry									2081.74		
Total CO_2 equivalent emissions with land use, land-use change and forestry									2080.16		
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									2081.74		
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									2080.16		

[1] For carbon dioxide (CO_2) 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.

N.B. 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 (0.994 ktonnes CO2) are being accounted for under non-ETS.
For the purposes of distinguishing between ETS and non-ETS emissions, CO2 emissions from civil aviation (2,12 ktonnes CO2) have been subtracted from the non-ETS value reported.
Process emissions falling within the scope of the EU ETS (use of urea for the purposes of deNOx in one of the EU ETS installations) amounting to 0.41 ktonnes CO2 are included in emissions for category 2.D; these are accounted for under ETS.

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 2021
Submission 2022
Country Netherlands
Geographical scope[4]

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2[1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total	ETS	non-ETS
	CO_2 equivalent (kt)									CO2 equivalent (Gg)	
Total (net emissions)[1]	144028.76	16734.26	7559.34	1321.43	67.63	124.58	NO	NO	169836	68941.30	69119.98
1. Energy	135273.87	2168.73	618.68						138061.28	**67 847**	**68 666**
A. Fuel combustion (sectoral approach)	134146.88	1748.18	618.68						136513.75	**43 715**	**4 071**
1. Energy industries	47355.75	138.24	291.61						47785.61	**23 710**	**3 839**
2. Manufacturing industries and construction	27439.81	65.60	43.63						27549.03		**26 319**
3. Transport (3)	26031.25	60.27	227.40						26318.91	**423**	**34 270**
4. Other sectors	33155.61	1483.70	53.36						34692.67		**168**
5. Other	164.46	0.37	2.68						167.52	**1 094**	**454**
B. Fugitive emissions from fuels	1126.99	420.55	NO						1547.54	**71**	**5**
1. Solid fuels	71.45	4.67	NO						76.12	**1 022**	**449**
2. Oil and natural gas	1055.54	415.88	NO						1471.42		
C. CO_2 transport and storage	NO								NO	**5 191**	**3 125**
2. Industrial processes and product use	5332.68	376.13	1093.98	1321.43	67.63	124.58	NO	NO	8316.44	**598**	**516**
A. Mineral industry	1113.60								1113.60	**4 562**	**858**
B. Chemical industry	3767.91	328.12	1014.68	288.28	20.19	NO	NO	NO	5419.18	**32**	**84**
C. Metal industry	99.41	NO	NO	NO	16.13	NO	NO		115.54		**337**
D. Non-energy products from fuels and solvent use	336.65	0.32	NO						336.97		**31**
E. Electronic Industry				NO	31.31	NO	NO	NO	31.31		**1 033**
F. Product uses as ODS substitutes				1033.15	NO	NO	NO	NO	1033.15		**252**
G. Other product manufacture and use	0.16	47.69	79.31	NO	NO	124.58			251.74		**15**
H. Other	14.95	NO	NO						14.95		
3. Agriculture	78.21	11747.57	5587.34						17413.11		
A. Enteric fermentation		8135.08							8135.08		
B. Manure management		3612.49	766.04						4378.53		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NO	4821.30						4821.30		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		NO	NO						NO		
G. Liming	31.03								31.03		
H. Urea application	47.17								47.17		
I. Other carbon-containing fertilizers	NO								NO		
J. Other	NO	NA	NA						NO		
4. Land use, land-use change and forestry[1]	3344.00	0.5	93.36						3437.86		
A. Forest land	-2275.67	0.49	4.98						-2270.2		
B. Cropland	1550.16	NO	46.48						1596.63		
C. Grassland	2769.89	0.01	7.06						2776.97		
D. Wetlands	-66.03	NO	2.37						-63.66		
E. Settlements	1070.20	NO	22.44						1092.64		
F. Other land	176.54	NO	10.03						186.57		
G. Harvested wood products	118.91								118.91		
H. Other	NO	NO	NO						NO		
5. Waste	NO	2441.34	165.97						2607.31		
A. Solid waste disposal	NO	2085.53							2085.53		
B. Biological treatment of solid waste		116.68	90.31						206.98		
C. Incineration and open burning of waste	NO	0.02	0.01						0.03		
D. Waste water treatment and discharge		239.12	75.66						314.77		
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	43274.22	161.05	345.45						43780.72		
Aviation	7292.44	1.27	60.79						7354.51		
Navigation	35981.77	159.77	284.66						36426.21		
CO_2 emissions from biomass	20890.38								20890.38		
CO_2 captured	NO								NO		
Indirect CO_2 [2]	419.32										
Total CO_2 equivalent emissions without land use, land-use change and forestry									166398.14	74132.24	92265.91
Total CO_2 equivalent emissions with land use, land-use change and forestry									169836		
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									166817.46		
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									168908.94		

(1) For carbon dioxide (CO_2) 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

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 2021
Submission 2022
Country Poland
Geographical scope[4]

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2[1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total	ETS	non-ETS
	CO_2 equivalent (kt)									CO2 equivalent (Gg)	
Total (net emissions)[1]	305964.31	44694.49	24500.70	4837.55	9.76	96.56	NO	NO	380103.36	NE	
1. Energy	308076.22	20955.50	2940.47						331972.18	**NE**	
A. Fuel combustion (sectoral approach)	303908.05	4215.45	2939.89						311063.39	**NE**	
1. Energy industries	153899.24	112.10	716.50						154727.85	**NE**	
2. Manufacturing industries and construction	30671.08	124.65	203.21						30998.93	**NE**	
3. Transport (3)	67401.85	95.73	720.43						68218.01	**NE**	
4. Other sectors	51935.88	3882.97	1299.75						57118.60	**NE**	
5. Other	NO	NO	NO						NO	**NE**	
B. Fugitive emissions from fuels	4168.17	16740.05	0.58						20908.80	**NE**	
1. Solid fuels	2340.56	14117.93	NA						16458.49	**NE**	
2. Oil and natural gas	1827.61	2622.13	0.58						4450.31	**NE**	
C. CO_2 transport and storage	NO								NO	**NE**	
2. Industrial processes and product use	18774.80	51.03	648.41	4837.55	9.76	96.56	NO	NO	24418.10	**NE**	
A. Mineral industry	11507.02								11507.02	**NE**	
B. Chemical industry	4582.39	40.74	514.46	NO	NO	NO	NO	NO	5137.59	**NE**	
C. Metal industry	1970.37	10.29	NA	NA	NO	NO	NO	NO	1980.65	**NE**	
D. Non-energy products from fuels and solvent use	715.02	NO	NO						715.02	**NE**	
E. Electronic Industry				NO	NO	NO	NO	NO	NO	**NE**	
F. Product uses as ODS substitutes				4837.55	9.76	NO	NO	NO	4847.31	**NE**	
G. Other product manufacture and use	NA	NA	133.96	NO	NO	96.56	NO	NO	230.51	**NE**	
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	**NE**	
3. Agriculture	1458.75	14039.97	18213.01						33711.73		
A. Enteric fermentation		12834.79							12834.79		
B. Manure management		1177.69	2838.18						4015.88		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NA	15362.39						15362.39		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		27.49	12.44						39.92		
G. Liming	836.30								836.30		
H. Urea application	431.33								431.33		
I. Other carbon-containing fertilizers	191.13								191.13		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry[1]	-22944.56	5.60	1774.12						-21164.85		
A. Forest land	-21960.03	3.53	27.97						-21928.53		
B. Cropland	-612.45	NO	14.87						-597.59		
C. Grassland	-39.73	2.06	1.41						-36.25		
D. Wetlands	1754.57	NO	6.16						1760.73		
E. Settlements	2361.74	NO	1723.70						4085.44		
F. Other land	NO	NO	NO						NO		
G. Harvested wood products	-4448.66								-4448.66		
H. Other	NA	NA	NA						NA		
5. Waste	599.11	9642.39	924.69						11166.19		
A. Solid waste disposal	NO	7543.78							7543.78		
B. Biological treatment of solid waste		98.18	70.22						168.40		
C. Incineration and open burning of waste	599.11	0.00	71.01						670.11		
D. Waste water treatment and discharge		2000.43	783.47						2783.90		
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	2296.23	2.44	18.77						2317.45		
Aviation	1349.27	0.24	11.25						1360.75		
Navigation	946.96	2.21	7.52						956.70		
CO_2 emissions from biomass	38010.17								38010.17		
CO_2 captured	NO								NO		
Indirect CO_2 [2]	NA										
Total CO_2 equivalent emissions without land use, land-use change and forestry									401268.21	191525.5	209651
Total CO_2 equivalent emissions with land use, land-use change and forestry									380103.36		
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									NA	NA	
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									NA		

(1) For carbon dioxide (CO_2) 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.

The main reason of increase in GHG emission from fuel combustion in stationary sources (by 10.0%) is increase in consumption of coal (by 11.3%) and lignite (by 14.1 %).

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 2021
Submission 20220708
Country Portugal
Geographical scope[4]

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2[1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total	ETS	non-ETS
	CO_2 equivalent (kt)									CO2 equivalent (Gg)	
Total (net emissions)[1]	34000.56	9313.12	3584.75	3333.82	23.78	22.88	NO	NO	50278.90	16423.73	33855.17
1. Energy	36919.37	367.94	547.84						37835.15	**13 593**	**24 242**
A. Fuel combustion (sectoral approach)	35871.59	305.66	545.33						36722.57	**12 619**	**24 104**
1. Energy industries	8236.95	10.57	99.43						8346.96	**7 514**	**833**
2. Manufacturing industries and construction	7299.31	47.77	111.02						7458.10	**4 757**	**2 701**
3. Transport (3)	15914.72	19.18	159.60						16093.50	**348**	**15 746**
4. Other sectors	4354.29	228.12	174.72						4757.14	**0**	**4 757**
5. Other	66.31	0.01	0.55						66.87	**0**	**67**
B. Fugitive emissions from fuels	1047.78	62.29	2.51						1112.58	**974**	**138**
1. Solid fuels	0.00	15.36	0.00						15.36	**13**	**2**
2. Oil and natural gas	1047.78	46.93	2.51						1097.22	**961**	**136**
C. CO_2 transport and storage	NO								NO	**0**	**0**
2. Industrial processes and product use	3861.45	26.40	62.78	3333.82	23.78	22.88	0.00	0.00	7331.09	**2 831**	**4 500**
A. Mineral industry	2897.55								2897.55	**2 687**	**211**
B. Chemical industry	660.32	26.40	33.23	NO	NO	NO	NO	NO	719.95	**100**	**620**
C. Metal industry	79.16	NO	NO	NO	NO	NO	NO	NO	79.16	**44**	**35**
D. Non-energy products from fuels and solvent use	224.42	NO	NO						224.42	**0**	**224**
E. Electronic Industry				NE	NE	NE	NE	NO	NO	**0**	
F. Product uses as ODS substitutes				3333.82	23.78	NO	NO	NO	3357.60	**0**	**3 358**
G. Other product manufacture and use	NO	NO	29.54	NO	NO	22.88	NO	NO	52.42	**0**	**52**
H. Other	0.00	NO	NO	NO	NO	NO	NO	NO	0.00	**0**	**0**
3. Agriculture	68.14	4542.63	2513.92						7124.68		
A. Enteric fermentation		3621.95							3621.95		
B. Manure management		746.64	226.35						972.99		
C. Rice cultivation		139.87							139.87		
D. Agricultural soils		NO	2267.71						2267.71		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		34.17	19.85						54.02		
G. Liming	11.81								11.81		
H. Urea application	24.19								24.19		
I. Other carbon-containing fertilizers	32.13								32.13		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry[1]	-6879.92	222.70	258.62						-6398.60		
A. Forest land	-2540.31	176.11	111.93						-2252.27		
B. Cropland	-1666.84	13.05	77.03						-1576.76		
C. Grassland	-2880.84	33.54	30.19						-2817.11		
D. Wetlands	365.43	0.00	27.05						392.48		
E. Settlements	95.72	0.00	12.42						108.14		
F. Other land	0.00	0.00	0.00						0.00		
G. Harvested wood products	-253.09								-253.09		
H. Other	NO	NO	NO						NO		
5. Waste	31.53	4153.45	201.60						4386.57		
A. Solid waste disposal	NO	3402.53							3402.53		
B. Biological treatment of solid waste		23.11	12.29						35.40		
C. Incineration and open burning of waste	31.53	0.24	0.89						32.66		
D. Waste water treatment and discharge		727.56	188.43						915.99		
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	

Memo items:											
International bunkers	NE	NE	NE						NE		
Aviation	NE	NE	NE						NE		
Navigation	NE	NE	NE						NE		
CO_2 emissions from biomass	NE								NE		
CO_2 captured	NE								NE		
Indirect CO_2 [2]	131.50										
Total CO_2 equivalent emissions without land use, land-use change and forestry									56677.50	16423.73	40253.77
Total CO_2 equivalent emissions with land use, land-use change and forestry									50278.90		
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									56809.00		
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									50410.40		

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 2021, there was a reduction in GHG emissions in the Energy sector, the main contribution to this reduction was the closure of one of the coal-fired thermoelectric plants. Resulting in a reduction of category 1.A.1.a emissions by 23% In category 1A3 "Transport", there was a opposite trend, with an increase in GHG emissions related to the resumption of activity in the Road Transport sector after the first year of the COVID-19 pandemic. * There is an estimated decrease of about 3% in the IPPU emissions mostly due to the following sectors: - in mineral industry, specifically cement production (2A1) and lime sector (2A2); - in metal industry, specifically iron and steel sector (2C1). * There is an estimated increase of about 1.9% in the Agriculture GHG emissions mostly due to to balance of opposite tendencies of main categories: - 3A (Enteric Fermentation): related to an increase in the livestock - particularly non-dairy cattle and sheep; - 3B (Manure Management): related to an increase in the livestock - particularly poultry; - 3C (Rice Cultivation): increase of rice cultivation areas; - 3D (Agriculture Soils): increase in animal manure applied to soils and in areas of some cultures.

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 2021
Submission 2022
Country Romania
Geographical scope[4] Romania

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2[1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total	ETS	non-ETS
	CO_2 equivalent (kt)									CO2 equivalent (Gg)	
Total (net emissions)[1]	45498.97	22528.73	11810.29	2108.34	3.70	71.45	NO	NO	82021.47	31969.27	57959.68
1. Energy	67543.68	8868.33	670.11						77082.12	**22 208**	**54 874**
A. Fuel combustion (sectoral approach)	66790.99	1116.75	669.34						68577.08	**21 644**	**46 933**
1. Energy industries	19514.25	326.28	195.56						20036.09	**16 435**	**3 601**
2. Manufacturing industries and construction	15722.42	262.88	157.56						16142.86	**5 209**	**10 934**
3. Transport (3)	19364.63	323.78	194.06						19882.47	**NA**	**19 882**
4. Other sectors	11497.27	192.23	115.22						11804.72	**NA**	**11 805**
5. Other	692.42	11.58	6.94						710.94	**NA**	**711**
B. Fugitive emissions from fuels	752.69	7751.58	0.76						8505.04	**564**	**7 941**
1. Solid fuels	NO	5415.86	NO						5415.86	**NA**	**5 416**
2. Oil and natural gas	752.69	2335.72	0.76						3089.17	**564**	**2 525**
C. CO_2 transport and storage	NO								NO	**NO**	
2. Industrial processes and product use	10565.27	10.11	87.96	2108.34	3.70	71.45	NO	NO	12846.83	**9 761**	**3 086**
A. Mineral industry	4892.89								4892.89	**4 812**	**80**
B. Chemical industry	769.25	5.80	86.15	NO	NO	NO	NO	NO	861.20	**594**	**267**
C. Metal industry	4359.51	4.32	NO	NO	3.68	NO	NO	NO	4367.50	**4 353**	**15**
D. Non-energy products from fuels and solvent use	543.63	NO	NO						543.63	**1**	**543**
E. Electronic Industry				NO	NO	NO	NO	NO	NO	**NA**	
F. Product uses as ODS substitutes				2108.34	0.02	NO	NO	NO	2108.36	**NA**	**2 108**
G. Other product manufacture and use	NO	NO	1.81	NO	NO	71.45	NO	NO	73.26	**NA**	**73**
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	**NA**	
3. Agriculture	147.85	8236.77	10544.75						18929.38		
A. Enteric fermentation		7080.68							7080.68		
B. Manure management		615.06	1046.39						1661.45		
C. Rice cultivation		17.79							17.79		
D. Agricultural soils		NE	9307.78						9307.78		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		523.25	190.58						713.83		
G. Liming	52.88								52.88		
H. Urea application	94.97								94.97		
I. Other carbon-containing fertilizers	NO								NO		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry[1]	-32770.63	7.96	53.34						-32709.33		
A. Forest land	-24151.17	7.96	29.19						-24114.02		
B. Cropland	-6344.47	NO	1.05						-6343.42		
C. Grassland	-1287.28	NO	16.88						-1270.41		
D. Wetlands	-150.64	NO	0.68						-149.96		
E. Settlements	2155.71	NO	5.53						2161.24		
F. Other land	73.36	NO	0.01						73.37		
G. Harvested wood products	-3066.14								-3066.14		
H. Other	NA	NA	NA						NA		
5. Waste	12.79	5405.55	454.12						5872.47		
A. Solid waste disposal	NA	3871.98							3871.98		
B. Biological treatment of solid waste		56.61	26.79						83.40		
C. Incineration and open burning of waste	12.79	0.05	2.17						15.01		
D. Waste water treatment and discharge		1476.91	425.17						1902.08		
E. Other	NA	NA	NA						NA		
6. Other *(as specified in summary 1.A)*	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	

Memo items:											
International bunkers	381.08	0.77	3.49						385.34		
Aviation	242.78	0.47	2.47						245.71		
Navigation	138.30	0.30	1.03						139.63		
CO_2 emissions from biomass	18126.85								18126.85		
CO_2 captured	NO								NO		
Indirect CO_2 [2]	NO										
Total CO_2 equivalent emissions without land use, land-use change and forestry									114730.80	31969.27	57959.68
Total CO_2 equivalent emissions with land use, land-use change and forestry									82021.47		
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									NA	NA	
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									NA		

(1) For carbon dioxide (CO_2) 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.
Based on the requirement in the Art. 26.2 of the Regulation (EU) no. 2018/1999 corroborated with Art. 7.2 in the Regulation (EU) no. 2020/1208, please find below the elements on the explanations including on main drivers for the key changes in emissions and removals reported in accordance with the format set out in Annex VI of the Regulation (EU) no. 2020/1208 compared to the most recent final greenhouse gas inventory reported. 1 Energy (CRF sector 1) The emissions trend reflects the changes in this period characterized by a process of transition to a market economy. With the entire economy in transition, some energy intensive industries reduced their activities, and this is reflected in the GHG emissions reduction. In the year 2021, emissions from the Energy Sector have increased by 5.83% (77,082.18 kt CO2 equivalent) compared to the year 2020 (72,834.34 kt CO2 equivalent). The consumption for the year 2021 for liquids fuels increased by 7.99% compared to 2020 year, for solids fuels increased with 16.35% and for gaseous fuels increased with 1.56%. The CO2 emissions for the year 2021 from: - liquids fuels (refinery gas, petroleum coke, kerosene type jet fuel) increased by 7.99% (29,571.99 kt CO2 equivalent) compared with 2020 year (27,384.42 kt CO2 equivalent); - solids fuels (coke oven coke, lignite) decreased with 16.35% (12,305.74 kt CO2 equivalent) compared with 2020 year (10,576.31 kt CO2 equivalent); - natural gas increased by 1.56% (23,812.74 kt CO2 equivalent) compared with 2020 year (23,447.06 kt CO2 equivalent). In the year 2021, the GHG emissions from the Fugitive emissions from fuels Subsector decreased with 0.93% compared with 2020 year: - the emissions from coal mining and handling decreased with 0.84% compared with 2020; production of other bituminous coal and lignite and brown coal production from underground mines decreased due to the continuation of the mines closure process; - in the year 2021, the emissions from oil and natural gas category, decreased with 1.08% compared with 2020; the decrease of CO2 emissions is due to the decrease of production of oil and natural gas. 2 Industrial Processes and Product Use (CRF sector 2) 2021 year approximated emissions from this sector decreased by 0.16% compared with emissions associated with 2020 year. In 2021 year the emissions decreased compared with 2020 year due to the decrease of various activities level (ammonia production, nitric acid production, SF6 consumption in electrical equipments). Other activities recorded increases in their production (cement production, lime production, glass production, limestone and dolomite consumption, iron and steel production, aluminium production). 3 Agriculture (CRF sector 3) In the 2021 year the emissions level associated to this sector decreased by 3.38% compared with the emissions level in 2020. The drivers associated to the emissions level variation include: - the decrease of the livestock number; - rice cultivated area decreased in 2021; - the crop production area and the crop production decreased for most crops; - the increase of burned areas. 4 Land Use, Land-Use Change and Forestry (CRF sector 4) The difference between the 2021 and, respectively, 2022 net emissions/removals level is less than 1%. A series of drivers/variables contributed to the construction of NGHGI 2022, respectively of the GHG E(+)/R(-) estimates generated by the specific activities of the LULUCF Sector. In addition, there are: (i) explicit geospatial approach 3, for the most accurate determination of AD(kha) for each land use category; (ii) CS type parameters introduced through scientific studies; (iii) revised C stock values for all carbon pools: LB, DOM and Soil. If approach 3 captured the dynamics of land use changes, the CS parameters brought the transition from Tier 1 to Tier 2, for more carbon pools. All these new inputs compared to the previous inventory submission, led to a series of transformations in the level of GHG E(+)/R(-) estimates applied to 1989-2020 time series for the LULUCF Sector. 5 Waste (CRF sector 5) 2021 approximated emissions from this sector decreased with 0.74% compared to the emissions level in the 2020 year. The drivers associated to the emissions level variation include: - the population consumption growth; - the fluctuations in waste incineration activity data; - the fluctuations of the population number connected to the sewerage system. Information on the uncertainties associated to the LULUCF estimates

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 2021
Submission 2022
Country Sweden
Geographical scope[4] Sweden

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2[1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total	ETS	non-ETS
	CO_2 equivalent (kt)									CO2 equivalent (Gg)	
Total (net emissions)[1]	38218.06	4095.73	4658.72	939.32	49.76	38.93	0.00	0.00	48000.52		
1. Energy	32082.24	242.84	644.31						32969.38	IE	
A. Fuel combustion (sectoral approach)	31303.43	198.85	643.89						32146.18	IE	
1. Energy industries	7926.50	62.09	218.26						8206.85	IE	
2. Manufacturing industries and construction	6037.33	26.78	142.44						6206.55	IE	
3. Transport (3)	15175.78	52.69	195.60						15424.07	IE	
4. Other sectors	2163.82	57.29	87.60						2308.71	IE	
5. Other	IE	IE	IE						IE	IE	
B. Fugitive emissions from fuels	778.80	43.98	0.42						823.20	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	5900.34	9.77	191.14	939.32	49.76	38.93	IE	NO	7129.26	IE	
A. Mineral industry	IE								IE	IE	
B. Chemical industry	IE	IE	IE	IE	IE	IE	IE	NO	IE	IE	
C. Metal industry	IE	IE	NA	1.04	49.76	NO	NA	NO	IE	IE	
D. Non-energy products from fuels and solvent use	IE	NA	NA						IE	IE	
E. Electronic Industry				NA	NA	NA	NA	NO	NA	IE	
F. Product uses as ODS substitutes				938.75	0.10	NA	NA	NO	938.75	IE	
G. Other product manufacture and use	NE	NA	IE	IE	NO	38.93	IE	NO	IE	IE	
H. Other	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	
3. Agriculture	122.57	3211.25	3597.24						6931.06		
A. Enteric fermentation		2948.50							2948.50		
B. Manure management		262.75	325.20						587.95		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NO	IE						IE		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		NO	NO						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]	-41475.70	442.47	1268.70						-39764.54		
A. Forest land	-39660.56	231.98	1148.23						-38280.35		
B. Cropland	2561.34	198.43	3.81						2763.58		
C. Grassland	293.63	6.97	5.44						306.04		
D. Wetlands	175.17	5.09	0.89						181.14		
E. Settlements	2508.07		105.58						2613.65		
F. Other land	22.03	NO	NO						22.03		
G. Harvested wood products	-7375.37								-7375.37		
H. Other	NO	NO	NO						NO		
5. Waste	112.91	631.88	226.04						970.82		
A. Solid waste disposal	NO	531.74							531.74		
B. Biological treatment of solid waste		70.59	25.27						95.85		
C. Incineration and open burning of waste	112.91	0.04	3.67						116.61		
D. Waste water treatment and discharge		29.51	197.11						226.62		
E. Other	NO	NO	NO						NO	IE	
6. Other *(as specified in summary 1.A)*	IE	IE	IE	IE	IE	IE	IE	NO	NO		

Memo items:											
International bunkers	9047.80	12.98	143.43						9204.21		
Aviation	997.10	0.18	13.61						1010.89		
Navigation	8050.70	12.80	129.82						8193.32		
CO_2 emissions from biomass	NE								NE		
CO_2 captured	NO								NO		
Indirect CO_2 [2]	NE										
Total CO_2 equivalent emissions without land use, land-use change and forestry									48000.52	18671.38	29329.14
Total CO_2 equivalent emissions with land use, land-use change and forestry											
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry											
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry											

(1) For carbon dioxide (CO_2) 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.

Swedish greenhouse gas emissions were about 48 million tonnes of carbon dioxide equivalents in 2021, which is equivalent to an increase by about four percent comparing the approximated greenhouse gas inventory for 2021 with the complete reported inventory for 2020.

Domestic transportation (CRF 1A3) accounted for one third of Swedish greenhouse gas emissions. Emissions from domestic transportation increased with 1.2 percent in 2021 compared to 2020. The estimated emissions for 2021 were based a on data regarding fuel deliveries and data of trafic, e.g. distance driven for vehicles using available data from Transport Analysis. The increase is an effect of more trafic after the pandemic.

Industrial emissions and product use (including stationary, fugitive and process from manufacturing industries and construction, CRF1A2, 1B and CRF 2) accounted for one third of Swedish greenhouse gas emissions. Industrial emissions increased with 8.4 percent in 2021 compared to 2020. Industrial emissions are described at the aggregate level since the key drivers are pretty much the same. Industrial emissions for 2021 were based on available energy statistics and adjusted based on information provided from the EU ETS-reporting. The increase in emissions from industrial emissions and product use is mainly due to higher production within the iron- and steelindustry, refineries and chemical industry. Both the iron- och steelindustry and the refineries were affected during the pandemic with decreasing emissions. The largest emitting plant within the chemical sector was affected by a fire during 2020 which caused a stop for a large part of the year. During 2021 the plant has been up and running again.

Energy industries (CRF 1A1) accounted for 17 percent of Swedish greenhouse gas emissions. These emissions increased by 9 percent in 2021 compared to 2020. The estimated emissions for the heat and power production facilities were based on available energy statistics. Trends in this sector depend largely on weather and prices.

Agricultural emissions (CRF 3) were based on available data regarding number of animals from the Farm register and milk production. Emissions from soil were assumed to be equal to the previous year due to lack of data to support an approximated estimate for 2020. Emissions calculated from data from the Farm register and milk production is basically unchanged since 2020, since the number of animals hasn't changed much.

Emissions and removals from LULUCF (CRF 4) were assumed to be equal to the previous year due to lack of data to support an approximated estimate for 2020.

Emissions from waste (CRF 5) decreased by five percent in 2020 compared to 2019, based on an assumed annual reduction rate due to lack of data. The waste sector has been decreasing steadily since the beginning of the 1990s due of extensive legislation in the sector.

Additional information on the approximated greenhouse gas emissions inventory is available at (in Swedish):
https://www.naturvardsverket.se/data-och-statistik/klimat/vaxthusgaser-territoriella-utslapp-och-upptag/

Please note that the Swedish EPA use a different sectoral division than CRF-categories in national reporting that is more closely related to implemented and proposed policies and measures.

Please also note that data on emissions within ETS and non-ETS sectors are preliminary and should be used with caution. The estimate for the ETS sector includes domestic aviation (CRF 1A3a).

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 2021
Submission 2022
Country Slovenia
Geographical scope[4] Slovenia

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2[1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total	ETS	non-ETS
	CO_2 equivalent (kt)									CO2 equivalent (Gg)	
Total (net emissions)[1]	10601.94	1839.88	774.27	300.67	7.82	15.93	NO	NO	13540.51	5681.50	7859.01
1. Energy	11883.90	337.84	138.39						12360.14	**5 007**	**7 353**
A. Fuel combustion (sectoral approach)	11771.07	118.11	138.39						12027.57	**4 945**	**7 083**
1. Energy industries	4128.60	3.14	20.22						4151.97	**3 987**	**165**
2. Manufacturing industries and construction	1650.86	5.19	18.51						1674.57	**958**	**716**
3. Transport (3)	4802.21	4.15	55.70						4862.06	**NO**	**4 862**
4. Other sectors	1186.24	105.63	43.93						1335.80	**NO**	**1 336**
5. Other	3.15	0.00	0.03						3.17	**NO**	**3**
B. Fugitive emissions from fuels	112.83	219.73	0.00						332.57	**62**	**270**
1. Solid fuels	112.70	178.52	NO						291.22	**62**	**229**
2. Oil and natural gas	0.13	41.21	0.00						41.34	**NO**	**41**
C. CO_2 transport and storage	NO								NO	**NO**	
2. Industrial processes and product use	781.48	NO	34.83	300.67	7.82	15.93	NO	NO	1140.73	**675**	**466**
A. Mineral industry	567.53								567.53	**553**	**14**
B. Chemical industry	61.98	NO	NO	NO	NO	NO	NO	NO	61.98	**NO**	**62**
C. Metal industry	121.73	NO	NO	NO	7.82	NO	NO	NO	129.55	**121**	**8**
D. Non-energy products from fuels and solvent use	30.25	NA	NA						30.25	**NO**	**30**
E. Electronic Industry				NO	NO	NO	NO	NO	NO	**NO**	
F. Product uses as ODS substitutes				300.67	NO	NO	NO	NO	300.67	**NO**	**301**
G. Other product manufacture and use	NO	NO	34.83	NO	NO	15.93	NO	NO	50.75	**NO**	**51**
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	**NO**	
3. Agriculture	30.62	1174.79	519.51						1724.92		
A. Enteric fermentation		938.50							938.50		
B. Manure management		236.29	80.37						316.65		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NO	439.14						439.14		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		NO	NO						NO		
G. Liming	14.47								14.47		
H. Urea application	11.79								11.79		
I. Other carbon-containing fertilizers	4.35								4.35		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry[1]	-2108.35	0.18	35.18						-2072.99		
A. Forest land	-1879.16	0.18	0.12						-1878.86		
B. Cropland	190.79	NO	4.98						195.77		
C. Grassland	-388.43	NO	0.89						-387.54		
D. Wetlands	2.05	NO	NO						2.05		
E. Settlements	111.03	NO	18.75						129.78		
F. Other land	3.82	NO	0.35						4.17		
G. Harvested wood products	-148.45								-148.45		
H. Other	NO	NO	NO						NO		
5. Waste	14.29	327.06	46.37						387.72		
A. Solid waste disposal	NO	184.19							184.19		
B. Biological treatment of solid waste		11.31	8.09						19.40		
C. Incineration and open burning of waste	14.29	0.00	0.06						14.35		
D. Waste water treatment and discharge		131.56	38.22						169.78		
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	376.31	0.80	2.91						380.02		
Aviation	25.96	0.00	0.22						26.18		
Navigation	350.35	0.79	2.70						353.84		
CO_2 emissions from biomass	2856.90								2856.90		
CO_2 captured	NO								NO		
Indirect CO_2 [2]	NO										
Total CO_2 equivalent emissions without land use, land-use change and forestry									15613.50	5681.5	9932.002
Total CO_2 equivalent emissions with land use, land-use change and forestry									13540.51		
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									15613.50	5681.5	9932.002
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									13540.51		

(1) For carbon dioxide (CO_2) 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 2021, GHG emissions without LULUCF increased by -1.5 % (-238 kt CO2 eq) compared to 2020. Emissions in the Energy sector decreased by -1.4% (-178 kt CO2 eq). The main reason for a decrease is a decline of emissions from the Energy industries by -8.1% (-365 kt CO2 eq) which prevailed over the increase of emissions in the transport sector by 6.1 % (281 kt CO2 eq). Emissions from IPPU decreased by -2.9% (-34 kt CO2 eq). The largest decrease of emissions was in the other product manufacture and use due to the decrease in the use of N2O. Emissions in agriculture sector was almost identical as in the previous year. Removals from LULUCF sector decreased by 56.2% (2,553 kt CO2 eq). The larger decrease of removals was in FLRFL due to the increase in the cut. Emissions from waste sector decreased by -6.5% (-27 kt CO2 eq). The main reason for lower emissions is a decrease of emissions from SWDS by -10.5% (-22 kt CO2 eq).

Slovakia (submitted by member state)

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	Slovakia		
								Geographical scope[4]	Slovakia		
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	**CO_2[1]**	**CH_4**	**N_2O**	**HFCs**	**PFCs**	**SF_6**	**Unspecified mix of HFCs and PFCs**	**NF_3**	**Total**	**ETS**	**non-ETS**
	CO_2 equivalent (kt)									**CO2 equivalent (Gg)**	
Total (net emissions)[1]	26373.79	3227.39	1924.93	578.88	5.34	4.86	NO	NO	32115.19	20898.86	19933.57
1. Energy	25751.39	652.82	222.20						26626.40	**11 617**	**15 010**
A. Fuel combustion (sectoral approach)	25736.50	268.26	222.20						26226.96	**11 617**	**14 610**
1. Energy industries	6366.56	14.49	30.79						6411.84	**5 887**	**524**
2. Manufacturing industries and construction	6895.03	19.73	39.57						6954.33	**5 604**	**1 350**
3. Transport (3)	7977.60	7.92	88.03						8073.55	**121**	**7 952**
4. Other sectors	4414.90	225.45	63.37						4703.72	**4**	**4 700**
5. Other	82.41	0.67	0.44						83.52	**NO**	**84**
B. Fugitive emissions from fuels	14.89	384.56	0.00						399.44	**NO**	**399**
1. Solid fuels	13.93	164.59	NO						178.52	**NO**	**179**
2. Oil and natural gas	0.95	219.97	0.00						220.92	**NO**	**221**
C. CO_2 transport and storage	NO								NO	**NO**	
2. Industrial processes and product use	9302.66	1.48	122.53	578.88	5.34	4.86	NO	NO	10015.76	**9 282**	**734**
A. Mineral industry	2337.53								2337.53	**2 323**	**15**
B. Chemical industry	1659.96	0.55	57.30	NO	NO	NO	NO	NO	1717.82	**1 717**	**1**
C. Metal industry	5236.60	0.93	NO	NO	5.34	NO	NO	NO	5242.87	**5 242**	**1**
D. Non-energy products from fuels and solvent use	68.57	NO	NO						68.57	**1**	**67**
E. Electronic Industry				NO	NO	NO	NO	NO	NO	**NO**	
F. Product uses as ODS substitutes				578.88	NO	NO	NO	NO	578.88	**NO**	**579**
G. Other product manufacture and use	NO	NO	65.23	NO	NO	4.86	NO	NO	70.10	**NO**	**70**
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	**NO**	
3. Agriculture	82.50	990.85	1368.68						2442.02		
A. Enteric fermentation		913.51							913.51		
B. Manure management		77.34	139.53						216.87		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NO	1229.16						1229.16		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		NO	NO						NO		
G. Liming	16.96								16.96		
H. Urea application	65.54								65.54		
I. Other carbon-containing fertilizers	NO								NO		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry[1]	-8763.35	16.03	30.08						-8717.24		
A. Forest land	-7499.75	16.03	10.57						-7473.14		
B. Cropland	-1170.34	NO	9.65						-1160.68		
C. Grassland	-55.92	NO	0.29						-55.63		
D. Wetlands	NO	NO	NO						NO		
E. Settlements	84.81	NO	4.66						89.47		
F. Other land	71.39	NO	4.91						76.30		
G. Harvested wood products	-193.56								-193.56		
H. Other	NO	NO	NO						NO		
5. Waste	0.60	1566.22	181.43						1748.25		
A. Solid waste disposal	NO	1107.80							1107.80		
B. Biological treatment of solid waste		184.84	132.20						317.04		
C. Incineration and open burning of waste	0.60	0.08	0.69						1.36		
D. Waste water treatment and discharge		273.50	48.54						322.04		
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	103.70	0.06	0.84						104.60		
Aviation	88.09	0.02	0.71						88.83		
Navigation	15.61	0.04	0.13						15.77		
CO_2 emissions from biomass	7504.69								7504.69		
CO_2 captured	45.88								45.88		
Indirect CO_2 [2]											
Total CO_2 equivalent emissions without land use, land-use change and forestry									40832.43	20898.86	19933.57
Total CO_2 equivalent emissions with land use, land-use change and forestry									32115.19		
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									40878.31	20898.86	19979.45
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									32161.07		

(1) For carbon dioxide (CO_2) 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.
ENERGY: Based on preliminary data (and EU ETS reports) a significant increase of CO2 emissions is expected in categories 1.A.1 and 1.A.2. This increase is mainly caused by increase of steel production. Main iron and steel producer resumed operation in one of blast furnace reconstructed in previous year. Similar trend is visible in the corresponding IPPU categories. The increase of CO2 emissions in iron and steel production is on a level of 2 400 kt CO2 in 2021, in comparison with year 2020. There is no EU ETS data for categories 1.A.4. and 1.A.5, therefore the emissions were estimated mainly according to trend from previous years. In the 1.A.4 category, a slight increase of emissions is expected. In the category 1.A.5, the emissions remained practically on the same level in comparison with the previous year. The increasing emissions in categories 1.A.1 and 1.A.2 caused increase of total GHG emissions estimate 2021 (inter-annually 2020-2021 is expected by 10-11%). TRANSPORT: The significant increase in transport emissions recognised in 2021 is caused by return to pre-pandemic behaviour in road mobility. Total energy consumption of petrol and diesel oil rose by almost 5% and the corresponding GHG emissions increased by 7%. GHG emissions of diesel oil vehicles rose by 16.8% and GHG emissions from petrol vehicles increased by 12%. IPPU: Categories 2.A, 2.B and 2.C were estimated based on the EU ETS verified GHG emissions 2021. ESD emissions in categories 2.A, 2.B, 2.C, 2.D and 2.G were extrapolated based on the 5-years average. AGRICULTURE: The official statistics for 2021 for livestock numbers and animal production data were used in the 2021 proxy estimate. Activity data for 2021 consumption of inorganic nitrogen fertilizers, sewage sludge, compost, limestone, dolomite, and urea were not available. Instead of these, extrapolated data using the 30-years mean was used. Emissions decreased in 3.B Manure Management and in 3.A Enteric Fermentation due to the decline of livestock number in all animal subcategories. The emissions from the 3.D Agricultural Soil decreased compared to the previous submission. The main driver of emissions drop is the significant reduction of breeding animals, despite the expectation of a slight increase consumption in organic nitrogen fertilizers, crop residues urea application, and limestone. LULUCF: A. FOREST LAND: Emissions of CO2, CH4 and N2O are preliminary and were calculated using new input data from 2021. Significant increase in sinks was caused by the lower harvest of wood (lower gains) in this category. 4.B CROPLAND: Emissions of CO2, CH4 and N2O are preliminary and were calculated using new input data from 2021. C. GRASSLAND: Emissions of CO2, CH4 and N2O are preliminary and were calculated using new input data from 2021. D. WETLANDS: Slovakia does not report this category. E. SETTLEMENTS: Emissions of CO2 and N2O are preliminary and were calculated using new input data from 2021. F. OTHER LAND: Emissions of CO2 and N2O are preliminary and were calculated using new input data from 2021. G. HWP: FAO database for 2021 was not available. Emissions were estimated using the input FAO data from 2020 and the harvested wood volume from 2021. WASTE: The proxy estimates of emissions were prepared from analysis of 5-year data. There are no new data available, which have impact on emission estimates from waste sector as published in the last submission. Emissions from waste disposal at the same level as in 2020 (slight decrease was caused by lowering of disposal) and will be updated later. Emissions of CH4 and N2O from 5.D wastewater are decreasing due to increasing share of connectivity to the public sewage treatment plant. The impact of the COVID pandemic on the reduction of industrial production and wastewater was also taken into account. The emissions increased compare to the previous submission. Incineration of waste is decreasing according to the data available in national database of stationary sources. MEMO ITEMS: Emissions are not significant and proxy is calculated based on the real consumption for the year 2020.

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 2021
Submission 2022
Country Iceland
Geographical scope[4]

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2[1]	CH_4	N_2O	HFCs	PFCs	SF_6	Unspecified mix of HFCs and PFCs	NF_3	Total	ETS	non-ETS
	CO_2 equivalent (kt)									CO2 equivalent (Gg)	
Total (net emissions)[1]	8789.08	3937.95	296.99	168.61	98.97	2.97	0.00	0.00	13294.56	1853.60	11440.96
1. Energy	1729.82	7.00	19.03						1755.85	**10**	**1 745**
A. Fuel combustion (sectoral approach)	1564.96	2.66	19.03						1586.65	**10**	**1 576**
1. Energy industries	2.56	0.00	0.01						2.57		
2. Manufacturing industries and construction	44.16	0.11	0.46						44.72	**10**	**34**
3. Transport (3)	919.75	1.15	11.61						932.51		
4. Other sectors	595.96	1.39	6.95						604.30		
5. Other	2.53	0.00	0.01						2.54		
B. Fugitive emissions from fuels	164.86	4.34	0.00						169.20		
1. Solid fuels	NO	NO	NO						NO		
2. Oil and natural gas	164.86	4.34	0.00						169.20		
C. CO_2 transport and storage	NO								NO		
2. Industrial processes and product use	1751.73	3.58	2.80	168.61	98.97	2.97	NO	NO	2028.66	**1 843**	**186**
A. Mineral industry	0.93								0.93		
B. Chemical industry	NO	NO	NO	NO	NO	NO	NO	NO	NO		
C. Metal industry	1744.25	3.55	NO	NO	98.90	NO	NO	NO	1846.70	**1 843**	**4**
D. Non-energy products from fuels and solvent use	6.54	NO	NO						6.54		
E. Electronic Industry				NO	NO	NO	NO	NO	NO		
F. Product uses as ODS substitutes				168.61	0.07	NO	NO	NO	168.68		
G. Other product manufacture and use	0.02	0.03	2.80	NO	NO	2.97	NO	NO	5.81		
H. Other	NA	NA	NA	NO	NO	NO	NO	NO	NO		
3. Agriculture	7.27	339.34	266.06						612.68		
A. Enteric fermentation		285.25							285.25		
B. Manure management		54.09	17.12						71.21		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NA	248.94						248.94		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		NO	NO						NO		
G. Liming	4.51								4.51		
H. Urea application	1.32								1.32		
I. Other carbon-containing fertilizers	1.43								1.43		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry[1]	5294.36	3352.73	0.86						8647.95		
A. Forest land	-525.83	0.74	0.84						-524.25		
B. Cropland	1843.59	94.27	NO						1937.86		
C. Grassland	5212.54	420.05	0.01						5632.61		
D. Wetlands	-1239.74	2837.66	NO						1597.92		
E. Settlements	3.86	NO	0.01						3.86		
F. Other land	NO	NO	NO						NO		
G. Harvested wood products	-0.06								-0.06		
H. Other	NO	NO	NO						NO		
5. Waste	5.89	235.29	8.24						249.42		
A. Solid waste disposal	NO	187.12							187.12		
B. Biological treatment of solid waste		2.89	2.05						4.94		
C. Incineration and open burning of waste	5.89	0.09	0.25						6.23		
D. Waste water treatment and discharge		45.19	5.94						51.13		
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	478.84	0.23	3.97						483.04		
Aviation	412.22	0.07	3.44						415.73		
Navigation	66.62	0.16	0.54						67.32		
CO_2 emissions from biomass	53.10								53.10		
CO_2 captured	7.54								7.54		
Indirect CO_2 [2]	NE										
Total CO_2 equivalent emissions without land use, land-use change and forestry									4646.61	1853.602	2793.011
Total CO_2 equivalent emissions with land use, land-use change and forestry									13294.56		
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									NA		
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									NA		

(1) For carbon dioxide (CO_2) 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.

Pleas note that ETS numbers from 2C are slightly diffrent than the verified ETS numbers. The reason is that the verified ETS numbers are in AR5 while these numbers here are in AR4.

Key drivers for changes in emissions between 2020 and 2020:
- Inceased emissions from road transport most likely due to increased tourism after the pandemic.
- Increased emissions from fishing most likely due to increase in fishing quotas in Iceland.
- Increased emissions from metal industry because one company started production again after shutting down for a brief period during the pandemic.
- Decreased emission from 2F as less F-gases are being imported

Norway (submitted by country)

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	Norway		
								Geographical scope[4]			
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	**CO_2[1]**	**CH_4**	**N_2O**	**HFCs**	**PFCs**	**SF_6**	**Unspecified mix of HFCs and PFCs**	**NF_3**	**Total**	**ETS**	**non-ETS**
	CO_2 equivalent (kt)									**CO2 equivalent (Gg)**	
Total (net emissions)[1]	20223.92	4886.07	2594.20	775.25	247.73	60.69	NO	NO	28787.86		
1. Energy	32834.36	955.52	230.18						34020.05	**14 763**	**19 257**
A. Fuel combustion (sectoral approach)	31146.52	463.19	228.64						31838.35	**13 862**	**17 976**
1. Energy industries	13317.12	117.12	37.84						13472.08	**12 763**	**709**
2. Manufacturing industries and construction	2856.50	12.50	34.52						2903.52	**1 100**	**1 804**
3. Transport (3)	12036.36	108.93	118.54						12263.83	**0**	**12 264**
4. Other sectors	2826.55	224.59	36.70						3087.83	**0**	**3 088**
5. Other	110.00	0.05	1.03						111.09	**0**	**111**
B. Fugitive emissions from fuels	1684.76	492.33	1.54						2178.63	**898**	**1 281**
1. Solid fuels	8.57	70.27	NO						78.84	**0**	**79**
2. Oil and natural gas	1676.19	422.06	1.54						2099.79	**898**	**1 202**
C. CO_2 transport and storage	3.07								3.07	**3**	**0**
2. Industrial processes and product use	8045.54	21.74	216.39	775.25	247.73	60.69	NO	NO	9367.34	**7 699**	**1 669**
A. Mineral industry	933.27								933.27	**931**	**2**
B. Chemical industry	1678.52	20.47	196.89	NO	NO	NO	NO	NO	1895.88	**1 807**	**89**
C. Metal industry	5087.26	1.27	4.17	NO	247.73	NO	NO	NO	5340.44	**4 952**	**389**
D. Non-energy products from fuels and solvent use	226.56	NA	NA						226.56	**0**	**227**
E. Electronic Industry				NO	NO	1.14	NO	NO	1.14	**0**	**1**
F. Product uses as ODS substitutes				775.25	NO	NO	NO	NO	775.25	**0**	**775**
G. Other product manufacture and use	NO	NO	15.32	NO	NO	59.55	NO	NO	74.87	**0**	**75**
H. Other	119.93	NO	NO	NO	NO	NO	NO	NO	119.93	**9**	**111**
3. Agriculture	121.66	2651.13	1807.04						4579.83		
A. Enteric fermentation		2278.22							2278.22		
B. Manure management		370.03	155.86						525.89		
C. Rice cultivation		NO							NO		
D. Agricultural soils		NE	1650.29						1650.29		
E. Prescribed burning of savannas		NO	NO						NO		
F. Field burning of agricultural residues		2.88	0.89						3.77		
G. Liming	121.56								121.56		
H. Urea application	0.10								0.10		
I. Other carbon-containing fertilizers	NO								NO		
J. Other	NO	NO	NO						NO		
4. Land use, land-use change and forestry[1]	-20778.65	186.76	252.16						-20339.74		
A. Forest land	-24731.60	51.30	176.52						-24503.77		
B. Cropland	2139.42	91.27	4.62						2235.30		
C. Grassland	153.14	12.20	2.60						167.94		
D. Wetlands	267.22	8.58	33.13						308.93		
E. Settlements	1842.43	NO	15.00						1857.43		
F. Other land	NO	NO	NO						NO		
G. Harvested wood products	-449.25								-449.25		
H. Other	NO	23.41	20.29						43.69		
5. Waste	1.02	1070.92	88.43						1160.37		
A. Solid waste disposal	0.00	819.70							819.70		
B. Biological treatment of solid waste		50.01	17.13						67.14		
C. Incineration and open burning of waste	1.02	0.10	0.03						1.14		
D. Waste water treatment and discharge		201.11	71.28						272.38		
E. Other	NO	NO	NO						NO		
6. Other *(as specified in summary 1.A)*	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
Memo items:											
International bunkers	1380.08	57.28	26.56						1463.92		
Aviation	383.48	0.09	6.25						389.82		
Navigation	996.60	57.19	20.30						1074.10		
CO_2 emissions from biomass	5267.61								5267.61		
CO_2 captured	1082.40								1082.40		
Indirect CO_2 [2]	264.04										
Total CO_2 equivalent emissions without land use, land-use change and forestry									48863.55	22462.16	20925.23
Total CO_2 equivalent emissions with land use, land-use change and forestry									28523.82		
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									49127.59		
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									28787.86		

(1) For carbon dioxide (CO_2) 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.

1. For LULUCF, the data for 2021 is not ready. Therefore, the reported numbers are from 2020. 2. With regards to indirect CO2, they are an integral part of the emission estimates for each source category at the most dissaggregated level. Please see NIR chapter 9 for further details. Estimates for 2021 are 264 kt CO2. The split in row 66 between ETS and non-ETS does not include these indirect CO2 emissions, but these are included in row 68 which is the appropriate national total for Norway. 3. Emissions from road traffic, manufacturing industry and energy supply increased in 2021 because of increased activity in these sectors compared with the previous year (2020). The temporarily closing of a facility in the oil and gas sector resulted in considerable lower emissions from this sector in 2021. The total emissions for 2021 except LULUCF remained almost unchanged compared with the 2020 emissions (down 0.3 per cent). Reference: https://www.ssb.no/natur-og-miljo/forurensning-og-klima/statistikk/utslipp-til-luft/artikler/klimagassutslippene-gikk-ned-0-3-prosent-i-2021

Switzerland (submitted by country)

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	Switzerland		
								Geographical scope[4]			
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	**CO_2[1]**	**CH_4**	**N_2O**	**HFCs**	**PFCs**	**SF_6**	**Unspecified mix of HFCs and PFCs**	**NF_3**	**Total**	**ETS**	**non-ETS**
	CO_2 equivalent (kt)									**CO2 equivalent (Gg)**	
Total (net emissions)[1]	35832.10	4508.18	3373.23	1284.20	25.90	121.90	NO	0.40	45145.91		
1. Energy	33678.76	266.47	245.55						34190.78	**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	2087.85	6.44	596.65	1284.20	25.90	121.90	NO	0.40	4123.34	**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	46.00	3794.86	1920.65						5761.52		
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	8.90	439.84	609.92						1058.65		
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)*	10.59	0.57	0.47	NO	NO	NO	NO	NO	11.62	NE	
Memo items:											
International bunkers	NE	NE	NE						NE		
Aviation											
Navigation											
CO_2 emissions from biomass											
CO_2 captured											
Indirect CO_2 [2]											
Total CO_2 equivalent emissions without land use, land-use change and forestry									45145.91	NE	
Total CO_2 equivalent emissions with land use, land-use change and forestry									NE		
Total CO_2 equivalent emissions, including indirect CO_2, without land use, land-use change and forestry									45145.91	NE	
Total CO_2 equivalent emissions, including indirect CO_2, with land use, land-use change and forestry									NE		

(1) For carbon dioxide (CO_2) 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.
Information on Swiss climate reporting under the UNFCCC is available: http://www.climatereporting.ch In the different sectors, emission changes from 2020 to 2021 were mainly caused by the following drivers: Sector 1 'Energy' In 2021, CO2 emissions from motor fuels increased by 1.5 per cent compared to the previous year. However, emissions were still significantly lower than in 2019, before the COVID 19 pandemic. The fact that emissions did not rise more sharply is due not only to the pandemic but also to the growing share of electromobility in road traffic. The share of biogenic fuels in total fuel consumption, on the other hand, has fallen and was 3.3 per cent in 2021 (2020: 3.7 per cent). Emissions from heating fuels increased by 9.3 per cent from 2020 to 2021. The increase for the latest year reflects the strong influence of winter temperatures on emissions and shows that buildings in Switzerland (responsible for around three quarters of CO2 emissions from fuels) are still largely heated with fossil oil or gas. Sector 2 'Industrial processes and product use' Slightly increased CO2 emissions from cement production (based on data from cement plants). F-Gases are estimated to decrease for the second time (likely a turning point is achieved). Sector 3 'Agriculture' The approximated emission estimate considered preliminary new data for aggregated animal numbers, updated milk production, and estimates on mineral fertilizers. Also considered are updated methods and default values of the 2019 Refinements (IPCC 2019) for the calculation of methane emissions. Due to missing data only rough estimates have been made concerning the development of biogas plants, mineral fertilisers with nitrification inhibitors, crop yields, areas of organic soils, N mineralization, alignment of N input from crop residues with soil C modelling. Sector 5 'Waste' Reduced emissions of CH4 from waste disposal sites (based on model simulations, disposal of burnable solid waste is prohibited since the year 2000). Reduced CH4 emissions due to a planned recalculation in 5 D Wastewater treatment and discharge. Strongly increased N2O emissions due to a planned recalculation in 5 D Wastewater treatment and discharge: according to representative (year round) measurements of N2O on Swiss waste water treatment plants a much higher emission factor for N2O is implemented. Concerning sector 5D, the values for 2021 are not consistent with Switzerland's latest greenhouse gas inventory of April 2022 (values from 1990 to 2020), as the planned improvement is already considered for 2021 here. Sector 6 'Other' Due to a lack of data, it is estimated that sector 6 'Other' emits the same as in the previous year.

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 eq.	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 tons)
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 tons)
N_2O	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
NO	Norway
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
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Climate change mitigation