Council of the European Union

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**COVER NOTE**

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# COMMISSION STAFF WORKING DOCUMENT

## Technical information

***Accompanying the document***

## REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL

## EU Climate Action Progress Report 2024

{COM(2024) 498 final}

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# 1 OVERVIEW OF EU CLIMATE TARGETS

***Table 1.1:*** *Overview of new climate targets as adopted under the Fit for 55 package*

| | International commitments | | EU domestic legislation | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **The EU's commitment under the Kyoto Protocol (KP)** | **The EU's commitment under the Paris Agreement** | **2020 Climate and Energy Package** | | **2030 Climate and Energy Framework** | | | | **2050** |
| | | | **EU ETS** | **Effort Sharing Decision (ESD)** | **EU ETS (ETS1)** | **ETS 2 for buildings, road transport and small-emitting industry [1]** | **Effort Sharing Regulation (ESR)** | **LULUCF** | |
| **Target year of period** | Second commitment period (2013-2020) | Already in force – covers the period post 2020 | 2013-2020 | | 2021 - 2030 | | | | 2050 |
| **Overall emission reduction target** | -20% | at least -55% net emissions in 2030 | -20% GHG emissions reduction vs 1990 | | at least -55% net domestic reduction vs 1990 | | | | climate neutrality (Balance between emissions and removals) |
| **Emission reduction target** | | | -21% in 2020 compared with 2005 for ETS emissions | -10% in 2020 compared with 2005 for non-ETS emissions | -62% in 2030 compared with 2005 for EU ETS emissions | -42% in 2030 compared with 2005 for ETS 2 emissions | -40% in 2030 compared with 2005 for ESR emissions (non- ETS1 emissions)<br><br>Annual binding | First phase 2021-2025 'no-debit' commitment to maintain current carbon sink levels. In a second phase | |

[1] Surrendering of allowances under the new ETS 2 will start in 2027.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Annual binding targets by MS ranging from +20% to -20%. | | | targets by MS ranging from -10% to -50%. | 2026-2030: EU-wide target of -310 Mt $CO_2$ equivalent of net removals by 2030, each MS will have nationally binding 2030 targets | |
| **Base year** | 1990, but subject to flexibility rules. 1995 or 2000 may be used as its base year for Nitrogen trifluoride (NF3) | 1990 | 2005 | 2005 | 2005 | | 2005 | Subject to accounting rules | N/A |
| | | | 1990 for overall emission reduction target | | 1990 for overall emission reduction target | | | | |
| **Carry-over of units from preceding periods**[2] | Subject to KP rules including those agreed in the Doha Amendment | No | EU ETS allowances can be banked into subsequent ETS trading periods since the second trading period. | No carry over from previous period. | Indefinite validity of allowances not limited to trading periods. No need to carry over. | | No | No | No |
| **Gases covered** | $CO_2$, $CH_4$, $N_2O$, HFCs[3], PFCs, $SF_6$, $NF_3$ | $CO_2$, $CH_4$, $N_2O$, HFCs, PFCs, $SF_6$, $NF_3$ | $CO_2$, $N_2O$, PFCs, | $CO_2$, $CH_4$, $N_2O$, HFCs, PFCs, $SF_6$ | $CO_2$, $CH_4$, $N_2O$, HFCs, PFCs, $SF_6$ | $CO_2$, $CH_4$, $N_2O$, HFCs, PFCs, $SF_6$ | $CO_2$, $CH_4$, $N_2O$, HFCs, PFCs, $SF_6$, $NF_3$ | $CO_2$, $CH_4$, $N_2O$ | $CO_2$, $CH_4$, $N_2O$, $SF_6$, $NF_3$, HFCs, PFCs |
| **Sectors included** | Energy, IPPU, agriculture, waste, LULUCF | Energy, IPPU, agriculture, waste, LULUCF | Power & heat generation, energy-intensive industry | Transport (except aviation), buildings, non-ETS industry, | Electricity & heat generation, energy-intensive industry, aviation[4], maritime[5] | Buildings, road transport and small-emitting sectors (i.e. emissions from fuel combustion in | Domestic transport (except aviation), buildings, non-ETS | Land use, land use change and forestry | Economy-wide |

[2] For the CP2 it refers to carry over from CP1. For the ETS it refers to carry-over from previous trading period under the scheme itself. For the effort sharing legislation it refers to carry over from ESD to ESR. For LULUCF it refers to carry-over from Kyoto Protocol period.

[3] HFCs are also covered by the Kigali Amendment to the Montreal Protocol, which entered into force on the 1st of January 2019.

[4] Emissions from flights between EEA airports as well as flights departing to airports in Switzerland and in the UK.

[5] Emissions from all large ships entering EU ports in respect of 50% of emissions from voyages starting or ending outside of the EU and 100% of emissions that occur between two EU ports and when ships are within EU ports.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | sectors, aviation | agriculture and waste | | these sectors) | industry, agriculture and waste | | |
| **Global Warming Potentials used** | IPCC SAR | IPCC AR4 | IPCC AR5 | IPCC AR4 | | IPCC AR5 | | | | IPCC AR5 |
| **Applicable to number of MS** | 15 (additio-nal KP targets for single MS) | EU-27, UK and Iceland | EU-27 | EU-27[6] | | EU-27[7] | | | | EU-27[8] |



[6] In addition to the 27 Member States, Northern Ireland, Iceland, Liechtenstein and Norway are also covered under the EU-ETS. The UK was initially also covered by the ESD.

[7] In addition to the 27 Member States, Northern Ireland, Iceland, Liechtenstein and Norway are also covered under the EU-ETS. Norway and Iceland have also incorporated the ESR.

[8] Within the Agreement on the European Economic Area, Iceland and Norway cooperate with the EU-27 towards achieving the 2030 targets in the LULUCF and Effort Sharing sectors.

# 2 EU CLIMATE TARGETS, ESTIMATING THE EMISSIONS FALLING UNDER ITS SCOPE (TECHNICAL NOTE)

## 2.1 INTRODUCTION

The tracking of progress towards the **EU climate targets** (i.e. 2020, 2030 and the 2050 climate-neutrality objective) compared with 1990 emissions, has so far been based on the annual EU greenhouse gas (GHG) inventory submitted to the UNFCCC. Use has been made of total GHG emissions, net of removals (LULUCF) and including/excluding emissions from international aviation (GHG inventory). However, none of these aggregates reflects the exact legal scope as set out in the **European Climate Law** [9]. Nor do the aggregates reflect the scope of the EU's nationally determined contribution (NDC) as submitted to the UNFCCC secretariat.

This note first describes the 2050 climate-neutrality objective and the 2030 climate target set in the European Climate Law. It then sets out a definition of aggregates that more closely reflects their legal scope and the methodology that the Commission recommends for the estimation of the emissions since 1990. This refers in particular to the estimation of the emissions from international aviation and maritime transport currently covered by the EU law. This is because the scope of the EU ETS has evolved since it was created in 2005, with the inclusion of new countries, activities and gases. It is therefore necessary to produce estimates of historical emissions for aviation and maritime transport in line with the scope of the European Climate Law and consistently with the current scope of the EU ETS.

## 2.2 EU CLIMATE TARGETS AS DEFINED IN THE EUROPEAN CLIMATE LAW

Article 2(1) of the European Climate Law provides that:

> *Union-wide greenhouse gas emissions and removals regulated in Union law shall be balanced within the Union at the latest by 2050, thus reducing emissions to net zero by that date, and the Union shall aim to achieve negative emissions thereafter.*

The 2050 objective is set at EU level and is economy-wide. It is to be achieved domestically, without the use of international credits [10]. The emissions and removals regulated in EU law can change over time. There should be a territorial link with the EU, and the exact territorial scope is set by the acts that regulate the GHG emissions and removals.

Article 4(1) on intermediate EU climate targets provides that:

[9] Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law'), OJ L 243, 9.7.2021, p. 1.

[10] The following GHG are covered: Carbon dioxide (CO2), Methane (CH4), Nitrous Oxide (N2O), Sulphur hexafluoride (SF6), Nitrogen trifluoride (NF3), Hydrofluorocarbons (HFCs) (see list HFCs in Part 2 of Annex V to Regulation (EU) 2018/1999), Perfluorocarbons (PFCs) (see list PFCs in Part 2 of Annex V to Regulation (EU) 2018/1999). It includes GHG emissions and removals regulated in Union law.

*In order to reach the climate-neutrality objective set out in Article 2(1), the binding Union 2030 climate target shall be a domestic reduction of net greenhouse gas emissions (emissions after deduction of removals) by at least 55% compared with 1990 levels by 2030.*

*When implementing the target referred to in the first subparagraph, the relevant Union institutions and the Member States shall prioritise swift and predictable emission reductions and, at the same time, enhance removals by natural sinks.*

*In order to ensure that sufficient mitigation efforts are deployed up to 2030, for the purpose of this Regulation and without prejudice to the review of Union legislation referred to in paragraph 2, the contribution of net removals to the Union 2030 climate target shall be limited to 225 million tonnes of $CO_2$ equivalent. In order to enhance the Union's carbon sink in line with the objective of achieving climate neutrality by 2050, the Union shall aim to achieve a higher volume of its net carbon sink in 2030.*

The 2030 climate target is a step on the way to achieving the 2050 climate-neutrality objective, and the scopes should be consistent. What is covered in the legislation enabling the achievement of the 2030 target is under the scope of the 2030 target (with the contribution of net removals to the 2030 EU climate target limited to 225 million tonnes of $CO_2$ equivalent)[11]. It is a domestic reduction, meaning without using international credits, economy-wide, net, and covers the same GHG as the 2050 climate-neutrality objective (listed in Part 2 of Annex V to Regulation (EU) 2018/1999).

## 2.3 THE EU TARGET SCOPE

Based on the above, the scope that best represent the EU's climate mitigation target can be obtained by adding to the EU-27 total domestic GHG emission, including LULUCF, the EU-27 emissions from international aviation and maritime transport regulated in EU Law. In particular and for the purpose of tracking the progress towards the EU climate target, EU emissions cover:

**International aviation (EU target scope):** $CO_2$ emissions from flights between the EU Member States and departing flights to Iceland, Norway, Switzerland and the United Kingdom. International aviation also covers $CO_2$ emissions from non-domestic flights between EU Member States and the Outermost Regions (OMRs)[12].

By July 2026, the Commission will make a legislative proposal to revise the EU ETS that will include the scope of the EU ETS for aviation. According to the revised EU ETS Directive[13],

[11] According to recital 20 of the European Climate Law, "sinks include natural and technological solutions, as reported in the Union's greenhouse gas inventories to the UNFCCC". The GHG inventories allow for the reporting of "technological" sinks, referred to as "industrial carbon removals" in the CRCF. However, they are not covered by a specific policy instrument (notably they are not recognised under the ETS Directive, the ESR or the LULUCF Regulation) and so at this time are considered not regulated under Union Law with the purpose of meeting the 2030 climate target. The GHG inventory under the UNFCCC includes BECCS, based on IPCC guidelines but not DACCS. Note that there are currently no "industrial removals" to be reported in the GHG inventories, but that projects are being developed in some Member States which are expected to be operational in the coming years.

[12] From 1 January 2024, the revised EU ETS also covers non-domestic flights to and from outermost regions that were previously exempted. The outermost regions of the EEA Member Countries are: i) France: French Guiana, Guadeloupe, Martinique, Mayotte, Reunion, Saint Martin; ii) Spain: Canary Islands; iii) Portugal: Azores, Madeira.

[13] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32023L0958

from 1 January 2027, flights involving third countries not applying ICAO's CORSIA scheme will also be covered by the EU ETS, except for flights involving most small island countries and Least Developed Countries[14]. Depending on the assessment preparing the legislative proposal, the revised scope may be changed so that flights to third countries applying ICAO's CORSIA scheme will also be covered by the EU ETS. Consequently, the target scope will be adjusted accordingly.

***Figure 2.1:*** *Illustration of emissions from aviation covered by the EU target scope.*

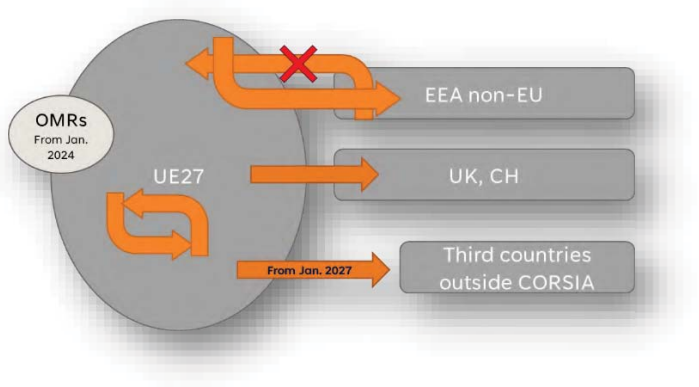



***Table 2.1:*** *Aviation emissions covered by the EU climate target.*

| Emissions | Domestic aviation | | | Intra-EEA aviation | | | | Extra-EEA aviation |
|---|---|---|---|---|---|---|---|---|
| | Domestic EU flights (e.g. Palermo Milan) | Domestic "non-EU EEA" flights (e.g. Oslo to Bergen) | To OMRs (e.g. Canary Islands to Madrid) | Flights between "non-EU EEA" countries (from Oslo to Reykjavik) | Flights within the EEA, arriving at EU airport from an EEA non-EU airport | Flights within the EEA, departing from EU airports | flights to/from EU airports from/to OMRs | departing flights from EU airports to UK and Switzerland |
| **EU 2030 target scope** | Yes | No | No (covered by ESR) | No | No | Yes | From Jan 2024 | Yes |

**International maritime transport (EU target scope):** GHG emissions (i.e. $CO_2$ and from 2026 $CH_4$, $N_2O$) from cargo and passenger ships of or above 5 000 GT as follows: i) 50% of emissions from voyages departing from a port outside the jurisdiction of an EU Member State and arriving at a port under the jurisdiction of an EU Member State; ii) 50% of emissions from voyages departing from a port under the jurisdiction of an EU Member State and arriving at a port outside the jurisdiction of an EU Member State; iii) 100% of emissions from voyages departing from a port under the jurisdiction of an EU Member

[14] Article 25a(6) of Directive 2003/87/EC

State and arriving at a port under the jurisdiction of another EU Member State; iv) 100% of emissions within a port under the jurisdiction of an EU Member State.

***Figure 2.2:*** *Illustration of maritime transport covered by the EU target scope.*

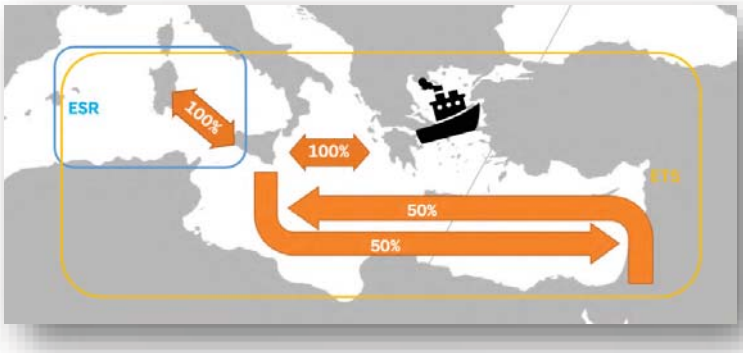



***Table 2.2:*** *Maritime emissions covered by the EU climate target*

| Emissions | Domestic maritime transport | | International maritime transport | | | | At berth | |
|---|---|---|---|---|---|---|---|---|
| | Voyages within an EU MS (e.g. Valencia - Barcelona) | Voyages within NO/IS (e.g. Oslo - Bergen) | Voyages between two EU MS (e.g. Valencia - Rotterdam) | Voyages between an EU MS and NO/IS (e.g. Rotterdam - Oslo) | Voyages between an EU MS and a third country | Voyages between NO/IS and a third country (or IS/NO) | At berth emissions in a port of an EU MS | At berth emissions in a port of NO and IS, or of a third country |
| **EU 2030 target scope** | Yes | No | Yes | Yes<br>50% | Yes<br>50% | No | Yes | No |

## 2.4 METHODOLOGY

International aviation and maritime emissions covered by the EU targets, as defined in the European Climate Law, are estimated by using the Joint Research Centre's Integrated Database of the European Energy System (JRC-IDEES)[15]. It allows to split the international transport $CO_2$

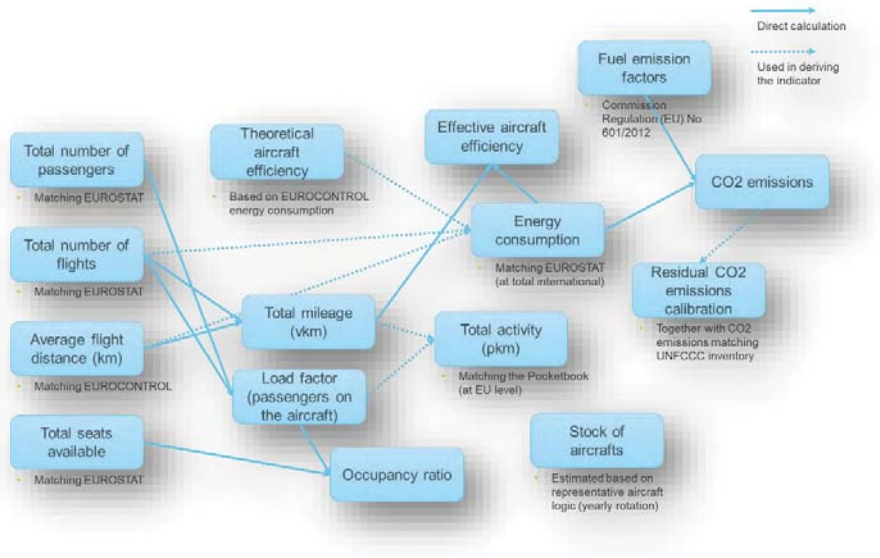
[15] European Commission, Joint Research Centre, Jaxa-Rozen, M., Rozsai, M. and Neuwahl, F., Aligning historical international aviation and maritime transport data to the scope of EU climate policies, Publications Office of the European Union, Luxembourg, JRC139028. https://publications.jrc.ec.europa.eu/repository/handle/JRC139028

emissions into intra-EU/extra-EU and intra-EEA/extra-EEA categories backwards in time (i.e. 1990) [16].

For international transport, JRC-IDEES applies a decomposition methodology that reconciles the scopes of available primary statistics and harmonises historical data on international aviation and maritime emissions, energy use, and transport activity. The resulting annual dataset covers 1990-2021 and distinguishes between domestic, intra-EU/intra-EEA, and extra-EU/extra-EEA activity for each EU Member State, Iceland and Norway.

In aviation, JRC-IDEES distinguishes between passenger and freight modes, with three geographical categories of flight origin/destinations for each mode: domestic, intra-EEA+UK, and extra-EEA+UK. Intra-EU, UK, and EEA categories are also used internally during calibration but aggregated for reporting. For each mode/category combination, JRC-IDEES estimates activity (as passenger-km or tonne-km), energy use and $CO_2$ emissions, aircraft stock (expressed as representative aircraft), load factors, and aircraft efficiencies. As country-specific activity statistics are not available, the decomposition first allocates EU-level activity data from the DG MOVE Transport Pocketbook [17] to each country and flight category.

***Figure 2.3:*** *Aviation emissions: Overview of the methodology.*




For passenger modes, this allocation calculates average load factors using Eurostat data on total passengers and flights. These load factors and total flight numbers are combined with average flight distances from EUROCONTROL to yield an initial estimate for passenger transport activity. For intra-EU activity, a uniform scaling factor is then applied across Member States to match total EU-level Transport Pocketbook data. Freight activity follows a similar process, using

[16] The JRC-IDEES analytical database is designed to support energy modelling and policy analysis, by combining primary statistics with technical assumptions to compile detailed energy-economy-emissions historical data for each key energy sector. For aviation, EEA emissions includes emissions related to the UK but not to Switzerland, where total CO2 emissions for the scope are additionally estimated from EUROCONTROL data.

[17] https://transport.ec.europa.eu/facts-funding/studies-data/eu-transport-figures-statistical-pocketbook/statistical-pocketbook-2023_en

a “representative flight” concept with a common load factor across all Member States to account for mixed passenger-freight flights.

Next, the decomposition estimates fuel use from EUROCONTROL data, by deriving a distance-dependent average aircraft efficiency then applying it to the country-specific ensemble of flights and routes. The final step scales the estimates to meet Eurostat energy balances for total domestic and international consumption back to 1990 values, maintaining intra-EEA/extra-EEA fuel use ratios derived from EUROCONTROL. JRC-IDEES additionally reports resulting differences with UNFCCC country submissions. The above process is followed throughout the entire decomposition period (1990-2021). Data gaps are estimated from the existing indicators as follows:

- The process iterates backwards towards 1990, starting from the oldest years in which data is available in each Member State.
- Average flight distance is kept constant for early years without EUROCONTROL data (generally before 2004).
- If the load factor (passengers per flight) cannot be calculated by lack of passenger and/or flight data, it is estimated from the trend of the existing time series.
- Missing numbers of flights are calculated from the load factor and the passengers carried.
- If no passenger data is available, the total mileage is estimated from the energy consumption, and combined with average flight distance to estimate the number of flights. The number of flights is then combined with the load factor to estimate the total passengers carried.
- For early years without data, constant values are assumed for the factors used to *i)* scale intra-EU activity to the Transport Pocketbook, *ii)* adjust the estimated fuel use to EUROCONTROL data for specific routes, and *iii)* scale this adjusted fuel use to Eurostat energy balances (e.g. before 1995 for Transport Pocketbook data; before 2004 for EUROCONTROL data).

For international maritime bunkers, JRC-IDEES estimates data both for intraEU/extraEU and intraEEA/extraEEA geographical categories. For the purpose of the present exercise, the emission estimates already include $CO_2$, $CH_4$, and $N_2O$ gases. Transport activity (tonne-km) is estimated from Eurostat data on gross weight of transported goods, using port-level and country-level data for intra-EU and extra-EU categories, respectively. Intra-EU activities are then scaled to match the DG MOVE Transport Pocketbook totals, accounting for domestic coastal shipping (calibrated separately in JRC-IDEES). Next, transport activity is combined with THETIS MRV EU-level mileage data and country-specific vessel sizes to estimate load factors (tonne per movement). The load factors and resulting annual mileage (km) are calibrated to meet EU-level THETIS MRV mileage. The annual mileage is in turn combined with THETIS MRV average efficiency to yield a total technical energy consumption, with corresponding emissions derived from default emissions factors. This energy consumption is scaled to Eurostat energy balances so as to minimize discrepancy to total intra-EU THETIS MRV emissions. As with aviation, JRC-IDEES reports corresponding differences to UNFCCC submissions. Early years with data gaps are estimated from existing indicators as follows:

- The process iterates backwards towards 1990, starting from the oldest years in which data is available in each Member State.

- Average distance of voyages is kept constant for early years without Eurostat activity data (generally before 1997-2000).
- If the load factor (tonnes per movement) cannot be estimated by lack of activity data, it is kept constant.
- If activity data is not available, it is estimated from Eurostat energy consumption.
- Missing mileage data is derived from the activity and load factor estimates.
- For early years without data, constant values are assumed for the factors used to i) scale intra-EU activity to the Transport Pocketbook, ii) scale estimated mileage to meet EU-level THETIS MRV mileage, and iii) scale domestic and intra-EU CO2 emissions estimated from energy consumption so as to match total THETIS MRV CO2 emissions.
- Finally, the ratios between the estimated MRV emissions and the CO2 emissions for the reported transport activity (for intra-EU/EEA and extra-EU/EEA categories) between 2018 and 2021 are used to calculate the MRV compliant estimates back to 1990 levels.

For the year 2022 and 2023, the international maritime and aviation emissions under the EU target scope have been estimated by applying the same share of those emissions on the total international maritime and aviation emissions (GHG inventory) as reported in 2021.

## 2.5 EMISSION ESTIMATES

***Figure 2.4:*** *EU-27 GHG international aviation and maritime transport under the EU target scope (1990-2023), Commission's estimates.*

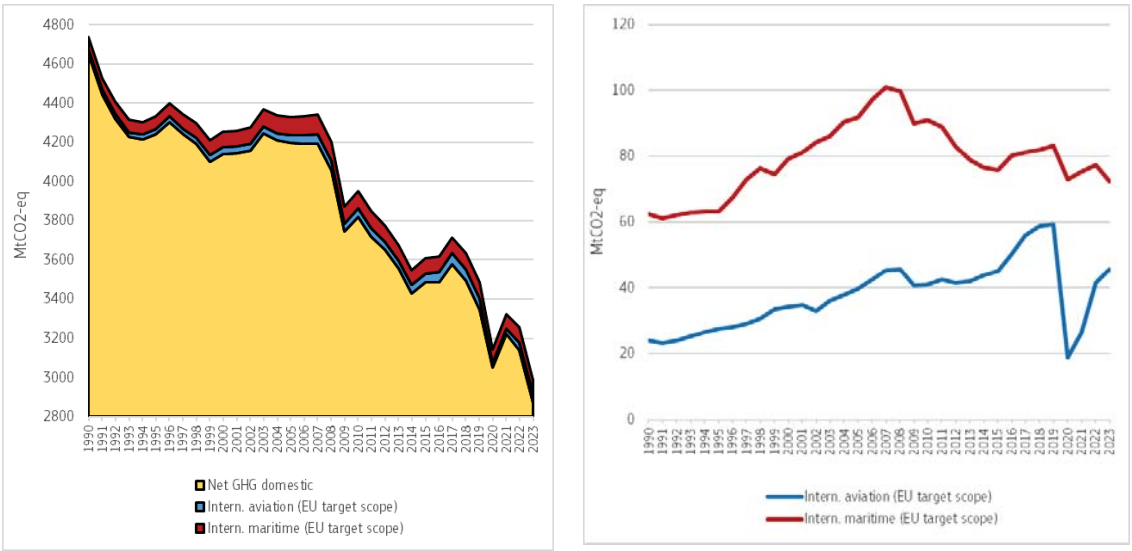


***Table 2.3:*** *EU-27 GHG emissions under the EU target scope (1990-2023), Commission's estimates.*

| EU-27 | Source | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 (proxy) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total emissions (UNFCCC) | EEA GHG 2023 | 4867 | 4559 | 4453 | 4544 | 4172 | 3811 | 3293 | 3461 | 3375 | 3119 |
| 4 - Land Use, Land-Use Change and Forestry | EEA GHG 2023 | -217 | -317 | -311 | -348 | -351 | -325 | -241 | -241 | -236 | -257 |
| **Net GHG domestic emissions** | EEA GHG 2024 | 4650 | 4241 | 4142 | 4196 | 3820 | 3486 | 3052 | 3220 | 3138 | 2862 |
| Intern. aviation under the EU climate target scope | JRC-IDEES-2024 | 24 | 28 | 34 | 40 | 41 | 45 | 19 | 26 | 41 | 46 |
| ntern. navigation under the EU climate target scope | JRC-IDEES-2024 | 62 | 63 | 79 | 92 | 91 | 76 | 73 | 75 | 77 | 72 |
| Intra-EU navigation (MRV compliant, NDC scope*) | JRC-IDEES-2024 | 26 | 28 | 35 | 37 | 38 | 31 | 30 | 30 | 31 | 29 |
| **Net GHG emissions (target scope)** | own calculation | 4736 | 4332 | 4255 | 4327 | 3953 | 3607 | 3144 | 3322 | 3257 | 2980 |
| **Net GHG emissions (NDC scope)** | own calculation | 4700 | 4296 | 4212 | 4272 | 3899 | 3562 | 3100 | 3277 | 3211 | 2937 |

*Notes: i) Target scope includes: for International aviation, intra-EU flights, departing flights from EU27 to EEA (non-EU) countries, to UK and to CH; for International maritime : emissions from voyages between two EU27 Member States, 50% of emissions from voyages between a EU27 Member State and NO/IS, 50% of emissions from vvoyages between an EU27 Member States and a third country. ii) NDC scope includes: for International aviation as for the target scope; for International maritime, emissions from voyages within the EU27 Member States.*

***Table 2.4:*** *Reduction of net GHGs in 2023 compared with 1990.*

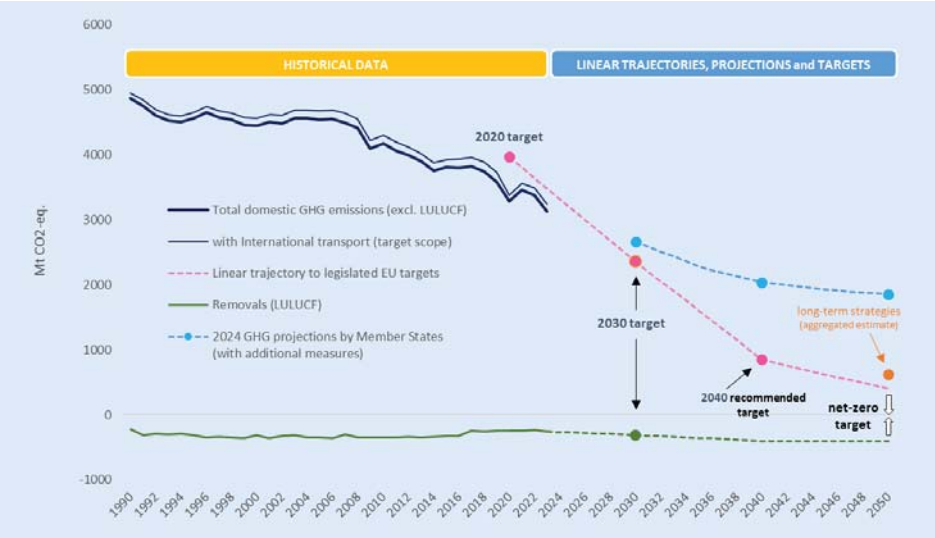
| | 1990 | 2023 | 2023/1990 |
|---|---|---|---|
| **Domestic** | 4650 | 2862 | -38.4% |
| **Target scope** | 4736 | 2980 | -37.1% |
| **NDC scope** | 4700 | 2937 | -37.5% |

# 3 EU'S GREENHOUSE GAS EMISSIONS: TRENDS AND PROJECTIONS

## 3.1 EU GREENHOUSE GAS EMISSIONS AND REMOVALS: RECENT DEVELOPMENTS

Preliminary EU GHG emissions in 2023 show a clear strong reduction compared with 2022, broadly in line with the linear declining trajectory towards the -55% EU 2030 reduction target (Figure 3.1). Total EU domestic GHG emissions (i.e. excluding LULUCF and international transport) decreased by 7.4% in 2023 compared with 2022. This translates into a reduction in GHG emissions of 35.8% compared with the 1990 base year (or 34.5% when international transport under the EU target scope is included) [18]. Over the same period, there is an approximated increase in reported GHG net removals from land use, land use change, and forestry (LULUCF) of around 20 million tonnes of CO2 equivalent compared with 2022 [19]. As a result, net GHG emissions for 2023 (i.e. including LULUCF) are expected to decrease by 8.6% compared with 2022 and to be 38.3% below the 1990 level (or 8.3% and 36.9%, respectively, when international transport under the EU target scope is included).

***Figure 3.1:*** *Total EU GHG emissions and removals (1990-2023), linear trajectories to EU targets, and Member States' latest GHG emissions projections (2023–2050)* [20].




[18] The EU GHG emission aggregate which better reflects the exact legal scope as provided by the European Climate Law can be obtained by adding to the EU-27 total domestic GHG emission, including LULUCF net emissions or removals, the EU-27 emissions from international aviation and maritime transport regulated in the Union Law. For more details, see Chapter 2 of this staff working document.

[19] Approximated 2023 data could suggest a break to the declining trend in the LULUCF sink observed in recent years. However, the assessment takes into consideration the large uncertainty of these data and as it will possibly be subject to larger revisions.

[20] Notes: (1) Historical GHG emissions and removals (1990-2023) are based on European Environment Agency's 2024 GHG Inventory and Approximated emissions and removals. (2) Linear trajectories for GHG emissions and removals (2023-2050) are based on the legislated EU 2030 targets, while emissions and removals by 2050 reflect estimates from the different model-based analyses supporting the "Delivering the European Green Deal". (3) The -55% 2030 target (EU Climate Law) considers a contribution of removals of -225 MtCO2eq.

At Member State level, emissions in 2023 fell compared with 2022 in almost all Member States, with very large emission reductions in some. They went down by more than 20% in three Member States (-27% in Bulgaria, -26% in Sweden and -22% in Finland) and between 10% and 20% in five other Member States (-19% in Estonia, -16% in Latvia, -14% in Croatia, -12% in Greece and -10% in Germany). These falls were mainly driven by less electricity generated by fossil fuels in Bulgaria, Germany, Estonia and Greece, by the enhancement of LULUCF net removals in Finland and Latvia, by the emission reductions in industry in Sweden and in transport and waste in Croatia.

The GHG emission intensity of the economy, defined as the ratio between EU GHG net domestic emissions (i.e. including LULUCF net removals and excluding international maritime and aviation transport) and GDP, fell to 207 $gCO_2$-eq/EUR in 2023, close to a third of its (Figure 3.2.a), the steady decline in the GHG emission intensity was accompanied by a convergence among Member States. The similar pattern is shown by the GHG emissions per capita, reaching in 2023 a record low of 6.4 tonnes of $CO_2$ equivalent, although with a more gradual convergence among Member States (Figure 3.2.b).

***Figure 3.2:*** *Average GHG emission intensity of GDP and GHG emissions per capita (1995-2023)*[21]

*Figure 3.2.a*

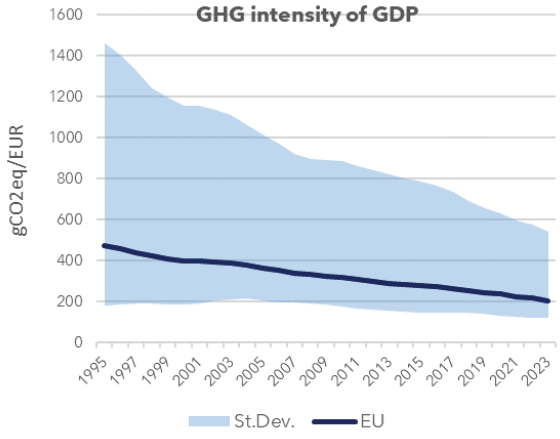
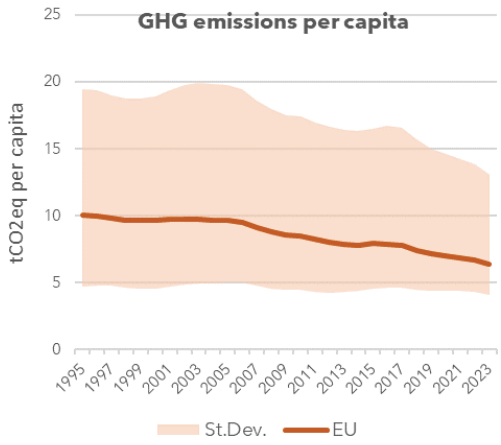



*Figure 3.2.b*




In terms of sectors, emission reductions in the last three decades were significant in the energy industry (-40%, or -18.6 MtCO2eq per year on average, *y-avg*), in the fuel combustion in the

[21] Source: EU GHG net emissions based on 2024 EU GHG inventory (EEA) and approximated EU GHG inventory for 2023 (EEA), Eurostat for the population [demo_pjan] and GDP at constant price (2015, [nama_10_gdp]). Shaded areas represent the standard deviation across the Member States. The GHG intensity in this report differs from the ones of the Air Emissions Accounts (AEA). The source of data used for the emissions is the GHG inventories, which are based on the 'territory principle' (i.e. emissions are assigned to the country where the emission takes place), whereas the emissions from the AEA follows the 'resident principle' (i.e. being the final result of the production activity of resident producer units), which is also used in national accounts (for the GDP). It has been preferred here to use GHG inventories to keep the same source of data for emissions throughout the report (in addition emissions from the AEA do not include the emissions from the LULUCF sector).

manufacturing industry and construction (e.g. iron and steel production, -54%, or -2.7 MtCO2eq/y-avg) and in the industrial processes and product use industries (e.g. chemical industry, -69% or -3.6 MtCO2eq/y-avg; metal industry, -50%, or -2.2 MtCO2eq/y-avg). Conversely, emissions in the transport sector have increased, especially in road transportation (+20%, or 4.2 MtCO2eq/y-avg) although they have been slightly decreasing in the last ten years (see Table 3.1). Emission reduction in the agriculture sector (excluding fuel combustion) has somewhat halted at the half-way, somewhat plateauing since 2010[22]. Finally, the traditional role of natural sink of CO2 of the LULUCF sector, declined at a worrying speed in the since 2010 (-33% or 10.4 MtCO2eq of loss net removals per year on average).

***Table 3.1:*** *Change in EU's GHG domestic emissions by sector over 1990-2022 and expected change by 2030* [23].

| EU-27 | 1990 | 2010 | | | 2022 | | | | | 2030 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | compared to 1990 | | | compared to 1990 | | compared to 2010 | | compared to 2022 | |
| | MtCO2eq | MtCO2eq | %Δ | annual μΔ MtCO2eq | MtCO2eq | %Δ | annual μΔ MtCO2eq | %Δ | annual μΔ MtCO2eq | %Δ | annual μΔ MtCO2eq |
| **1 - Energy** | **3741** | **3290** | **-12%** | **-22.5** | **2604** | **-30%** | **-36.7** | **-21%** | **-62.4** | **-40%** | **-115.9** |
| **1.A.1 - Energy Industries** of which: | **1442** | **1255** | **-13%** | **-9.3** | **867** | **-40%** | **-18.6** | **-31%** | **-35.3** | **-44%** | **-41.9** |
| 1.A.1.a - Public Electricity and Heat Production | 1233 | 1084 | -12% | -7.4 | 738 | -40% | -16.0 | -32% | -31.5 | | |
| **1.A.2 - Manufacturing Industries and Construction** of which: | **721** | **471** | **-35%** | **-12.5** | **393** | **-46%** | **-10.6** | **-17%** | **-7.1** | **-39%** | **-17.2** |
| 1.A.2.a - Iron and Steel | 152 | 93 | -39% | -2.9 | 70 | -54% | -2.7 | -26% | -2.2 | | |
| 1.A.2.c - Chemicals | 95 | 67 | -30% | -1.4 | 53 | -44% | -1.3 | -20% | -1.2 | | |
| 1.A.2.f - Non-metallic minerals | 129 | 100 | -22% | -1.4 | 82 | -37% | -1.5 | -19% | -1.7 | | |
| **1.A.3 - Transport** of which: | **672** | **815** | **21%** | **7.1** | **803** | **20%** | **4.2** | **-1%** | **-1.1** | **-27%** | **-24.4** |
| 1.A.3.b - Road Transportation | 620 | 768 | 24% | 7.4 | 764 | 23% | 4.6 | -1% | -0.4 | | |
| **1.A.4 - Other Sectors** | **714** | **652** | **-9%** | **-3.1** | **475** | **-33%** | **-7.7** | **-27%** | **-16.1** | **-47%** | **-24.9** |
| 1.A.4.a - Commercial/Institutional | 172 | 159 | -8% | -0.7 | 106 | -38% | -2.1 | -33% | -4.8 | | |
| 1.A.4.b - Residential | 450 | 412 | -9% | -1.9 | 294 | -35% | -5.0 | -28% | -10.6 | | |
| 1.A.4.c - Agriculture/Forestry/Fishing | 92 | 81 | -11% | -0.5 | 75 | -19% | -0.6 | -8% | -0.6 | | |
| **2 - Industrial Processes and Product Use** | **451** | **365** | **-19%** | **-4.3** | **292** | **-35%** | **-5.1** | **-20%** | **-6.6** | **-11%** | **-3.7** |
| **2.A - Mineral Industry** | **134** | **110** | **-18%** | **-1.2** | **99** | **-26%** | **-1.1** | **-10%** | **-1.0** | | |
| **2.B - Chemical Industry** | **162** | **77** | **-53%** | **-4.2** | **50** | **-69%** | **-3.6** | **-34%** | **-2.4** | | |
| **2.C - Metal Industry** | **134** | **78** | **-42%** | **-2.8** | **66** | **-50%** | **-2.2** | **-15%** | **-1.1** | | |
| **2.D,E,F,G,H - Other production** | **21** | **100** | **376%** | **3.9** | **76** | **262%** | **1.8** | **-24%** | **-2.2** | | |
| **3 - Agriculture** | **483** | **375** | **-22%** | **-5.4** | **366** | **-24%** | **-3.8** | **-2%** | **-0.8** | **-1%** | **-0.5** |
| of which: | | | | | | | | | | | |
| 3.1 - Livestock | 317 | 249 | -22% | -3.4 | 243 | -23% | -2.4 | -2% | -0.5 | | |
| **4 - Land Use, Land-Use Change and Forestry** | **-217** | **-351** | **62%** | **-6.7** | **-236** | **9%** | **-0.6** | **-33%** | **10.4** | **31%** | **-8.2** |
| **5 - Waste management** | **185** | **137** | **-26%** | **-2.4** | **110** | **-41%** | **-2.4** | **-20%** | **-2.5** | **-17%** | **-2.1** |
| **Total domestic GHG emissions (excluding LULUCF)** | **4867** | **4172** | **-14%** | **-35** | **3375** | **-31%** | **-48** | **-19%** | **-72** | **-33%** | **-124** |
| **Total domestic GHG net emissions (including LULUCF)** | **4867** | **4172** | **-14%** | **-35** | **3375** | **-31%** | **-48** | **-19%** | **-72** | **-42%** | **-158** |
| ***Total GHG net emissions (EU target scope)*** | **4736** | **3953** | **-17%** | **-39** | **3257** | **-31%** | **-48** | **-18%** | **-63** | **-37%** | **-132** |
| ***Total GHG net emissions (NDC scope)*** | **4700** | **3899** | **-17%** | **-40** | **3211** | **-32%** | **-48** | **-18%** | **-63** | **-37%** | **-132** |

Based on the analysis supporting the 'Delivering the European Green Deal', in the years up to 2030 the speed of reduction needs to significantly accelerate almost in all sectors compared with the progress achieved since 2010, particularly in transport (i.e. from an average annual reduction of 1 since 2010 to 24 MtCO2eq), fuel combustion in manufacturing (i.e. from 7 to 17 MtCO2eq), and residential emissions (from 16 to 25 MtCO2eq), while LULUCF need to reverse the last decade's trend in order to meet the EU -55% reduction target by 2030. In the case of agriculture, the GHG projected emission reductions, based on Member States reported existing

[22] https://www.eea.europa.eu/ims/greenhouse-gas-emissions-from-agriculture

[23] Based on the 2024 GHG inventory data submitted by Member States. Ending values for 2030 based on the model results under the MIX policy scenarios for delivering the European Green Deal https://energy.ec.europa.eu/data-and-analysis/energy-modelling/policy-scenarios-delivering-european-green-deal_en. The last two lines refer to the EU GHG emission aggregate which better reflects the exact legal scope as provided by the European Climate Law. For more details, see Chapter 2. The transport sector does not include emissions from international aviation and maritime activities.

and additional policies and measures (including under the new CAP 2023-2027) are in line with the Fit-for-55 package. Nevertheless, further efforts are needed, in particular to contribute to the increased ambition of the 2040 target.

## 3.2 DRIVERS OF GREENHOUSE GAS EMISSION REDUCTION SINCE 1990

A combination of factors has helped the EU to reduce total domestic greenhouse gas emissions (excluding the LULUCF sector) by about 31% over the past three decades. Figure 3.3 shows an annual breakdown of this trend into factors using a decomposition analysis with an extended Kaya identity [24]. The underlying methodology follows that of earlier studies, e.g. by the European Environment Agency [25]. As with all methods of this style, the effects should not be understood as an actual causality but rather a useful indication of the drivers' contribution.

Without technological advances in energy efficiency and carbon intensity, i.e. holding all other factors at 1990 level, the growth in GDP (income effect) and population (population effect) would have led to a substantial increase in GHG emissions. Economic growth would have caused increase by 40% and population growth increase by 6 %.

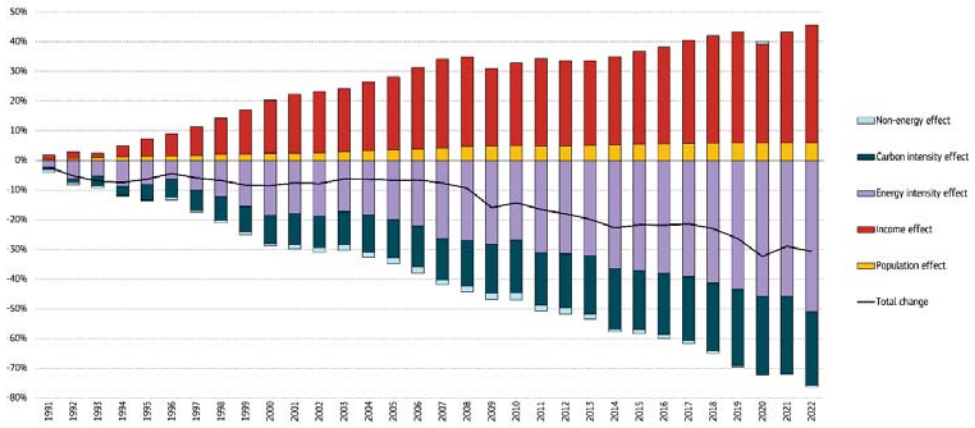
However, just the emission reduction from the decrease in primary energy use per unit of output generated (energy intensity effect) more than compensated this and reduced emissions by 51%. Compared with 1990, 45% less energy was needed to produce a unit of GDP in 2022. There are several drivers behind this efficiency gain. Better energy transformation processes, for example through electrification, have happened. For example, emission intensity of metal production dropped by 15% only from 2017 to 2021, intensity of non-metallic mineral production dropped by 13% in the same period. There is also a general shift to the less energy-hungry sectors – for example the share of whole industry in total gross value added decreased by 14% from 1995 to 2021, moreover the share of energy intensive industry in manufacturing gross value added decreased by 17% in the same period.

The second important driver was the carbon intensity effect, i.e. the volume of emissions from one unit of produced energy, which taken individually, reduced emissions by 25%. The fuel switch plays a crucial role here. The share of solid fossil fuels in energy production decreased from 39% in 1990 to 17% in 2022, whereas the share of renewable and nuclear energy increased from 24% in 1990 to 55% in 2022.

[24] The Kaya identity is a mathematical identity stating that the total GHG emission level can be expressed as the product of four factors: human population, GDP per capita, energy intensity (per unit of GDP), and carbon intensity (emissions per unit of energy consumed).

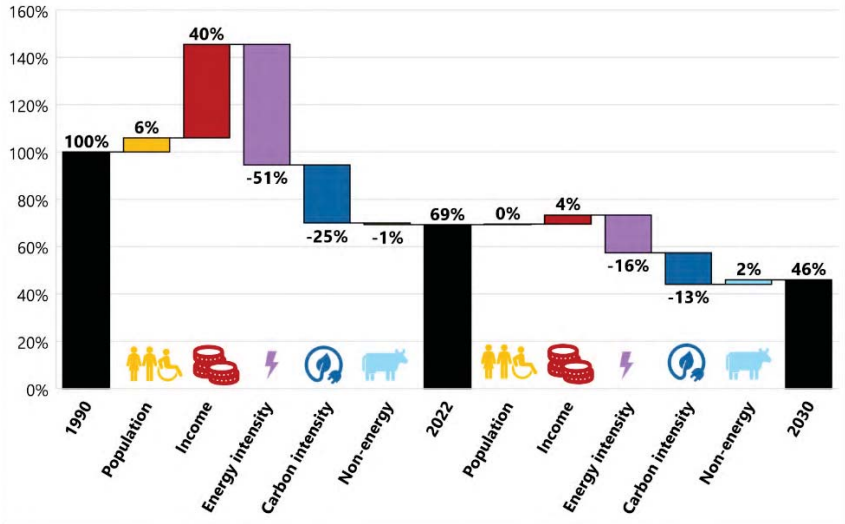
[25] The methodology of the Logarithm Mean Divisia Index (LMDI) method and the formula itself can be found in the EEA report No 03/2020 on trends and drivers of EU greenhouse gas emissions.

***Figure 3.3:*** *Drivers of total GHG emissions cumulated over 1990-2022*[26]




To set these achievements into perspective, Figure 3.4 combines this assessment of past emission trends with a glance into the future. Based on the European Commission's central scenario supporting the Fit for 55 legislative package, a faster pace is needed in this decade to achieve the EU 2030 target. As in the last three decades, the modelling suggests the largest emission reductions will come from a substantially lower energy intensity (energy intensity should be lower by 25% in 2030) leading to decrease of total emissions by 16% and a less carbon-intense primary energy consumption (energy supply emissions should be lower by 21%) leading to decrease of total emissions by 13%. Overall, energy-related emissions are expected to decrease faster than those from other sources as implied by the slightly positive non-energy effect.

***Figure 3.4****: Effects on total GHG emissions between 1990-2022 and 2022-2030 based on the modelling for the 2030 target (in % of 1990 emissions)*[27]




[26] Data sources: EU inventories to the UNFCC, AMECO, Eurostat energy balances.

[27] The remaining total emissions excluding LULUCF as shown in the chart is in line with EU's net emissions target of 57% mitigation.

## 3.3 PROGRESS TOWARDS CLIMATE NEUTRALITY

In 2023, the Climate Action Progress Report [28] provided, for the first time, an assessment of progress under the European Climate Law [29] including the collective progress made by Member States towards the EU's goal to achieve climate-neutrality by 2050 [30]. The assessment looked at progress on several aspects and from several sources, while taking into account the complexity inherent in the many possible paths to achieve a net-zero and resilient economy [31].

Overall, the report concluded that the level of progress by Member States in recent years fell significantly short of the effort required over the coming decades to meet both the medium and the long-term EU climate targets. In particular based on the available information, the level of progress towards the EU climate-neutrality objective appeared insufficient for Poland, Ireland, Latvia, Malta, and Croatia, and, to a lesser extent, for Austria, Estonia, Czechia, Cyprus, Italy and Romania.

In December 2023, based on that assessment, the Commission issued county-specific recommendations [32] to the above Member States, except for Romania, which in the meantime had updated their GHG projections in the context of the draft update NECP submission. The Commission urged Member States to rapidly accelerate action by making tangible progress on planned policies and by taking additional measures. Several Member States also faced sectoral weaknesses that needed to be remedied without further delay.

All the concerned Member States had notified the Commission on how they intend to address the recommendations. On 13 June, Latvia informed the Commission that in the context of the updated National Energy and Climate Plan (NECP) they will include increasing climate mitigation ambitions, supported by additional measures, and levered by new support funding mechanisms at EU level. In addition, Latvia will start updating its national long-term strategy, which will consider the Commission's recommendations to increase the ambition and quality of the strategy, including on the critical role of LULUCF removals. On 18 June, Austria replied to the Commission listing recent measures taken by the government to mitigate climate change, including $CO_2$ pricing introduced in October 2022 for all fossil fuel consumption outside EU ETS sectors, the environmental tax reform, several measures in the field of mobility, in renewables development, and to support a just transition. Austria also reiterated its objective to reach climate neutrality by 2040. On 4 September, Cyprus informed the Commission that a new long-term low-emission development strategy is being prepared in the context of the finalisation of its National Energy and Climate Plan (NECP) update, without additional details. On 5 September, Ireland confirmed its support to the EU climate-neutrality goal. In its reply, Ireland referred to the Climate Action Plan 2024 and listed several concrete measures in the area of agriculture and LULUCF. On 20 September, Estonia informed the Commission that new

[28] COM/2023/653 final

[29] Articles 6 to 8 of the European Climate Law (EUR-Lex - 32021R1119 - EN - EUR-Lex (europa.eu)).

[30] The EU climate-neutrality objective, set out in Article 2(1) of Regulation (EU) 2021/1119, is achieved when EU-wide GHG emissions and removals regulated in EU law are balanced within the EU at the latest by 2050, reducing emissions to net zero. The EU shall aim to achieve negative emissions thereafter.

[31] The assessment was based on the detailed analysis provided in Chapter 5 of the staff working document – 'Technical information' (SWD(2023) 339 final).

[32] Article 7(2) of the European Climate Law.

legislation, currently in preparation, will set in law GHG emission targets, providing clarity on how Estonia would reach climate neutrality by 2050. On 25 September, Malta signalled to the Commission that in May 2024 a new Climate Action Act was published providing for the set-up of an ad-hoc authority to focus on climate actions. On 26 September, Czechia informed the Commission that the final updated NECP has addressed all the recommendations, including the consistency of Czechia's measures with the EU's climate-neutrality objective. In addition, Czechia has started to update its national long-term strategy. Italy and Croatia informed the Commission that they have made – or will make, in the case of Croatia – reference to climate neutrality in their final updated National Energy and Climate Plan (NECP), which the Commission is currently evaluating. Finally, on 4 October, Poland replied that the final version of the updated NECP, which was, at the time of preparing this report, still under public consultation, will include additional measures accelerating emission reductions (i.e. -50.4% by 2030). The letter referred to initiatives in the transport sector (e.g. urban mobility, electromobility), LULUCF (e.g. increased forest cover and improved forest management), and agriculture sector (e.g. carbon farming and nutrient management). In a year's time, the Commission will reassess the situation based on the information included in the 2025 NECP progress report.

This section presents an update of the Climate-Neutrality Dashboard, a set of indicators used to examine past, present and future developments along multiple dimensions and across sectors. The aim is to ensure continuity in tracking progress towards the achievement of our common net-zero emissions objective, especially in this decisive decade for climate action.
In order to improve our understanding of the underlying developments, the dashboard now includes the share of renewable on gross final energy consumption, in line with the renewable 2030 target. In addition, a set of seven new complementary indicators, or levers, is introduced to put some light into the level of GHG emissions in Member States (see Table 3.2). Each indicator characterises one sector – energy, industry, transport, buildings, waste, and agriculture, by looking, beyond emissions, at the critical driving forces or factors. The last indicator is cross-sectoral and shows investment effort. Averages for 2018-2022 are used for all indicators, except waste prevention, which is based on averages for 2017-2021, because data for 2022 were not available at the time of publication.

***Table 3.2:*** *Climate-Neutrality Dashboard, complementary indicators.*

| *Indicator* | Description | Source |
|---|---|---|
| ***Zero emission energy*** | The indicator presents the share of renewables and nuclear power in gross electricity and heat production. A high share indicates lower emissions, whereas a low share means dependency on fossil fuels (mainly coal and natural gas). | EEA. Greenhouse gas emissions by source sector (env_air_gge)<br>EUROSTAT. Complete energy balances (nrg_bal_c) |
| ***Greening industry*** | Electrification and utilisation of renewable energy is the path towards climate neutrality in manufacturing and construction. Thus, the share of these two in final energy consumption is shown by this indicator. | EUROSTAT. Complete energy balances (nrg_bal_c). |
| ***Sustainable mobility*** | Average CO2 emissions of new cars sold indicate the share of electric and low-emission vehicles on the market and, thus, future emissions of the car fleet. | EUROSTAT. Average CO2 emissions per km from new passenger cars (sdg_12_30). |
| ***Energy-efficient buildings*** | The final energy consumption of buildings per floor area is a telling indicator for the building sector. The indicator covers households as well as commercial and public service buildings. Energy consumption is | EUROSTAT. Complete energy balances (nrg_bal_c).<br>BSO. EU Building Stock Observatory. Available here.<br>EUROSTAT. Cooling and heating degree days by country - annual data (nrg_chdd_a) |

| | | |
|---|---|---|
| | also adjusted by the number of heating and cooling days. | |
| ***Waste prevention*** | Waste prevention sits at the top of the waste hierarchy as the most preferred way to reduce the environmental impacts of waste. This indicator shows municipal waste generation per capita as a key figure in the sector. | EUROSTAT. Municipal waste by waste management operations (env_wasmun) |
| ***Sustainable consumption*** | A large fraction of emissions in agriculture is due to bovine meat production and consumption. Consumption of this meat per capita is thus a good indication of sustainable consumer behaviour and potentially the country's emissions. Keep in mind that international trade also plays an important role here. | FAO. Food Balances. Available here.<br>EUROSTAT. Usually resident population on 1 January (demo_urespop) |
| ***Climate investment*** | Climate-related investments as a share of gross domestic product (GDP) show efforts made across all sectors. The indicator includes private investment related to climate change mitigation (for example, renewable energy sources, electric vehicles or thermal insulation). It covers all steps in the value chain. | Investments in climate change mitigation by NACE Rev. 2 activity (env_ac_ccminv) - to be released soon |

The values for '**zero emission energy**' in the power sector, range from 11% in Malta, 13% in Cyprus, 14% in Poland to 70% in Denmark, 86% in France, and 91% in Sweden. The indicator also shows an expected pattern. The higher the share of zero-emission energy, the lower the GHG intensity of the GDP the country has. Sweden is a top scorer – it has the lowest GHG intensity of its total GDP and the highest share of zero-emission energy in its power sector. Nevertheless, the correlation is not absolute, and there are some outliers [33].

The **greening industry** indicator has a similar pattern but a slightly weaker correlation. Values range from 24% in the Netherlands, 30% in Croatia, 31% in Romania up to 66% in Malta, 68% in Finland and 79% in Sweden. Again, Ireland and the Netherlands have a low share of green industry and low GHG intensity of GDP. The opposite case is in Greece, Estonia, and Latvia, which have a high share of green industry but high GHG intensity of GDP. Sweden is premiant once again.

On the **sustainable mobility**, markets with the lowest emissions of new car fleets are the Netherlands (average emissions 107 gCO2/km), Sweden (112 gCO2/km) and Denmark (113 gCO2/km). On the opposite side are Latvia (147 gCO2/km), Cyprus (148 gCO2/km) and Estonia (150 gCO2/km). Sustainable mobility has the strongest correlation between the indicator score and GHG intensity of the whole economy, with almost no significant outliers.

The lowest energy consumption of **buildings** [34] is in Finland (2.3 gCO2/m2), Bulgaria and Estonia (both 2.9 gCO2/m2). The most consuming buildings are in Luxembourg (7.8 g CO2/m2), Ireland (9.0 gCO2/m2) and Malta (10.2 gCO2/m2). There is almost no direct correlation between the indicator and GHG intensity, but it still shows interesting potential for reducing emissions through improved efficiency, including electrification, and behavioural change.

[33] The most obvious cases are Malta, Ireland, and the Netherlands, which have a low share of zero-emission energy and low GHG intensity of GDP. These countries can be economically productive without zero-emission energy, meaning that energy does not play an essential role in GDP generation.

[34] The values are controlled for the weather – the number of heating and cooling days in the country.

**Waste prevention** shows the potential for low value of emissions in the waste sector. The highest waste production is in Austria (835 kg/capita), Denmark (812 kg/capita) and Luxembourg (795 kg/capita). On the other hand, the lowest production is in Romania (283 kg), Poland (346 kg) and Estonia (388 kg). The correlation of this indicator and GHG intensity is strong and negative. It means that countries with low GHG intensity tends to have a higher volume of municipal waste. Sweden is a good example of country with low production of municipal waste and at the same time low GHG intensity of economy.

**Bovine meat consumption** is a proxy indicator for the whole agri-food patterns of each country. The highest consumption is in Luxembourg (31 kg/capita), Sweden and Portugal (both 22 kg/capita). The lowest consumption is in Poland (0.1 kg/capita), Bulgaria (4 kg/capita) and Romania (5 kg/capita). There is a strong negative correlation between bovine meat consumption and GHG intensity. Member States with low GHG intensity, such as Sweden, Denmark or Luxembourg, also have high bovine meat consumption. In contrast, countries with high GHG intensity, like Bulgaria or Poland, have the lowest bovine meat consumption. Please note that major net importers (such as Malta, Greece, and Portugal) have lower agricultural emissions than consumption of bovine meat indicates. On the other hand, emissions from net exporters (such as Ireland, Denmark, Poland, or Lithuania) also cover consumption in different countries.

**Climate mitigation investment** shows a negative correlation with GHG intensity. It indicates that Member States with low GHG intensity have already made substantial investments to achieve climate targets in the past, and Member States with high GHG intensity still need these investments. The lowest investment activity is in Ireland and Cyprus (both 0.1% of GDP), Luxembourg (0.2%). Denmark and Latvia (both 1.6%), and Lithuania (1.3%), show the highest investments. Denmark could be considered as a green investor – its GHG intensity is one of the lowest in the EU, but the investment rate is still the highest. Lithuania and Latvia are, on the other hand, countries with high GHG intensity but also high investment rates. We could expect a substantial decrease in GHG intensity in the future there. There are also some poor-performing countries in both metrics, such as Greece and Cyprus, where additional investments are needed.

Overall, the climate-neutrality dashboard shows that, compared with 2023 edition, around two third of the indicators have improved, while only a fifth have worsened. The most sizeable progress is in the historic part, due to the strong reduction in GHG net emissions in 2023. Progress towards medium- and long-term objective is mixed, partly due to the fact that less than half of Member States updated their GHG projections in 2024. Among the seven complementary indicators, the ‘sustainable mobility’ and the ‘zero emissions energy’ levers show the broadest improvement, while progress for the ‘sustainable consumption’ indicator is mixed.

At Member States level, across the different indicators, the dashboard highlights the most significant improvements for Estonia and Latvia, which in 2023 have received specific recommendations under the European Climate Law due their insufficient progress towards the Union’s climate-neutrality objective, as well as for Finland and Bulgaria. Among the other Member States that received climate-neutrality recommendations in 2023, progress is noticeable also for Italy and Austria.

***Table 3.3:*** *Climate neutrality dashboard. Historical performance*[35]

| | Historic data[1] | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total net GHG emissions (% change) | | | | Sector performance (2023-2015, contribution to change) | | | | | | | GHG intensity and GDP per capita [3] | | | |
| | 2023-1990 | 2023-2022 | 2023-2019 | 2023-2015 | Power | Industry | Transport | Buildings[2] | Agriculture | Waste | LULUCF | GHG intensity of GDP (2023) | GHG intensity of GDP (2023-2015, % change) | GHG emissions per capita (2023) | GHG emissions per capita (2023-2015, % change) |
| Austria | -5% | -7% | -23% | -12% | -4% | -2% | -4% | -3% | 0% | -1% | 2% | 169 | -20% | 7.0 | -17% |
| Belgium | -31% | -4% | -15% | -16% | -5% | -5% | -2% | -4% | 0% | 0% | 0% | 210 | -26% | 8.4 | -20% |
| Bulgaria | -56% | -27% | -20% | -32% | -30% | 1% | 2% | -1% | 0% | -1% | -3% | 627 | -45% | 5.5 | -26% |
| Croatia | -30% | -14% | -13% | -13% | -4% | 0% | -1% | -1% | -3% | -9% | 4% | 304 | -33% | 4.7 | -5% |
| Cyprus | 57% | 0% | -1% | 6% | 1% | 2% | 1% | 0% | 1% | 1% | 0% | 330 | -26% | 9.2 | -3% |
| Czechia | -45% | -13% | -20% | -14% | -19% | 0% | 3% | -1% | -1% | 0% | 4% | 527 | -26% | 9.7 | -17% |
| Denmark | -50% | -6% | -16% | -21% | -12% | -3% | -2% | -3% | -1% | 0% | -1% | 119 | -35% | 6.6 | -25% |
| Estonia | -67% | -19% | -35% | -38% | -33% | -3% | 2% | -1% | 1% | 0% | -3% | 466 | -49% | 8.5 | -40% |
| Finland | -18% | -22% | -21% | -6% | -20% | -6% | -3% | -3% | -1% | -2% | 28% | 170 | -14% | 7.1 | -8% |
| France | -32% | -7% | -14% | -16% | -4% | -6% | -2% | -5% | -2% | 0% | 4% | 146 | -23% | 5.2 | -18% |
| Germany | -47% | -10% | -15% | -24% | -16% | -3% | -2% | -3% | -1% | 0% | 1% | 204 | -30% | 8.0 | -27% |
| Greece | -35% | -9% | -19% | -28% | -29% | -1% | 1% | 0% | 0% | 1% | -1% | 339 | -35% | 6.3 | -25% |
| Hungary | -48% | -9% | -19% | -15% | -9% | -3% | 3% | -4% | -1% | 0% | -1% | 339 | -32% | 5.0 | -13% |
| Ireland | 1% | -6% | -7% | -7% | -6% | -1% | 0% | -2% | -1% | 0% | 2% | 138 | -42% | 11.5 | -18% |
| Italy | -31% | -7% | -5% | -10% | -8% | -3% | 0% | -4% | 0% | 0% | 5% | 201 | -17% | 6.1 | -8% |
| Latvia | -8% | -16% | 37% | 13% | -7% | 0% | 0% | 0% | 0% | 0% | 20% | 439 | -3% | 6.7 | 19% |
| Lithuania | -71% | -3% | -14% | 1% | -7% | -10% | 9% | 1% | -4% | -3% | 15% | 259 | -20% | 4.3 | 3% |
| Luxembourg | -45% | -7% | -32% | -29% | -3% | -5% | -16% | -2% | 0% | 0% | -4% | 110 | -40% | 10.6 | -40% |
| Malta | -19% | -6% | 0% | -1% | -4% | 1% | 5% | -5% | 0% | 2% | 0% | 137 | -36% | 3.9 | -20% |
| Netherlands | -36% | -7% | -21% | -27% | -16% | -2% | -1% | -5% | -1% | -1% | -1% | 177 | -38% | 8.2 | -31% |
| Poland | -29% | -8% | -13% | -9% | -11% | -1% | 7% | -3% | 0% | 0% | -1% | 554 | -32% | 8.6 | -6% |
| Portugal | -29% | -8% | -21% | -27% | -20% | -5% | 3% | -1% | 0% | 0% | -4% | 219 | -38% | 4.4 | -28% |
| Romania | -74% | -7% | -14% | -14% | -18% | -6% | 7% | 0% | -1% | 0% | 3% | 276 | -35% | 3.1 | -10% |
| Slovakia | -55% | -2% | -17% | -18% | -6% | -6% | 2% | -1% | 0% | 0% | -7% | 309 | -30% | 5.4 | -18% |
| Slovenia | 0% | -6% | -12% | -17% | -7% | -1% | 0% | -2% | 0% | -1% | -4% | 295 | -34% | 6.8 | -19% |
| Spain | -10% | -8% | -13% | -20% | -16% | -6% | 2% | 0% | 0% | 0% | 0% | 187 | -30% | 4.7 | -23% |
| Sweden | -85% | -26% | -69% | 201% | -115% | -180% | -473% | -76% | -12% | -59% | 1114% | 6 | 162% | 0.3 | 178% |
| EU27 | -38% | -9% | -14% | -18% | -13% | -3% | 0% | -3% | -1% | 0% | 2% | 206 | -28% | 6.4 | -19% |

[35] Note to the table: (1) Historical GHG emissions and removals (1990-2022) are based on EEA's 2023 GHG Inventory and Approximated emissions and removals. Emissions from international aviation and maritime transport activities are not included. Contributions by sector are calculated as the ratio between the change in emissions of the sector between 2015 and 2023 and the level of total GHG emissions in 2015. The sum of contributions is therefore by construction equal to the growth rate of total GHG emissions between 2015 and 2023. (2) Including agriculture $CO_2$ emissions. (3) GHG intensity of GDP ($gCO_2$-eq/EUR2015) and GHG per capita ($tCO_2$-eq) use net GHG emissions (i.e. including LULUCF and excluding international aviation). Real GDP and population data from Eurostat. The GHG intensity in this report differs from the ones of the Air Emissions Accounts (AEA). The source of data used for the emissions is the GHG inventories, which are based on the 'territory principle', whereas the emissions from the AEA follows the 'resident principle', which is also used in national accounts (for the GDP). It has been preferred here to use GHG inventories to keep the same source of data for emissions throughout the report (in addition emissions from the AEA do not include the emissions from the LULUCF sector). The difference is around 10% at the EU level but is larger for some Member States (Denmark, Lithuania, Latvia).

***Table 3.4:*** *Climate-neutrality dashboard – levers and projections*[36]

| | GHG emission projections, levers, and future challenges(4) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2030 objectives and projections | | | | Climate-neutrality levers | | | | | | | Climate-neutrality objectives and projections(5) | | | | |
| | MS projected net GHGs by 2030 (tonnes of CO2 eq. per capita) | ESR target vs MS projections (to 2005 level, ppt) | LULUCF target vs MS projections (tCO2eq/km² of land) | Share of gross final consumption of energy from renewable sources | **Zero-Emission Energy** (share of RES and nuclear in gross electricity | **Greening industry** (share of RES and electricity in FEC in manufacturing and construction) | **Sustainable mobility** (average CO2 emissions of new cars sold) | **Energy efficient buildings** (FEC in buildings, gOE per m2*HDD and CDD) | **Waste prevention** (municipal waste generation per capita, kg) | **Climate investment** (climate change mitigation purposes, as share of GDP) | **Sustainable consumption** (bovine meet consumption per capita, kg) | MS projected net GHGs by 2050 (tonnes of CO2 eq. per capita) | Overshoot vs. linear trajectory net GHG emissions 2023-2050 | Overshoot vs. Benchmark Total GHG emissions 2023-2050 | Target year for climate neutrality (NECPR, nLTS or other sources) | Legal Status of long term target (based on https://zerotracker.net/) |
| Austria | 5.3 | -6 | 1 | 34% | 68% | 48% | 133 | 3.7 | 835 | 0.8% | 14 | 2.3 | 21% | 19% | 2040 | In law |
| Belgium | 6.8 | -4 | -4 | 14% | 62% | 38% | 129 | 4.9 | 742 | 0.8% | 12 | 3.1 | 53% | 21% | 2050 | In policy document |
| Bulgaria | 5.9 | -12 | -3 | 19% | 48% | 38% | 146 | 2.9 | 427 | 0.5% | 4 | 3.6 | 26% | 66% | 2050 | Declaration / pledge |
| Croatia | 5.2 | 0 | -92 | 29% | 58% | 29% | 135 | 5.0 | 432 | 0.7% | 15 | 3.4 | 63% | 71% | 2050 | In policy document |
| Cyprus | 6.7 | -23 | 41 | 19% | 13% | 36% | 148 | 3.4 | 649 | 0.1% | 12 | 3.7 | 31% | 56% | 2050 | In policy document |
| Czechia | 7.5 | -6 | -32 | 18% | 37% | 39% | 146 | 5.7 | 519 | 0.5% | 11 | 4.3 | 13% | 33% | 2030 | In policy document |
| Denmark | 4.2 | -6 | 140 | 42% | 70% | 42% | 113 | 3.6 | 812 | 1.6% | 22 | 2.8 | 14% | 3% | 2050 | Declaration / pledge |
| Estonia | 7.7 | -10 | -100 | 38% | 46% | 51% | 150 | 2.9 | 388 | 0.8% | 9 | 3.3 | 29% | 46% | 2050 | Declaration / pledge |
| Finland | 0.8 | -4 | 13 | 48% | 69% | 68% | 117 | 2.3 | 573 | 0.7% | 17 | -2.3 | -101% | -10% | 2035 | In law |
| France | 4.6 | -14 | -25 | 20% | 85% | 42% | 121 | 5.6 | 555 | 0.8% | 22 | 3.6 | 64% | 63% | 2050 | In law |
| Germany | 5.3 | -9 | -99 | 21% | 45% | 39% | 134 | 4.4 | 627 | 0.5% | 14 | 1.8 | -9% | -4% | 2045 | In law |
| Greece | 5.6 | 13 | 5 | 23% | 36% | 48% | 129 | 3.6 | 510 | 0.2% | 15 | 5.6 | 55% | 70% | 2050 | In law |
| Hungary | 5.4 | -6 | -27 | 15% | 50% | 40% | 144 | 6.3 | 394 | 1.1% | 6 | 4.4 | 87% | 66% | 2050 | In law |
| Ireland | 8.9 | -17 | -24 | 13% | 38% | 35% | 124 | 9.0 | 644 | 0.1% | 19 | 6.4 | 48% | 35% | 2050 | In law |
| Italy | 4.5 | -3 | -37 | 19% | 36% | 42% | 131 | 5.0 | 494 | 0.3% | 16 | 3.5 | 32% | 52% | 2050 | In policy document |
| Latvia | 6.6 | -2 | -67 | 43% | 58% | 67% | 147 | 4.8 | 439 | 1.3% | 6 | 5.6 | 33% | 8% | 2050 | In policy document |
| Lithuania | 2.5 | 0 | 53 | 30% | 57% | 42% | 147 | 4.6 | 471 | 1.6% | 6 | 2.8 | 21% | 30% | 2050 | In policy document |
| Luxembourg | 7.0 | 6 | 12 | 14% | 52% | 45% | 141 | 7.8 | 795 | 0.2% | 31 | 0.8 | -6% | -4% | 2050 | In law |
| Malta | 4.2 | -65 | -46 | 13% | 11% | 63% | 118 | 10.2 | 658 | 0.4% | 19 | 3.9 | 142% | 111% | 2050 | In policy document |
| Netherlands | 6.8 | -9 | 37 | 15% | 28% | 25% | 107 | 5.6 | 516 | 0.3% | 17 | 4.8 | 53% | 38% | 2050 | In law |
| Poland | 9.1 | -11 | -118 | 17% | 14% | 40% | 147 | 5.4 | 346 | 0.6% | 0 | 8.0 | 84% | 78% | 2030 | In policy document |
| Portugal | 2.8 | 13 | 139 | 35% | 51% | 54% | 118 | 4.3 | 506 | 0.4% | 22 | 0.3 | -18% | 22% | 2050 | In law |
| Romania | 3.3 | -17 | 62 | 24% | 49% | 31% | 136 | 6.2 | 283 | 0.7% | 5 | 3.5 | 103% | 77% | 2050 | In policy document |
| Slovakia | 5.2 | -11 | -42 | 18% | 66% | 40% | 146 | 5.3 | 438 | 0.5% | 7 | 3.8 | 82% | 62% | 2050 | In law |
| Slovenia | 5.2 | -1 | 117 | 25% | 62% | 47% | 140 | 5.2 | 492 | 0.5% | 12 | 0.0 | -1% | 12% | 2050 | In policy document |
| Spain | 3.2 | 7 | -15 | 22% | 62% | 43% | 135 | 3.2 | 467 | 0.3% | 13 | 2.8 | 31% | 47% | 2050 | In law |
| Sweden | -0.4 | -6 | -18 | 66% | 91% | 79% | 112 | 3.0 | 425 | 1.1% | 22 | -1.3 | -473% | 27% | 2045 | In law |
| EU27 (MS aggr. proj.) | 5.0 | -6 | -22 | 23% | 55% | 43% | 130 | 3.9 | 511 | 0.6% | 14 | 3.3 | 32% | 39% | 2050 | In law |

[36] Note to table: (4) GHG emission projections submitted in 2023 and updated in 2024 by Member States under Art. 18 of the Governance Regulation considering additional measures (WAM). EU Population in 2050 is based on the latest Eurostat population projections. Agriculture and forest land are based on the Eurostat land use statistics. (5) The overshoot vs. a linear trajectory compares, for each Member State, the cumulative projected net GHG emissions (including LULUCF) between 2022 and 2050 with a linear trajectory starting from the 2022 emission level to zero by 2050. The overshoot against an indicative benchmark compares the cumulative projected GHG emissions (excluding LULUCF) with an indicative pathway to climate neutrality based on the scenarios proposed by the European Scientific Advisory Board on Climate Change, and then distributed across Member States according to the country's share of EU emissions in the core policy scenario supporting the initiatives delivering the European Green Deal. Target dates to achieve climate neutrality as for the national long-term strategies, the NECP progress reports or, in grey, from other unofficial sources (Net Zero Tracker).

## 3.4 ADDITIONAL GREENHOUSE GASES INDICATORS

Since 2005, there has been a clear decline in GHG intensity of GDP, and similar but to a lesser extent, in net GHG emissions per capita for all EU Member States, except for Latvia [37] (Figure 3.5.a and Figure 3.5.b) [38].

Countries with higher emission intensity of GDP ratios in 2005 (e.g. Bulgaria, Poland, Czechia, Romania, Estonia, and Slovakia) experienced the most significant reductions, leading to a convergence towards the EU average. Figure 3.5.b show a similar patter for the emissions per capita rates, with a sizable group of countries with emissions above 10 tonnes of CO2 equivalent per capita in 2005, moving closer to the EU average of 6 $tCO_2$-eq in 2023. Nonetheless, in 2023, Poland and Czechia ranked among the top five for the two indicators, while Bulgaria showed the highest GHG intensity of GDP (above 620 grammes of $CO_2$ equivalent per Euro of GDP), and Ireland was the highest per capita emitter among the EU Member States (above 12 tonnes per capita).

***Figure 3.5:*** *Greenhouse gas emissions intensity (i.e. the ratio between GHG emissions and GDP, gCO2-eq./ EUR2015) and greenhouse gas emissions per capita in the EU and its Member States in 2005 and changes to 2023* [39]

***Figure 3.5.a*** *GHG intensity of GDP*

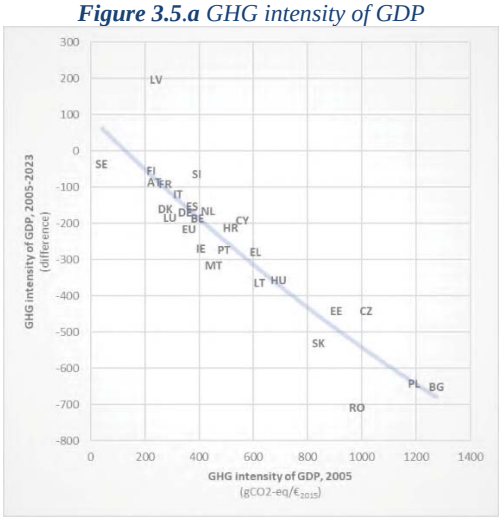
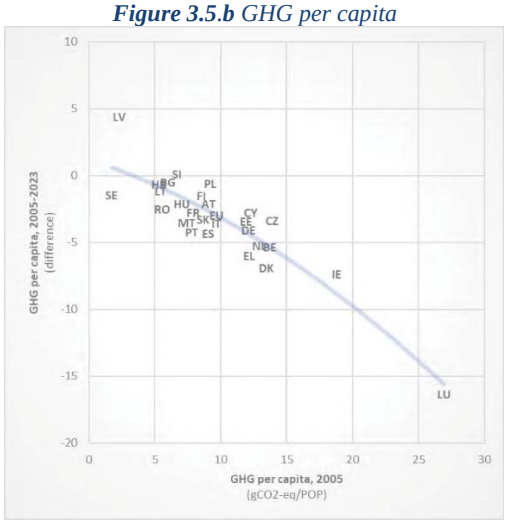



***Figure 3.5.b*** *GHG per capita*




In 2023, domestic transport surpassed the energy supply as the largest contributor to total EU GHG emissions (24% versus 23%). Adding emissions from international aviation and maritime, bring the emissions from transport activities close to a third of the total EU emissions [40].

[37] Due to a declining LULUCF sink.

[38] Figures use net GHG emissions, including LULUCF and excluding international transport emissions.

[39] Source: EU GHG net emissions based on 2024 EU GHG inventory (EEA) and approximated EU GHG inventory for 2023 (EEA), Eurostat for the population [demo_pjan] and GDP at constant price (2015,[nama_10_gdp].

[40] Emissions from international aviation and navigation as reported by Member States according to the UNFCCC GHG inventory (i.e. bunker approach). However, only around 50% of those emissions are currently estimated to be covered by the EU target (see Chapter 2).

Transport and Energy are closely followed by the industry sector (19%) when the energy use in manufacturing industries (11%) and emissions from industrial process and use (8%) are taken together (Figure 3.6.b).

***Figure 3.6:*** *EU-27 greenhouse gas emissions by sector (1990-2023) and in % of total emissions (2023)*[41]

***Figure 3.6.a***

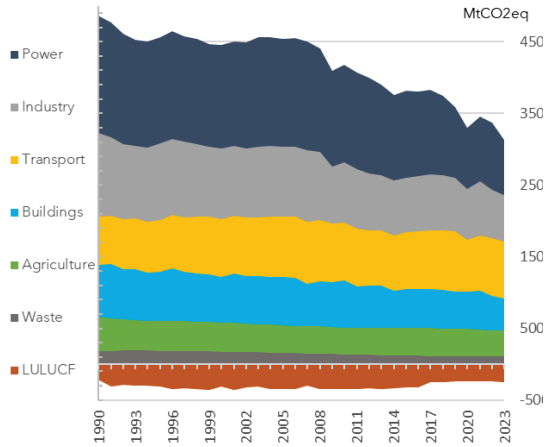



***Figure 3.6.b***

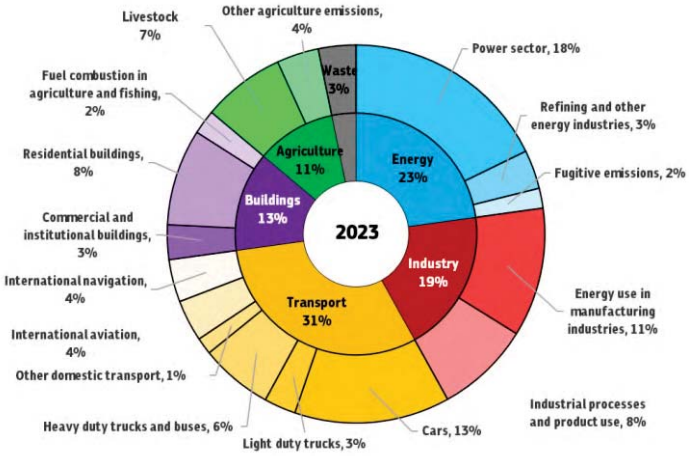



***Figure 3.7:*** *EU Member States greenhouse gas emissions by sector 2023 (in % of total emissions)* [42]

***Figure 3.7.a***

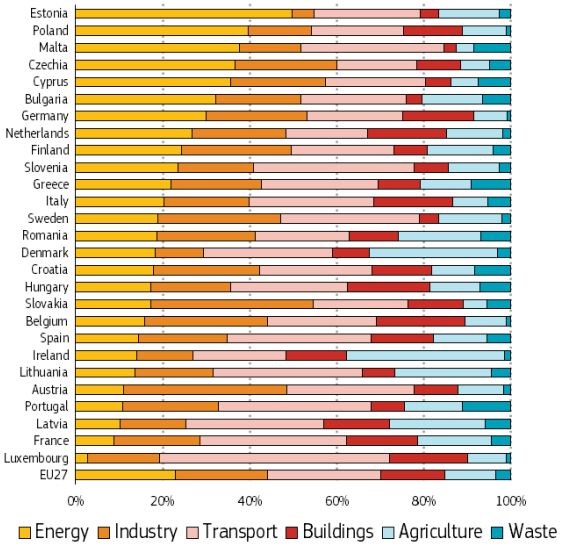
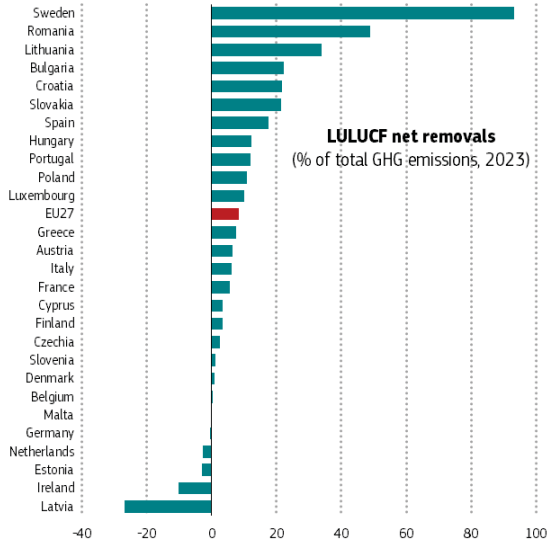



***Figure 3.7.b***




[41] The sectors used correspond to the following IPCC sectors: Energy: 1.A.1, 1.A.5, 1.B and 1.C; Energy use in manufacturing industries: 1.A.2: Industrial processes and product use: 2; Transport includes both domestic (1.A.3) and international (1.D.1, bunker approach); Buildings: 1.A.4, Agriculture: 3, Waste: 5. The sub-sectoral distribution within the Energy, Domestic Transport, Buildings and Agriculture sectors is based on the 2022 shares.

[42] Industry includes both the Energy use in manufacturing industries: 1.A.2 and Industrial processes and product use: 2; Buildings includes $CO_2$ emissions in agriculture.

Among all the EU Member States, in 2023, GHG emissions from the energy sector were highest in Estonia (50% as a percentage of total GHG emissions), followed with some distance by Poland (40%) and Malta (38%) (Figure 3.7.a). Emissions from industry were relatively high in Slovakia and Austria (37%). The transport sector's contribution to GHG emissions stood out in Luxembourg (53%). Ireland and Denmark had the highest shares of GHG emissions from agriculture among all Member States (36% and 29%, respectively), followed by Lithuania and Latvia (22%). For Sweden, and with some distance also for Romania, the LULUCF sink was significant in relation to the countries' respective GHG emissions.

***Table 3.5:*** *Total GHG emission per Member States (including/excluding LULUCF and international transport)* [43]

| | Total GHG emissions, excl. LULUCF, excl. international transport | | | | | Total net GHG emissions, incl. LULUCF, excl. international transport | | | | | Total net GHG emissions, incl. LULUCF, incl. international transport | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1990 | 2005 | 2015 | 2023 | 2023-1990 | 1990 | 2005 | 2015 | 2023 | 2023-1990 | 1990 | 2005 | 2015 | 2023 | 2023-1990 |
| **Belgium** | 146 | 145 | 119 | 99 | -32% | 143 | 144 | 118 | 99 | -31% | 159 | 173 | 142 | 129 | -19% |
| **Bulgaria** | 99 | 62 | 61 | 45 | -54% | 81 | 46 | 53 | 36 | -56% | 82 | 47 | 53 | 36 | -56% |
| **Czechia** | 201 | 150 | 130 | 108 | -46% | 192 | 142 | 122 | 105 | -45% | 193 | 143 | 123 | 106 | -45% |
| **Denmark** | 72 | 68 | 50 | 40 | -45% | 78 | 73 | 50 | 39 | -50% | 83 | 78 | 55 | 42 | -50% |
| **Germany** | 1251 | 988 | 899 | 674 | -46% | 1284 | 996 | 892 | 678 | -47% | 1303 | 1027 | 923 | 710 | -46% |
| **Estonia** | 40 | 19 | 18 | 11 | -72% | 35 | 16 | 19 | 12 | -67% | 36 | 17 | 20 | 13 | -65% |
| **Ireland** | 55 | 71 | 61 | 55 | 0% | 60 | 77 | 66 | 61 | 1% | 61 | 80 | 69 | 64 | 5% |
| **Greece** | 104 | 137 | 96 | 71 | -32% | 102 | 133 | 92 | 66 | -35% | 113 | 145 | 101 | 77 | -32% |
| **Spain** | 287 | 438 | 333 | 276 | -4% | 253 | 392 | 287 | 228 | -10% | 270 | 429 | 326 | 271 | 0% |
| **France** | 539 | 550 | 454 | 373 | -31% | 521 | 497 | 417 | 352 | -32% | 539 | 522 | 441 | 373 | -31% |
| **Croatia** | 32 | 31 | 26 | 23 | -29% | 26 | 23 | 21 | 18 | -30% | 26 | 23 | 21 | 19 | -29% |
| **Italy** | 522 | 596 | 443 | 384 | -27% | 519 | 562 | 401 | 360 | -31% | 527 | 577 | 415 | 376 | -29% |
| **Cyprus** | 6 | 9 | 8 | 9 | 58% | 5 | 9 | 8 | 9 | 57% | 6 | 11 | 10 | 10 | 62% |
| **Latvia** | 26 | 11 | 11 | 10 | -62% | 14 | 5 | 11 | 13 | -8% | 15 | 6 | 12 | 13 | -14% |
| **Lithuania** | 48 | 22 | 20 | 18 | -62% | 43 | 18 | 12 | 12 | -71% | 43 | 19 | 13 | 13 | -70% |
| **Luxembourg** | 13 | 13 | 10 | 8 | -39% | 13 | 12 | 10 | 7 | -45% | 13 | 14 | 11 | 9 | -33% |
| **Hungary** | 95 | 77 | 62 | 54 | -43% | 92 | 71 | 56 | 48 | -48% | 92 | 72 | 57 | 49 | -47% |
| **Malta** | 3 | 3 | 2 | 2 | -19% | 3 | 3 | 2 | 2 | -19% | 4 | 5 | 7 | 10 | 166% |
| **Netherlands** | 223 | 215 | 194 | 143 | -36% | 228 | 221 | 200 | 147 | -36% | 268 | 282 | 251 | 191 | -29% |
| **Austria** | 79 | 93 | 79 | 68 | -14% | 67 | 75 | 73 | 64 | -5% | 68 | 77 | 75 | 66 | -3% |
| **Poland** | 476 | 402 | 383 | 353 | -26% | 447 | 351 | 349 | 317 | -29% | 449 | 353 | 352 | 321 | -29% |
| **Portugal** | 59 | 86 | 68 | 53 | -10% | 66 | 90 | 64 | 47 | -29% | 69 | 93 | 69 | 53 | -23% |
| **Romania** | 257 | 151 | 117 | 105 | -59% | 230 | 120 | 68 | 59 | -74% | 231 | 120 | 69 | 59 | -74% |
| **Slovenia** | 19 | 21 | 17 | 15 | -22% | 14 | 13 | 17 | 14 | 0% | 14 | 13 | 18 | 15 | 0% |
| **Slovakia** | 73 | 51 | 41 | 37 | -50% | 65 | 46 | 36 | 29 | -55% | 65 | 47 | 36 | 29 | -55% |
| **Finland** | 71 | 70 | 55 | 41 | -43% | 48 | 45 | 42 | 39 | -18% | 51 | 48 | 45 | 42 | -18% |
| **Sweden** | 71 | 66 | 53 | 44 | -38% | 20 | 16 | 1 | 3 | -85% | 24 | 24 | 9 | 10 | -56% |
| **EU-27** | **4867** | **4544** | **3811** | **3119** | **-36%** | **4650** | **4196** | **3486** | **2862** | **-38%** | **4807** | **4446** | **3721** | **3105** | **-35%** |
| ***EU-27 Net GHG emissions (EU target scope)*** | | | | | | | | | | | ***4736*** | ***4327*** | ***3607*** | ***2980*** | ***-37%*** |
| ***EU-27 Net GHG emissions (EU NDC scope)*** | | | | | | | | | | | ***4700*** | ***4272*** | ***3562*** | ***2937*** | ***-38%*** |

[43] The last two lines refer to the EU GHG emission aggregate which better reflects the exact legal scope as provided by the European Climate Law. For more details, see Chapter 2.

# 4 TRACKING PROGRESS TOWARDS THE EU'S NDC SETTING ITS 2030 TARGET UNDER THE UNFCCC ENHANCED TRANSPARENCY FRAMEWORK

With the Expert Review Team (ERT) conclusions that the EU and its Member State shall be deemed to have met their commitments under Article 3, paragraph 1 bis, of the Kyoto Protocol second commitment period; it is now time to move on to the implementation of the Enhanced Transparency Framework under the Paris Agreement.

The Enhanced Transparency Framework (ETF), adopted under the Paris Agreement, aims at building mutual trust and confidence and at promoting the effective implementation of the Agreement. It builds on the transparency arrangements under the United Nations Convention on Climate Change (UNFCCC), and its purpose is to provide a clear understanding of climate change action and of support provided and received. Information reported under the Enhanced Transparency Framework is of particular importance for the Global Stocktake, which periodically takes stock of the implementation of the Paris Agreement. The modalities, procedures and guidelines (MPGs) for the Enhanced Transparency Framework, adopted in decision 18/CMA.1 in 2018, specify the information which is to be provided by Parties in their Biennial Transparency Reports (BTRs). They also provide the rules for the technical expert review of this information and for the Facilitative, Multilateral Consideration of Progress (FMCP). Further details on the reporting of this information, including the outline of the BTR and tables for electronic reporting, were adopted in decision 5/CMA.3 in 2021. Tables for electronic reporting include Common Reporting Tables (CRT) for greenhouse gas inventory information and Common Tabular Formats (CTF). The latter are used for the reporting of information necessary to track progress in implementing and achieving Nationally Determined Contributions (NDCs), and information on support to developing countries. The first biennial transparency report, including CRT and CTF tables, is to be submitted by 31 December 2024 at the latest.

On 17th October 2023, the Council approved the submission of an updated nationally determined contribution (NDC) of the EU and its member states to the United Nations Framework Convention on Climate Change (UNFCCC). The EU and its MS raised their ambition to a greenhouse gas emissions reduction target of at least 55% by 2030 compared with 1990 levels.

The National Inventory Report is a key component of the BTR, as it will be the EU's indicator for tracking progress towards the NDC. The MPGs specify that this report may be submitted as a stand-alone report or as a component of the BTR. They also specify that the National Inventory Report (NIR) consists of a National Inventory Document (NID) and of the CRT. The outline for the National Inventory Documents is defined in decision 5/CMA.3, and it is similar to the outline for National Inventory Reports which are submitted by Parties listed in Annex I to the Convention. The EU will continue submitting its National Inventory Document as a standalone report, thus reporting separate reports.

The BTRs play a crucial role in tracking the progress made towards the 2030 target. To this end, the chapter on 'information necessary to track progress made in implementing and achieving the NDC' contains, inter alia, sections on the description of the NDC, on mitigation policies and measures, and on projections. The chapter on tracking progress is supplemented by CTF tables

which contain details on policies and measures, on projections on GHG emissions and removals and on the Party's NDC. Moreover, this first BTR will also comprise information on national circumstances, institutional arrangements and NDC-specific data and indicators. There will be a strong focus as required under the Paris Agreement on the support provided to developing country parties for their implementation of the ETF. Under the MPGs parties are also invited to provide information on adaptation planning and actions.

The Governance Regulation article 29 paragraph 5(a) lays down the provisions to track progress and policy response to ensure Union targets achievement. This includes monitoring whether the Union and its Member States have made sufficient progress towards meeting their commitment taken under the Paris Agreement, towards their NDC.

# 5 REPORT ON THE QUALITY OF PETROL AND DIESEL FUEL USED FOR ROAD TRANSPORT IN THE EUROPEAN UNION (REPORTING YEAR 2022)

## 5.1 INTRODUCTION

Pursuant to Article 7a of Directive 98/70/EC [44] relating to the quality of petrol and diesel fuels (the 'Fuel Quality Directive') and Article 5 of Council Directive (EU) 2015/652 laying down calculation methods and reporting requirements pursuant to Directive 98/70/EC [45], Member States are required to report annually on the GHG intensity of fuels and energy supplied in their territories. This reporting obligation applied for the first time tofor the 2017 reporting year, following the application and transposition of Council Directive (EU) 2015/652. The recent amendment of the Renewable Energy Directive [46], deleted Article 7a of the Fuel Quality Directive as from 20 November 2023. However, pursuant to Article 4 of the amending directive, which setout transitional provisions, Member States are still required to collect and report the data in accordance with Article 7a of the Fuel Quality Directive for the years 2022 and 2023. This annual report contains the data reported for the year 2022.

Furthermore and, pursuant to Article 8(3) of the Fuel Quality Directive, Member States are required to report on national fuel quality data for the preceding calendar year.

This annual report summarises the information provided by Member States in relation to the above-mentioned reporting requirements. It is based on the data submitted by Member States to the European Environment Agency (EEA) for the year 2022.

## 5.2 VOLUMES AND LIFE CYCLE GREENHOUSE GAS INTENSITY OF FUEL AND ENERGY TYPES

Article 7a of the Fuel Quality Directive set out, in conjunction with Council Directive (EU) 2015/652, set out reporting requirements concerning the following:

- the total volume of each type of fuel or energy supplied for road transport and non-road mobile machinery (including inland waterway vessels when not at sea), agricultural and forestry tractors, and recreational craft when not at sea;

[44] Directive 98/70/EC of the European Parliament and of the Council relating to the quality of petrol and diesel fuels and amending Council Directive 93/12/EEC, OJ L 350 of 28.12.1998, p. 58.

[45] Council Directive (EU) 2015/652 of 20 April 2015 laying down calculation methods and reporting requirements pursuant to Directive 98/70/EC of the European Parliament and of the Council relating to the quality of petrol and diesel fuels, OJ L 107 of 25.4.2015, p. 26.

[46] Directive (EU) 2023/2413 of the European Parliament and of the Council of 18 October 2023 amending Directive (EU) 2018/2001, Regulation (EU) 2018/1999 and Directive 98/70/EC as regards the promotion of energy from renewable sources, and repealing Council Directive (EU) 2015/652.

- the life-cycle GHG emissions per unit of energy, including the provisional mean values of the estimated indirect land use change (ILUC) emissions from biofuels;[47]
- the feedstock and the biofuel production pathway used for each of the biofuels supplied on the territories of Member States.

Until the relevant articles are removed, the Fuel Quality Directive obliges Member States to require fuel suppliers to reduce the life-cycle GHG intensity of transport fuels, i.e., the life-cycle GHG emissions per unit of energy from fuel and energy supplied, by a minimum of 6% compared with the fuel baseline standard for 2010 of 94.1 gCO2eq/MJ. ILUC GHG emissions are not taken into account when assessing compliance with the minimum 6% reduction target. The Renewable Energy Directive (EU) 2018/2001[48] sets out several measures to address ILUC including a cap on food- and feed-based biofuels. Its delegated act[49] sets out detailed criteria for determining high ILUC-risk feedstock for biofuels that are to be gradually phased out by 2030 and the criteria for certifying low ILUC-risk biofuels, bioliquids and biomass fuels.

In 2022, all 27 Member States, UK (in respect of Northern Ireland[50]), Iceland and Norway provided data on GHG emission reductions in the appropriate format. The comparisons between aggregated figures refer to the EU-27 for all reference years.

### 5.2.1 Greenhouse gas emissions and distance to 2020 target

According to the data provided, the average GHG intensity of the fuels and energy supplied in the 27 reporting Member States in 2022 was 89 $gCO_2eq/MJ$, which translates into a saving of 59 $MtCO_2eq$ during the year 2022. This is 5.6% lower than the 2010 baseline of 94.1 gCO2eq/MJ (corresponding to a similar level of reduction achieved by the 27 EU Member States in 2021) and, means that an additional 0.4% reduction in the GHG intensity of all fossil fuels, biofuels and energy supplied is needed in order to reach the 6% target.

Reported data for 2022 shows that the progress achieved by EU fuel suppliers varies greatly across the EU Member States. 9 Member States (Sweden, Finland, Estonia, Belgium, Luxembourg, Netherlands, Slovakia, Germany and Malta) have achieved their objective of reducing the GHG intensity of transport fuels by 6% compared with 2010 (see Figure 5.1). The largest progress within a year was achieved by Sweden and Italy with 4.4 and 1.1 percentage points increases between 2021 and 2022, against the 2010 baseline, followed by Austria with 1.0 percentage point. However, most of the Member States made negative progress (14 Member

[47] Directive (EU) 2015/1513 of the European Parliament and of the Council of 9 September 2015 amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources, OJ L239 of 15.9.2015, p. 8.

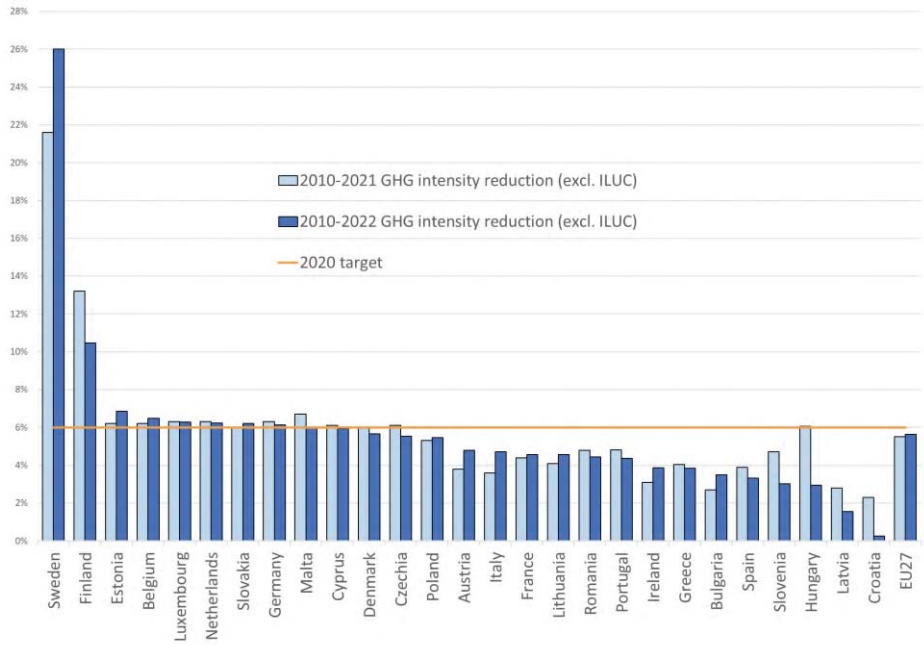
[48] Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources, OJ L 328, 21.12.2018, p. 82–209

[49] Commission Delegated Regulation (EU) 2019/807 of 13 March 2019 supplementing Directive (EU) 2018/2001 of the European Parliament and of the Council as regards the determination of high indirect land-use change-risk feedstock for which a significant expansion of the production area into land with high carbon stock is observed and the certification of low indirect land-use change-risk biofuels, bioliquids and biomass fuels, OJ L 133, 21.5.2019, p. 1–7

[50] Following the end of the transition period, Council Directive (EU) 2015/652 setting out relevant reporting obligations no longer applies to the UK as whole. However, pursuant to Article 5(4) read in conjunction with Annex 2, point 47 of the Protocol on Ireland/Northern Ireland to the Withdrawal Agreement, Council Directive (EU) 2015/652 continues to apply to and in the UK in respect of Northern Ireland (https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:12020W/TXT).

States) or very minimal progress, i.e. below 1.0 percentage point (8 Member States), or remained at the same level (1 Member State). Further information can be found in the EEA report on GHG intensities of transport fuels in the EU in 2022 [51].

***Figure 5.1:*** *Reductions in GHG intensity of fuels achieved by EU fuel suppliers in Member States in 2010-2021 and 2010-2022 (Source: EEA)*




Furthermore, in 2022, upstream emission reductions (UERs) [52] were reported by 15 Member States (Croatia, Malta, Slovenia, Luxembourg, Cyprus, Estonia, Slovakia, Czechia, Romania, Denmark, Hungary, Italy, Austria, Poland, Germany), which contributed between 0.4 and 3.7 percentage points to the overall GHG emission reduction achievement. Consequently, the total reported UERs were 5 927 kt CO2eq in 2022, resulting in an additional reduction in the fuel GHG intensity by 0.5 percentage points from 5.1% to 5.6%. UERs claimed by suppliers have to be quantified and reported in accordance with the requirements set out in Council Directive (EU) 2015/652.

When ILUC emissions are taken into account [53], the average GHG intensity of the fuels in the EU in 2022 was 4.0% lower than in 2010. According to Article 7d of the Fuel Quality Directive, which lays down the method of calculation of life cycle GHG emissions from biofuels, ILUC

[51] Technical Report No 2024/04. https://www.eionet.europa.eu/etcs/etc-cm/products/etc-cm-report-2024-04/view 2

[52] 'Upstream emissions' means all greenhouse gas emissions occurring prior to the raw material entering a refinery or a processing plant where the fuel is produced.

[53] For this calculation, the provisional estimated indirect land-use change emissions from biofuels were taken into account as listed in Annex V of the Fuel Quality Directive.

emissions are not to be taken into account when assessing compliance with the minimum 6% reduction target.

Further action will be necessary in order to decarbonise the fuel used in transport and to contribute to the increased climate ambition, as set out in the European Green Deal and the legislative proposals adopted as part of the "Fit-For-55" legislative package of 14 July 2021. The amended Renewable Energy Directive substantially increases the overall ambition of decarbonising transport fuels and energy carriers. Member States will have to reduce their GHG intensity by at least 14.5% compared with the 2010 baseline or will need at least a 29% share of renewable energy within the final consumption of energy in the transport sector by 2030. In addititon, the ReFuelEU Aviation and FuelEU Maritime Regulations will boost the production and uptake of sustainable alternative fuels in the aviation and maritime sectors.

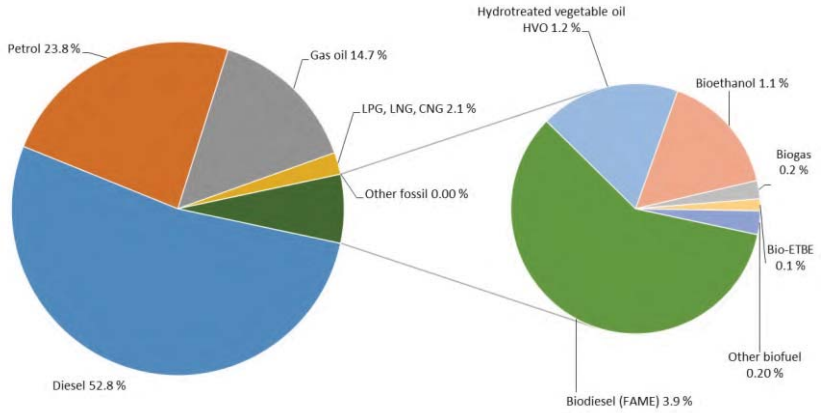
### 5.2.2 Fuel supply

This section summarises the data submitted by Member States on all fossil fuels, biofuels and fuels of non-biological origin within the scope of the Fuel Quality Directive for road transport and non-road mobile machinery.

Total fuel supply reported by the 27 Member States in 2022 was 11 164 petajoules (PJ), representing a slight decrease of 4% compared with 2021. The fuel supply remained dominated by fossil fuels (93.4%) followed by biofuels (6.6%) and a very minor share (0.04%) of electricity (see *Section 5.2.4*). No renewable fuels of non-biological origin were reported in 2022.

Fossil fuel supply remained dominated in 2022 by diesel (52.8%; 5 892 PJ), followed by petrol (23.8%; 2 658 PJ) and gas oil [54] (14.7%; 1 637 PJ). Liquefied petroleum gas and natural gas had a combined share of 2.1% (236 PJ) (see Figure 5.2).

***Figure 5.2:*** *Fuel energy supply shares per fuel type in 2022 (Source: EEA)*

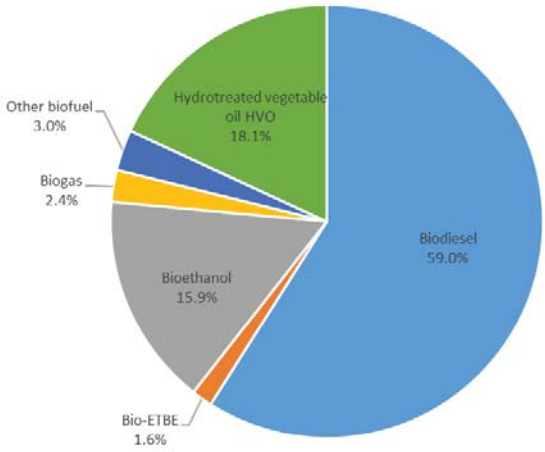



[54] "Gas oil" denotes fuel used for non-road mobile machinery as per definition in Article 2(3) of the Fuel Quality Directive.

### 5.2.3 Biofuel consumption

Total biofuel consumption decreased slightly from 781 PJ to 742 PJ between 2021 and 2022 in the 27 Member States. It remains dominated by biodiesel (fatty acid methyl ester, FAME), which accounts for 59.08% of total biofuel consumption (438 PJ), followed by hydrotreated vegetable oil (HVO) (18.1%; 134 PJ), and bioethanol (15.9% ; 118 PJ). Bio-ethyl tert-butyl ether (bio-ETBE) accounted for 1.6% (12 PJ) and biogas for 2.4% (17 PJ) of the total biofuel consumption. The other biofuels collectively accounted for 3.0% (23 PJ) (see Figure 5.3). This means that almost 80% of all biofuels are blended into diesel fuel. Detailed information for all biofuels and pathways can be found in the EEA Technical Report No 2024/04.

***Figure 5.3:*** *Biofuel energy supply shares per fuel type in 2022 (Source: EEA)*




### 5.2.4 Electricity consumption

The reporting of electricity consumption by fuel suppliers is voluntary. 19 Member States (compared to 11 in 2021) reported data on electricity consumed by electric vehicles, including motorcycles (see Table 5.1). The total reported quantity of electricity consumed by electric vehicles increased by approximatelly 10% from 9 859 593 GJ in 2021 to 10 829 451 GJ (excluding powertrain efficiency adjustment). The actual electricity consumption of electric vehicles in the different Member States may be greater because reporting of electricity was compulsory under Article 7a and some Member States did not report it, even thogh it would help them achieve the 6% target.

***Table 5.1:*** *Electricity consumed by electric vehicles and motorcycles in 2022 as a reported contribution by fuel suppliers to their GHG reduction target (Source: EEA)*

| Member State | Quantity of energy | | GHG intensity | |
|---|---|---|---|---|
| | excluding powertrain efficiency (GJ) | including powertrain efficiency (GJ) [55] | reported by Member State (g $CO_2e$/MJ) | reported by Member State (g $CO_2e$/kWh) |
| Austria | 334 033 | 133 613 | 18 | 64 |
| Belgium | 21 443 | 8 577 | 74 | 266 |
| Czechia | 20 114 | 8 046 | 177 | 637 |
| Croatia | 125 | 50 | 0 | 0 |
| Denmark | 31 286 | 12 514 | 58 | 207 |
| Estonia | 72 361 | 28 944 | 114 | 412 |
| France | 5 083 200 | 2 033 280 | 14 | 52 |
| Germany | 4 285 | 1 714 | 119 | 428 |
| Greece | 3 373 | 1 349 | 117 | 420 |
| Hungary | 39 585 | 15 834 | 62 | 225 |
| Ireland | 458 711 | 183 484 | 96 | 346 |
| Italy | 480 102 | 192 041 | 110 | 397 |
| Netherlands | 3 900 000 | 1 560 000 | 94 | 337 |
| Poland | 6 495 | 2 598 | 200 | 721 |
| Portugal | 145 139 | 58 055 | 56 | 203 |
| Slovakia | 206 048 | 82 419 | 46 | 167 |
| Slovenia | 8 221 | 3 289 | 84 | 304 |
| Spain | 5 624 | 2 250 | 83 | 299 |
| Sweden | 9 306 | 3 722 | 7 | 26 |
| **Total** | **10 829 451** | **4 331 779** | | |

## 5.3 OVERVIEW OF THE EU'S 2022 FUEL QUALITY DATA

In accordance withe Article 8 of the Fuel Quality Directive, all 27 Member States, Iceland; Norway and the United Kingdom (in respect of Northern Ireland) submitted reports on national fuel quality data for 2022.

This section provides the data for petrol and diesel sales, and the biocomponents included therein, for road transport reported by the 27 EU Member States. It excludes other fossil fuels, other biofuels and fuels of non-biological origin, and fuels used for non-road mobile machinery.

[55] In accordance with Annex I, Part 1 of the Council Directive (EU) 2015/652, the GHG reduction target is calculated on the basis of electricity quantities using the adjustment factor for the EV technology, which corresponds to the inclusion of the powertrain efficiency.

More detailed information on fuel quality can be found in EEA Technical Report No 2024/02 on "Fuel quality monitoring in the EU in 2022"[56].

### 5.3.1 Petrol and diesel

The share of diesel remained stable between 2017 and 2022, representing 71.5% of total sales in 2022. The total amount of diesel sold in 2022 decreased by 0.9 percentage points when compared with 2021. In parallel, petrol sales in 2022 increased by 1.1 percentage points when compared with 2021 (see Table 5.2).

***Table 5.2:*** *Diesel and petrol fuel sales for the EU-27 (in ml litres and their respective shares) in 2017/2022*

| | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| **Diesel fuel sales** | 235 388 (73.3%) | 241 653 (73.3%) | 246 865 (73.0%) | 217 395 (73.2%) | 231 224 (72.6%) | 233 348 (71.5%) |
| **Petrol fuel sales** | 85 911 (26.7%) | 87 994 (26.7%) | 90 917 (27.0%) | 79 659 (26.8%) | 87 385 (27.4%) | 92 921 (28.5%) |
| **Total (diesel and petrol)** | **321 299** | **329 629** | **337 782** | **297 054** | **318 609** | **326 269** |

Diesel fuel consumption is dominant in all EU Member States, except in the Netherlands and Cyprus where the proportion of petrol use is 51%. Member States with relatively high petrol consumption are Greece and Finland (45% and 37% respectively). By contrast, the corresponding petrol shares in Bulgaria, Lithuania and Latvia, range from 19%, 16% to 14% respectively.

There were no significant changes in the distribution of petrol sales in terms of petrol grade research octane numbers (RON) between 2021 and 2022. Most petrol sales in 2022 involved fuels with a petrol grade of RON 95 while the share of RON ≥ 98 sales slightly decreased. Small changes were made in the reporting template where category 95 < RON < 98 was removed to harmonise reporting and remove some potential inconsistencies (see Table 5.3).

***Table 5.3:*** *Share of petrol sales in the EU-27 according to RON numbers*

| | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| **RON 95** | 84.3% | 80.0% | 77.8% | 79.3% | 80.5% | 95.1% |
| **95 < RON < 98** | 8.5% | 14.9% | 16.7% | 14.3% | 13.1% | - |
| **RON ≥ 98** | 6.9% | 4.9% | 5.4% | 6.4% | 6.4% | 4.9% |

[56] https://www.eionet.europa.eu/etcs/etc-cm/products/etc-cm-report-2024-02

| | | | | | | |
|---|---|---|---|---|---|---|
| **RON = 91** | 0.2% | 0.2% | 0.1% | 0.01% | 0.03% | 0.01% |

### 5.3.2 Biocomponents content

In 2022, all petrol and diesel sold in the EU was marketed as containing biocomponents. 61.5% of all petrol sold, contained up to 5% ethanol content by volume (E5), while 37.6% contained up to 10% ethanol content (E10); 0.9% of petrol contained more than 10% ethanol (E+[57]).

All diesel fuel sold in 2022 contained biocomponents. 99.8% of diesel fuel contained up to 7% FAME (B7) and 0.2% contained more than 7% (B+)[58] (see Table 5.4).

***Table 5.4:*** *Use of biocomponents in petrol and diesel fuels sold in the EU-27 in 2017-2022*

| Fuel type | | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|
| Petrol | E0 | 14.5% | 4.9% | 0.7% | 0.0% | 0.0% | 0.0% |
| | E5 | 66.7% | 81.5% | 73.3% | 65.7% | 65.4% | 61.5% |
| | E10 | 18.6% | 13.4% | 25.7% | 33.3% | 34.2% | 37.6% |
| | E+ | 0.1% | 0.2% | 0.4% | 1.0% | 0.4% | 0.9% |
| Diesel | B0 | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| | B7 | 81.8% | 99.2% | 99.1% | 86.2% | 99.8% | 99.8% |
| | B+ | 16.2% | 0.8% | 0.8% | 13.8% | 0.2% | 0.2% |

### 5.3.3 Compliance of sold fuels with quality limits

A high compliance with the fuel quality limits is observed in the EU as a whole. A very large majority of key fuel parameters in the samples taken in 2022 were reported as being within the tolerance limits.

6 Member States (Ireland, Croatia, Cyprus, Lithuania, the Netherlands and Sweden) verified and reported full compliance for both petrol and diesel fuels. 9 Member States verified and reported full compliance for petrol (Ireland, Croatia, Cyprus, Lithuania, Malta, the Netherlands, Romania, Slovenia and Sweden), and 15 for diesel (Czechia, Denmark, Ireland, Greece, Croatia, Cyprus, Lithuania, Luxembourg, Hungary, the Netherlands, Austria, Poland, Portugal, Finland and Sweden).

Member States reported a total of 124 cases of non-compliance for petrol and 125 cases for diesel in 2022. For petrol, the most common parameters falling outside the specifications were

[57] E+ is petrol fuel with > 10% (% v/v) ethanol content.

[58] B+ is diesel fuel with > 7 % (% v/v) biodiesel content.

exceedances of the summer vapour pressure (in 16 Member States), RON in 4 Member States; and motor octane number (MON), aromatics content and sulphur content (in 3 Member States for all 3 parameters). For diesel, the most common parameters falling outside the specifications were the sulphur content and density of 15 $^{o}$C (in 6 Member States for both parameters) and the FAME content (in 5 Member States).

All Member States described the actions taken when non-compliant samples were identified. These actions included informing the competent authorities, initiating investigations, imposing penalties and fines, and resampling. In a small number of cases, no action was taken when the non-compliant parameters were found to be very close to the tolerance limits.

There was therefore no need for the Commission to launch any investigation in this area. It can be concluded that the fuel quality monitoring system in place ensures that high-quality fuels are sold in the EU in accordance with the requirements of the Fuel Quality Directive.

# 6 EU ETS EMISSIONS

***Table 6.1:*** *Verified emissions data from the EU Emissions Trading System (EU ETS) – from power and industry installations (broken down by electricity and heat generation and industrial production) and from aircraft operators.*

| Year | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|
| **Verified emissions from power and industry installations** | 1 530 | 1 356 (1 253 UK excl.) | 1 337 | 1 313 | 1 096 |
| **Change year-on-year** | -9.1% | -11.4% | -1.4% (6.6% UK excl.) | -1.8% | -16.5% |
| **Verified emissions from electricity and heat generation** | 822 | 696 (653 UK excl.) | 708 | 725 | 552 |
| **Change year-on-year** | -14.7% | -15.3% | 1.6% (8.5% UK excl.) | 2.4% | -23.9% |
| **Verified emissions from industrial production** | 708 | 660 (601 UK excl.) | 629 | 589 | 544 |
| **Change year-on-year** | -1.6% | -6.9% | -4.7% (4.7% UK excl.) | -6.4% | -7.5% |
| **Verified emissions from aircraft operators** | 68.2 | 25.2 | 27.9 | 49.5 | 54.1 |
| **Change year-on-year** [59] | +1% | −63% | +30% | +77% | +9.5% |

[59] Considering the updated scope of aviation in the EU ETS (without incoming flights from the UK).

# 7 USE OF REVENUES FROM AUCTIONING OF ETS ALLOWANCES

The table below includes information from Member States' annual reports on the use of the EU Emission Trading System (ETS) auction revenue as required by the Regulation on the Governance of the Energy Union and Climate Action [60]. As of 5 June 2023, Member States must spend all ETS revenue (or an equivalent financial value) on energy- and climate-related purposes listed in Article 10(3) of the ETS Directive [61], except for any revenue spent in aid for indirect carbon costs under Article 10a(6) of the Directive.

In cases where Member States reported spending their auction revenue in aid for indirect carbon costs [62], this value was deducted from the total revenue [63] to obtain the value of the revenue to be spent on the purposes of Article 10(3). For the revenue that Member States collected until 4 June 2023, they were encouraged to use at least 50% of revenues from general allowances and 100% from aviation allowances for the Article 10(3) purposes.

For the data on the Member States' use of their ETS auction revenue in the 2013-2022 period, see the Climate Action Progress Report 2023 [64].

[60] COM(2024)550 final

[61] Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a system for greenhouse gas emission allowance trading within the Union and amending Council Directive 96/61/EC (OJ L 275 25.10.2003, p. 32)

[62] See Carbon Market Report 2024, Chapter 8.1. At the time the current report is being finalised, the Carbon Market Report 2024 (the report on the functioning of the EU ETS in 2023) is expected to be adopted in early November. Once adopted, the Carbon Market Report 2024 will be available on the website of the Directorate General Climate Action 'What is the EU ETS'.

[63] See Table 2 in the Annex to the Carbon Market Report 2024. At the time the current report is being finalised, the Carbon Market Report 2024 (the report on the functioning of the EU ETS in 2023) is expected to be adopted in early November. Once adopted, the Carbon Market Report 2024 will be available on the website of the Directorate General Climate Action 'What is the EU ETS'.

[64] EU Climate Action Progress Report 2023, COM(2023) 653 final, 24.10.2023.

***Table 7.1:*** *Member States' generated revenue from the auctioning of ETS allowances in 2023 to be spent on climate and energy-related purposes (EUR million) and the share reported as disbursed (%)* [65].

| **Austria** | | **Total percentage disbursed up to the year indicated** |
|---|---|---|
| Year of generation of revenue | Revenue to be spent on the purposes of Art. 10(3) (EUR million) | 2023 |
| 2023 | 435.4 | 100% |
| Revenue is not earmarked. Reported equivalent financial value spending on climate and energy purposes is higher than the auction revenue. The purpose reported in 2023 with the biggest allocation from the ETS revenue is the improvement/extension of railway infrastructure, which includes spending on the Brenner base tunnel (EUR 1 183.1 million). | | |
| **Belgium** | | **Total percentage disbursed up to the year indicated** |
| Year of generation of revenue | Revenue to be spent on the purposes of Art. 10(3) (EUR million) | 2023 |
| 2023 | 541.2 | 41% |
| Flanders reported spending EUR 212.3 million of its 2023 auction revenue to compensate for indirect carbon costs. This amount was deducted from Belgium's total revenue for the purpose of calculating the amount Belgium must spend on the purposes of Article 10(3). 59% of the 2023 revenue to be spent on the purposes of Article 10(3) was reported as carried over for future spending and reporting. Additionally, EUR 69.9 million of the pre-2023 revenue was reported as disbursed in 2023 and EUR 193.7 million of the pre-2023 revenue was reported as committed in 2023. Since 2023, the direct spending of auction revenue is on hold pending a legal decision on a division between the regions and the federal government. The amount reported as disbursed in 2023 comes temporarily from the regional general budgets and is to be offset when the 2023 revenue becomes available. The purpose reported in 2023 with the biggest allocation from the ETS revenue is supporting the low-carbon transition of businesses, via WalEnergie (EUR 85.0 million). | | |
| **Bulgaria** | | **Total percentage disbursed up to the year indicated** |
| Year of generation of revenue | Revenue to be spent on the purposes of Art. 10(3) (EUR million) | 2023 |
| 2023 | 1,172.2 | 100% |
| Almost all 2023 revenue is disbursed to the Ministry of Energy's Fund for Security of the Electric Power System (FSES) that compensates non-domestic end-users for the rise in electricity prices (EUR 1,167.6 million). | | |
| **Croatia** | | **Total percentage disbursed up to the year indicated** |

[65] Data in this table is based on the annual reporting by the Member States with some modifications made to ensure consistency across all Member States and over the reporting period. The harmonisation, methodology and analysis were conducted by SQ Consult in a study for the European Commission.

| Year of generation of revenue | Revenue to be spent on the purposes of Art. 10(3) (EUR million) | 2023 |
|---|---|---|
| 2023 | 158.9 | 0% |

24% of the 2023 revenue to be spent on the purposes of Article 10(3) was reported as committed and 76% was reported as carried over for future spending and reporting. Additionally, EUR 123.7 million of the pre-2023 revenue was reported as disbursed in 2023 and EUR 151.1 million of the pre-2023 revenue was reported as committed in 2023. According to national law, 100% of the auction revenues is spent on climate and energy purposes via the Environmental Protection and Energy Efficiency Fund (EPEEF). No revenue generated in 2023 was disbursed in 2023. All the revenue disbursed in 2023 came from earlier years. The purpose reported in 2023 with the biggest allocation from the ETS revenues is subsidies for social support and just transition via the EPEEF (EUR 89.9 million).

| **Cyprus** | | **Total percentage disbursed up to the year indicated** |
|---|---|---|
| Year of generation of revenue | Revenue to be spent on the purposes of Art. 10(3) (EUR million) | 2023 |
| 2023 | 113.6 | 91% |

9% of the 2023 revenue to be spent was reported as carried over for future spending and reporting. Equivalent financial value is spent on the purposes of Art. 10(3) via the general budget. The purpose reported in 2023 with the biggest allocation from the ETS revenue is Public Passenger Transport by the Ministry of Transport (EUR 79.2 million).

| **Czechia** | | **Total percentage disbursed up to the year indicated** |
|---|---|---|
| Year of generation of revenue | Revenue to be spent on the purposes of Art. 10(3) (EUR million) | 2023 |
| 2023 | 777.2 | 26% |

5% of the 2023 revenue to be spent was reported as committed, 59% was reported as carried over for future spending and reporting and the remaining 10% was reported as committed without indication of the purpose. Additionally, EUR 78.0 million of the pre-2023 revenue was reported as disbursed in 2023. Czechia mentioned an ongoing legislative process to enshrine additional spending for the purpose of Art. 10(3) in national law. The purpose reported in 2023 with the biggest allocation from the ETS revenues is the Support of renewable energy sources by the Ministry of Industry and Trade (EUR 167.6 million).

| **Denmark** | | **Total percentage disbursed up to the year indicated** |
|---|---|---|
| Year of generation of revenue | Revenue to be spent on the purposes of Art. 10(3) (EUR million) | 2023 |
| 2023 | 416.1 | 100% |

Revenue is not earmarked. Projects for Art. 10(3) purposes with the equivalent financial value have been reported. The purpose reported in 2023 with the biggest allocation from the ETS revenue is grants for upgrading and purification of biogas, implemented by the Danish Energy Agency under the Ministry of Climate, Energy and Utilities (EUR 287.6 million).

| **Estonia** | **Total percentage disbursed up to the year indicated** |
|---|---|

| Year of generation of revenue | Revenue to be spent on the purposes of Art. 10(3) (EUR million) | 2023 |
|---|---|---|
| 2023 | 360.0 | 2% |
| 50% of the 2023 revenue to be spent on the purposes of Article 10(3) was reported as committed and the remaining 48% of the 2023 revenue has not been described in the report. Additionally, EUR 152.7 million of the pre-2023 revenue was reported as disbursed in 2023. Up to 2023, 50% of the auctioning revenues were earmarked and directed through the four-year State Budget Strategy and spent on Art. 10(3) purposes, which may take multiple years. Any unspent revenue is carried over to later years and always used for climate and energy projects. The remaining 50% went to the general budget. From 2024 onwards, 100% of revenue will be earmarked for Art 10(3) purposes. The purpose reported in 2023 with the biggest allocation from the ETS revenues is grants to increase energy efficiency in public sector buildings, implemented by the State Shared Service Centre (EUR 125.6 million). | | |

| **Finland** | | **Total percentage disbursed up to the year indicated** |
|---|---|---|
| Year of generation of revenues | Revenues to be spent on the purposes of Art. 10(3) (EUR million) | 2023 |
| 2023 | 466.0 | 100% |
| Finland reported spending EUR 115.6 million from its 2023 auction revenue to compensate for indirect carbon costs. This amount was deducted from Finland's total revenues for the purpose of calculating the amount Finland must spend on the purposes of Article 10(3). Revenue is not earmarked. Equivalent spending of slightly more than the revenue to be spent on the purposes of Art. 10(3) was reported for 2023. The purpose reported in 2023 with the biggest allocation from the ETS revenue is the development of public transport and purchase of public transportation services (EUR 193.3 million). | | |

| **France** | | **Total percentage disbursed up to the year indicated** |
|---|---|---|
| Year of generation of revenue | Revenue to be spent on the purposes of Art. 10(3) (EUR million) | 2023 |
| 2023 | 2 100.2 | 100% |
| The auction revenue co-funds energy efficiency improvements of low-income housing, up to a ceiling of EUR 700 million per year. The remainder is not earmarked but goes to the general budget, from which the equivalent financial value is reported. The purpose reported in 2023 with the biggest allocation from the ETS revenue is improving railway networks for enhanced performance and expanded national and European rail connectivity (EUR 1 400.2 million). | | |

| **Germany** | | **Total percentage disbursed up to the year indicated** |
|---|---|---|
| Year of generation of revenues | Revenues to be spent on the purposes of Art. 10(3) (EUR million) | 2023 |
| 2023 | 7 022.2 | 100% |

Germany reported spending EUR 623.3 million from its 2023 auction revenue to compensate for indirect carbon costs. This amount was deducted from Germany's total revenue for the purpose of calculating the amount Germany must spend on the purposes of Article 10(3). Germany's EUR 7.6 billion auction revenue co-funded EUR 18.5 billion in spending on Article 10(3) purposes and indirect carbon costs (Germany's total indirect carbon costs amounted to EUR 1.6 billion, with 37% of this figure attributed to the auction revenue in this table). The purpose reported in 2023 with the biggest allocation from the ETS revenue is promoting energy efficiency and renewable energy measures in the building sector, implemented by the Bundesministerium für Wirtschaft und Klimaschutz (EUR 11 049.5 million).

| **Greece** | | **Total percentage disbursed up to the year indicated** |
|---|---|---|
| Year of generation of revenue | Revenue to be spent on the purposes of Art. 10(3) (EUR million) | 2023 |
| 2023 | 1 201.7 | 100% |

Greece reported spending EUR 264.8 million from its 2023 auction revenue to compensate for indirect carbon costs. This amount was deducted from Greece's total revenue for the purpose of calculating the amount Greece must spend on the purposes of Article 10(3). Almost all revenue to be spent on the purposes of Article 10(3) goes to the Energy Transition Fund for social support and just transition, coordinated by the Greek Renewable Energy Sources Operator and Guarantees of Origin "DAPEEP" (EUR 1 131.7 million)

| **Hungary** | | **Total percentage disbursed up to the year indicated** |
|---|---|---|
| Year of generation of revenue | Revenue to be spent on the purposes of Art. 10(3) (EUR million) | 2023 |
| 2023 | 438.9 | 30% |

9% of the 2023 revenue to be spent on the purposes of Article 10(3) was reported as committed and the remaining 61% of the 2023 revenue has not been described in the report. Additionally, EUR 176.2 million of the pre-2023 revenue was reported as disbursed in 2023 and EUR 28.7 million of the pre-2023 revenue was reported as committed in 2023. Revenue is earmarked for Art. 10(3) purposes, any revenue not spent is carried over to future years. The purpose reported in 2023 with the biggest allocation from the ETS revenue is the implementation of a residential PV and storage support programme via NFFKÜ International Development and Resource Coordination Agency (EUR 104.6 million).

| **Ireland** | | **Total percentage disbursed up to the year indicated** |
|---|---|---|
| Year of generation of revenue | Revenues to be spent on the purposes of Art. 10(3) (EUR million) | 2023 |
| 2023 | 158.3 | 100% |

Revenue is not earmarked for specific purposes. The amounts reported are equivalent to 100% of this revenue and are allocated to emission reduction activities in line with the purposes of Art 10(3). The purpose reported in 2023 with the biggest allocation from the ETS revenue is public transport investment by the Department of Transport (EUR 117.3 million).

| **Italy** | | **Total percentage disbursed up to the year indicated** |
|---|---|---|
| Year of generation of revenue | Revenue to be spent on the purposes of Art. 10(3) (EUR million) | 2023 |

| | | |
|---|---|---|
| 2023 | 3,547.4 | 0% |

All 2023 revenue was reported as carried over for future spending and reporting. Additionally, EUR 23.2 million of the pre-2023 revenue was reported as disbursed in 2023 and EUR 23.8 million of the pre-2023 revenues was reported as committed in 2023. Following the Italian financial rules, committing or disbursing of the 2023 auction revenue will start in 2024. All reported spending corresponds to the revenue generated in 2022 or before. The purpose reported in 2023 with the biggest allocation from the ETS revenue is the financing of sustainable mobility interventions in public transport and mobility (EUR 20.0 million).

| **Latvia** | | **Total percentage disbursed up to the year indicated** |
|---|---|---|
| Year of generation of revenue | Revenue to be spent on the purposes of Art. 10(3) (EUR million) | 2023 |
| 2023 | 90.8 | 30% |

32% of the 2023 revenue to be spent on the purposes of Article 10(3) was reported as committed and 38% was reported as carried over for future spending and reporting. All auction revenue goes to the 'EAAI', a national green investment scheme, aimed at tackling global climate change. The purpose reported in 2023 with the biggest allocation from the ETS revenue is reducing greenhouse gas emissions in national protected architectural monuments through an open tender, implemented by the Ministry of Climate and Energy and Environmental Investment Fund (EUR 19.5 million).

| **Lithuania** | | **Total percentage disbursed up to the year indicated** |
|---|---|---|
| Year of generation of revenue | Revenue to be spent on the purposes of Art. 10(3) (EUR million) | 2023 |
| 2023 | 113.7 | 61% |

36% of the 2023 revenue to be spent on the purposes of Article 10(3) was reported as committed and 36% was reported as carried over for future spending and reporting. The auction revenue funds the four-year (2022-2025) Climate Change Programme. Funds are committed when funding applications are accepted, payments are made after the projects are implemented. The purpose reported in 2023 with the biggest allocation from the ETS revenue is investment support for biomethane production and/or biodegradation to promote green energy development (EUR 31.0 million).

| **Luxembourg** | | **Total percentage disbursed up to the year indicated** |
|---|---|---|
| Year of generation of revenue | Revenue to be spent on the purposes of Art. 10(3) (EUR million) | 2023 |
| 2023 | 9.3 | 100% |

Auction revenue, together with the climate contribution on road fuels and a share (40%) of the annual motor vehicle tax, finance the Climate and Energy Fund. An equivalent amount of Article 10(3) actions supported from this fund was reported. The purpose reported in 2023 with the biggest allocation from the ETS revenue is Climate and Energy Fund activities (EUR 9.3 million).

| **Malta** | | **Total percentage disbursed up to the year indicated** |
|---|---|---|
| Year of generation of revenue | Revenue to be spent on the purposes of Art. 10(3) (EUR million) | 2023 |

| | | |
|---|---|---|
| 2023 | 44.6 | 100% |
| Revenue is not earmarked. An equivalent spending of 26% more than the revenue to be spent on the purposes of Art. 10(3) was reported for 2023. The purpose reported in 2023 with the biggest allocation from the ETS revenue is the ARMS Feed-in-tariff project in Malta (EUR 13.1 million). | | |

| **Netherlands** | | **Total percentage disbursed up to the year indicated** |
|---|---|---|
| Year of generation of revenue | Revenue to be spent on the purposes of Art. 10(3) (EUR million) | 2023 |
| 2023 | 1 281.4 | 100% |
| Revenue is not earmarked. Equivalent spending has been reported as part of the spending under several large climate policies. The purpose reported in 2023 with the biggest allocation from the ETS revenue is the Investment Subsidy for Sustainable Energy (ISDE) programme (EUR 510.7 million). | | |

| **Poland** | | **Total percentage disbursed up to the year indicated** |
|---|---|---|
| Year of generation of revenue | Revenue to be spent on the purposes of Art. 10(3) (EUR million) | 2023 |
| 2023 | 4 988.1 | 92% |
| Poland reported spending EUR 384.4 million from its 2023 auction revenues to compensate for indirect carbon costs. This amount was deducted from Poland's total revenues for the purpose of calculating the amount Poland must spend on the purposes of Article 10(3). Of the 2023 revenue to be spent on the purposes of Article 10(3), the remaining 8% has not been explained in the report. Revenue is not earmarked. The equivalent financial value of actions for the purposes in Art. 10(3) has been reported. The purpose reported in 2023 with the biggest allocation from ETS revenues is compensation for certain recipients of gas fuels, implemented by Zarządca Rozliczeń (EUR 1 424.8 million). | | |

| **Portugal** | | **Total percentage disbursed up to the year indicated** |
|---|---|---|
| Year of generation of revenue | Revenue to be spent on the purposes of Art. 10(3) (EUR million) | 2023 |
| 2023 | 720.0 | 96% |
| Portugal reported spending EUR 25.0 million from its 2023 auction revenue to compensate for indirect carbon costs. This amount was deducted from Portugal's total revenue for the purpose of calculating the amount Portugal must spend on the purposes of Article 10(3). 4% of the 2023 revenue to be spent on the purposes of Article 10(3) was reported as carried over for future spending and reporting. All auction revenue is channelled to the Environment Fund (alongside other revenue), which finances environmental projects that may or may not be directly related to climate objectives. The amounts reported as spent represent climate change and energy projects financed from the Environmental Fund. The purpose reported in 2023 with the biggest allocation from the ETS revenue is to support renewables in the National Energetic System (SEN) (EUR 436.0 million). | | |

| **Romania** | | **Total percentage disbursed up to the year indicated** |
|---|---|---|
| Year of generation of revenue | Revenue to be spent on the purposes of Art. 10(3) (EUR million) | 2023 |
| 2023 | 475.9 | 100% |

Romania reported spending EUR 104.4 million from its 2023 auction revenue to compensate for indirect carbon costs. This amount was deducted from Romania's total revenues for the purpose of calculating the amount Romania must spend on the purposes of Article 10(3). Distribution of auction revenue to different purposes is governed by law GEO 115/2011. The purpose reported in 2023 with the biggest allocation from the ETS revenue is the installation of photovoltaic panel systems for electricity production and surplus delivery to the national grid, implemented by Administrația Fondului pentru Mediu "AFM" (EUR 201.1 million).

| **Slovakia** | | **Total percentage disbursed up to the year indicated** |
|---|---|---|
| Year of generation of revenue | Revenue to be spent on the purposes of Art. 10(3) (EUR million) | 2023 |
| 2023 | 298.0 | 31% |

Slovakia reported spending EUR 80.3 million from its 2023 auction revenues to compensate for indirect carbon costs. This amount was deducted from Slovakia's total revenue for the purpose of calculating the amount Slovakia must spend on the purposes of Article 10(3). 27% of the 2023 revenues to be spent on the purposes of Article 10(3) was reported as committed and 42% was reported as carried over for future spending and reporting. All auction revenue is earmarked and goes to the Environmental Fund, which is spent on purposes in Article 10(3). The purpose reported in 2023 with the biggest allocation from the ETS revenue is a programme for water pipes and sewers, including water retention measures (EUR 59.2 million).

| **Slovenia** | | **Total percentage disbursed up to the year indicated** |
|---|---|---|
| Year of generation of revenue | Revenue to be spent on the purposes of Art. 10(3) (EUR million) | 2023 |
| 2023 | 161.1 | 79% |

Slovenia reported spending EUR 26.0 million from its 2023 auction revenue to compensate for indirect carbon costs. This amount was deducted from Slovenia's total revenue for the purpose of calculating the amount Slovenia must spend on the purposes of Article 10(3). 21% of the 2023 revenue to be spent on the purposes of Article 10(3) was reported as committed. All auction revenue is used for purposes in Article 10(3), coordinated through the Climate Change Fund. The purpose reported in 2023 with the biggest allocation from the ETS revenue is investments in thermal insulation of buildings and efficient heating (EUR 38.0 million).

| **Spain** | | **Total percentage disbursed up to the year indicated** |
|---|---|---|
| Year of generation of revenue | Revenue to be spent on the purposes of Art. 10(3) (EUR million) | 2023 |
| 2023 | 3 355.5 | 33% |

Spain reported spending EUR 228.8 million from its 2023 auction revenue to compensate for indirect carbon costs. This amount was deducted from Spain's total revenue for the purpose of calculating the amount Spain must spend on the purposes of Article 10(3). 67% of the 2023 revenue to be spent on the purposes of Article 10(3) was reported as carried over for future spending and reporting. Estimated revenue is earmarked for energy and climate purposes ahead of each year, so the actual revenue may differ from the allocated estimate. All estimated revenue that is not used in aid for indirect carbon cost (excluded in the values above) is used for climate and energy purposes. The purpose reported in 2023 with the biggest allocation from the ETS revenue is financing the costs of the electric system related to promoting renewable energies (EUR 1 100.0 million).

| **Sweden** | | **Total percentage disbursed up to the year indicated** |
|---|---|---|
| Year of generation of revenue | Revenue to be spent on the purposes of Art. 10(3) (EUR million) | 2023 |
| 2023 | 323.2 | 0% |

100% of the 2023 revenue to be spent was reported as committed. Revenue is not earmarked. Example projects have been reported for at least the minimum required spending on energy and climate purposes. The purpose reported in 2023 with the biggest allocation from the ETS revenue is to Climate Leap. This funds local and regional investments in greenhouse gas emission reductions based on the expected emission reductions relative to the investment cost, and is implemented by the Swedish Environmental Protection Agency "Naturvårdsverket" (EUR 209.9 million).

# 8 EMISSIONS COVERED BY THE EFFORT SHARING LEGISLATION

By 30 June 2024, Member States had to report their final updated integrated National Energy and Climate Plans (NECPs) to the Commission [66]. The updated NECPs should contain the policies and measures that a Member State envisages to meet their climate and energy targets. The updated NECPs are currently being assessed by the Commission. The Commission includes in the analysis for 2030 the information from Member States' final updated NECPs, or draft updated NECPs in the absence of more recent information. A more complete overview will be available when the Commissions received final updated NECPs from all Member States.

***Table 8.1:*** *Member States targets, historical and projected emissions under the effort-sharing legislation and distance to targets in percentage change from 2005 base year emissions* [67]

| Member State | 2021 | 2022 | 2023 | 2030 (projections WEM) | 2030 (projections WAM) |
|---|---|---|---|---|---|
| **Austria** | | | | | |
| Target | -14% | -17% | -21% | -48% | -48% |
| Emissions | -15% | -19% | -23% | -30% | -42% |
| Distance to target (percentage point) | 0 | 2 | 3 | -18 | -6 |
| **Belgium** | | | | | |
| Target | -13% | -15% | -19% | -47% | -47% |
| Emissions | -16% | -22% | -22% | -22% | -43% |
| Distance to target (pp) | 3 | 6 | 2 | -25 | -4 |
| **Bulgaria** | | | | | |
| Target | 21% | 13% | 10% | -10% | -10% |
| Emissions | 13% | 10% | 5% | 4% | 2% |
| Distance to target (pp) | 9 | 3 | 5 | -14 | -12 |
| **Croatia** | | | | | |
| Target | -2% | -8% | -9% | -17% | -17% |
| Emissions | 3% | 10% | -10% | 4% | -17% |
| Distance to target (pp) | -6 | 3 | 0 | -14 | 0 |
| **Cyprus** | | | | | |
| Target | -5% | -7% | -10% | -32% | -32% |
| Emissions | 3% | 10% | 5% | 4% | -23% |

[66] By 15 October 2024, 14 Member States have submitted their final updated NECPs.

[67] 2021 and 2022 emissions are based on 2024 final GHG inventory reports, 2023 emissions are based on 2024 approximated inventory reports. Positive values indicate projected overachievement while negative values indicate projected underachievement. WEM = with existing measures, WAM = with additional measures. The 2005 emissions used for the calculation are set out in Annex I of Commission Implementing Decision (EU) 2020/2126. Any apparent miscalculations for percentage point distance to targets is due to rounding of the percentage targets and emissions.

| | | | | | |
|---|---|---|---|---|---|
| Distance to target (pp) | -8 | 3 | -15 | -14 | -9 |
| **Czechia** | | | | | |
| Target | 2% | -6% | -9% | -26% | -26% |
| Emissions | -5% | 10% | -6% | 4% | -33% |
| Distance to target (pp) | 7 | 3 | -3 | -14 | 7 |
| **Denmark** | | | | | |
| Target | -20% | -22% | -26% | -50% | -50% |
| Emissions | -21% | 10% | -25% | 4% | -44% |
| Distance to target (pp) | 1 | 3 | -1 | -14 | -6 |
| **Estonia** | | | | | |
| Target | 0% | -3% | -6% | -24% | -24% |
| Emissions | -8% | -19% | -3% | -29% | -14% |
| Distance to target (pp) | 8 | 2 | -3 | -8 | -10 |
| **Finland** | | | | | |
| Target | -16% | -19% | -23% | -50% | -50% |
| Emissions | -21% | -23% | -27% | -45% | -46% |
| Distance to target (pp) | 5 | 4 | 4 | -5 | -4 |
| **France** | | | | | |
| Target | -16% | -19% | -22% | -47% | -47% |
| Emissions | -20% | -24% | -26% | -24% | -46% |
| Distance to target (pp) | 4 | 5 | 4 | -23 | -1 |
| **Germany** | | | | | |
| Target | -12% | -15% | -19% | -50% | -50% |
| Emissions | -17% | -24% | -21% | -24% | -41% |
| Distance to target (pp) | 5 | 5 | 2 | -23 | -9 |
| **Greece** | | | | | |
| Target | -16% | -19% | -22% | -47% | -47% |
| Emissions | -20% | -24% | -26% | -24% | -46% |
| Distance to target (pp) | 4 | 5 | 4 | -23 | -1 |
| **Hungary** | | | | | |
| Target | 4% | -9% | -11% | -19% | -19% |
| Emissions | -4% | -8% | -15% | -15% | -25% |
| Distance to target (pp) | 8 | -1 | 4 | -3 | 6 |
| **Ireland** | | | | | |
| Target | -9% | -11% | -15% | -42% | -42% |
| Emissions | -3% | -4% | -10% | -9% | -25% |
| Distance to target (pp) | -6 | -7 | -5 | -33 | -17 |
| **Italy** | | | | | |
| Target | -20% | -22% | -24% | -43% | -43% |
| Emissions | -18% | -21% | -22% | -29% | -41% |

| | | | | | |
|---|---|---|---|---|---|
| Distance to target (pp) | -2 | -1 | -2 | -14 | -3 |
| **Latvia** | | | | | |
| Target | 24% | 3% | 0% | -17% | -17% |
| Emissions | 1% | -21% | -4% | -29% | -21% |
| Distance to target (pp) | 23 | -1 | 5 | -14 | 4 |
| **Lithuania** | | | | | |
| Target | 23% | 5% | 2% | -21% | -21% |
| Emissions | 9% | -21% | 4% | -29% | -21% |
| Distance to target (pp) | 14 | -1 | -2 | -14 | 0 |
| **Luxembourg** | | | | | |
| Target | -17% | -19% | -23% | -50% | -50% |
| Emissions | -20% | -21% | -32% | -29% | -56% |
| Distance to target (pp) | 3 | -1 | 8 | -14 | 6 |
| **Malta** | | | | | |
| Target | 102% | 21% | 16% | -19% | -19% |
| Emissions | 30% | -30% | 31% | -33% | 46% |
| Distance to target (pp) | 72 | 11 | -14 | -17 | -65 |
| **Netherlands** | | | | | |
| Target | -23% | -25% | -27% | -48% | -48% |
| Emissions | -27% | -2% | -34% | -12% | -39% |
| Distance to target (pp) | 4 | 5 | 7 | -5 | -9 |
| **Poland** | | | | | |
| Target | 12% | 6% | 3% | -18% | -18% |
| Emissions | 8% | 2% | 4% | -14% | -7% |
| Distance to target (pp) | 4 | 4 | -1 | -4 | -11 |
| **Portugal** | | | | | |
| Target | -13% | -16% | -18% | -29% | -29% |
| Emissions | -18% | 2% | -19% | -14% | -42% |
| Distance to target (pp) | 5 | 4 | 1 | -4 | 13 |
| **Romania** | | | | | |
| Target | 12% | -2% | -3% | -13% | -13% |
| Emissions | 6% | 4% | 4% | -9% | -15% |
| Distance to target (pp) | 6 | -6 | -7 | -4 | 3 |
| **Slovakia** | | | | | |
| Target | 1% | -9% | -10% | -23% | -23% |
| Emissions | -12% | -15% | -14% | -1% | -12% |
| Distance to target (pp) | 13 | 7 | 4 | -21 | -11 |
| **Slovenia** | | | | | |
| Target | -4% | -6% | -9% | -26% | -26% |
| Emissions | -12% | -15% | -15% | -1% | -29% |

| | | | | | |
|---|---|---|---|---|---|
| Distance to target (pp) | 9 | 7 | 6 | -21 | 3 |
| **Spain** | | | | | |
| Target | -17% | -18% | -20% | -37% | -37% |
| Emissions | -20% | -15% | -21% | -1% | -45% |
| Distance to target (pp) | 3 | 7 | 1 | -21 | 7 |
| **Sweden** | | | | | |
| Target | -28% | -29% | -32% | -50% | -50% |
| Emissions | -33% | -15% | -38% | -1% | -44% |
| Distance to target (pp) | 5 | 7 | 6 | -21 | -6 |
| **EU 27** | | | | | |
| Target | -12% | -15% | -18% | -40% | -40% |
| Emissions | -15% | -18% | -19% | -28% | -37% |
| Distance to target (pp) | 3 | 3 | 1 | -11 | -3 |
| **Iceland** | | | | | |
| Target | -7% | -10% | -12% | -29% | -29% |
| Emissions | -11% | -11% | -14% | -24% | -26% |
| Distance to target (pp) | 4 | 1 | 1 | -4 | -3 |
| **Norway** | | | | | |
| Target | -13% | -16% | -19% | -40% | -40% |
| Emissions | -12% | -13% | -16% | -32% | -32% |
| Distance to target (pp) | -1 | -3 | -3 | -8 | -8 |

***Table 8.2:*** *Annual emissions allocations, historical and projected emissions, and distance to targets under the Effort Sharing Regulation (MtCO2-eq.) covering the period 2021 - 2030. Positive values indicate overachievement, negative values indicate underachievement* [68] [69].



[68] AEAs for the years 2021-2025 are established in Implementing Decision (EU) 2020/2126. AEAs for the years 2026 -2030 are estimated based on the trajectory defined in Article 4 ESR and adjusted as provided for under Article 10(1)c ESR. To estimate the trajectory for 2026-2030, the estimated ESR emissions for the years 2021 to 2023 are used, after a reduction by the Article 10(1)c ESR adjustment included in the AEAs for 2021-2023. The trajectory values are adjusted based on Article 10(1)c on the basis of the assumption that the methodology applied to the AEAs for 2021 to 2025 is continued unchanged for the years 2026-2030, and no further adjustments for changes to EU ETS are required. The final AEAs for these years will be established after the comprehensive review in 2025 pursuant to Article 38(1a) of Regulation (EU) 2018/1999. The values of 'cumulative surplus of AEAs' are the cumulative annual distances to target and do not take into account cancellations and transfers. 2021 and 2022 emissions are based on 2024 final GHG inventory reports, 2023 emissions are based on 2024 approximated inventory reports. 2024 - 2030 emissions are based on the most recent WAM emissions projections reports, or in the absence of WAM projections the WEM projections. First compliance check will take place in 2027.

[69] Poland's estimated 2030 ESR emissions are based on their WEM projections from its draft updated NECP which is more ambitious than its WAM projections from their NECPR reporting in 2023. See also SWD(2024) 126 final. Romania and Latvia's emissions are based on WAM projections in their final NECPs for respective years 2025-2030 2024-2030.

| Member State | ETS and LULUCF flexibility | 2005 base year emissions | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Austria** | | | | | | | | | | | | |
| Estimated AEAs | | | 48.8 | 47.4 | 45.2 | 43.0 | 40.7 | 40.2 | 37.6 | 34.9 | 32.3 | 29.6 |
| Emissions | | 57.0 | 48.6 | 46.2 | 43.7 | 43.9 | 42.4 | 40.9 | 39.3 | 37.3 | 35.3 | 33.2 |
| LULUCF debit (2021-2025) | | Pursuant to Art 9(2) ESR, AEAs are reduced by the debit generated under the LULUCF Regulation in the period 2021-2025. See chapter 4 of the main report. | | | | | | | | | | |
| Distance to target | | | 0.1 | 1.2 | 1.5 | -0.9 | -1.6 | -0.7 | -1.8 | -2.3 | -3.0 | -3.6 |
| Cumulative balance of AEAs | | | 0.1 | 1.4 | 2.8 | 1.9 | 0.3 | -0.4 | -2.2 | -4.5 | -7.5 | -11.1 |
| ETS flexibility | 11.4 | Amount of ETS flexibility as per Commission Implementing Decision 2020/2126 and available over the 10-year period 2021-2030. | | | | | | | | | | |
| Maximum LULUCF flexibility | 2.5 | The availability of LULUCF flexibility depends on the amount of LULUCF credits generated under the LULUCF Regulation. The use of the available LULUCF flexibility is limited to 50% of the maximum amount of LULUCF flexibility in the period 2021-2025 and 50% of the maximum amount of LULUCF flexibility in the period 2026-2030. | | | | | | | | | | |
| **Belgium** | | | | | | | | | | | | |
| Estimated AEAs | | | 71.1 | 69.1 | 65.9 | 62.7 | 59.4 | 57.5 | 53.9 | 50.4 | 46.8 | 43.3 |
| Emissions | | 81.6 | 68.8 | 63.8 | 63.9 | 64.4 | 62.7 | 59.6 | 56.4 | 53.2 | 50.0 | 46.8 |
| LULUCF debit (2021-2025) | | Pursuant to Art 9(2) ESR, AEAs are reduced by the debit generated under the LULUCF Regulation in the period 2021-2025. See chapter 4 of the main report. | | | | | | | | | | |
| Distance to target | | | 2.4 | 5.3 | 2.0 | -1.8 | -3.3 | -2.1 | -2.4 | -2.8 | -3.2 | -3.6 |
| Cumulative balance of AEAs | | | 2.4 | 7.7 | 9.7 | 7.9 | 4.6 | 2.5 | 0.1 | -2.7 | -5.9 | -9.5 |
| ETS flexibility | 15.4 | Amount of ETS flexibility as per Commission Implementing Decision 2020/2126 and available over the 10-year period 2021-2030. | | | | | | | | | | |
| Maximum LULUCF flexibility | 3.8 | The availability of LULUCF flexibility depends on the amount of LULUCF credits generated under the LULUCF Regulation. The use of the available LULUCF flexibility is limited to 50% of the maximum amount of LULUCF flexibility in the period 2021-2025 and 50% of the maximum amount of LULUCF flexibility in the period 2026-2030. | | | | | | | | | | |
| **Bulgaria** | | | | | | | | | | | | |
| Estimated AEAs | | | 27.1 | 25.2 | 24.5 | 23.9 | 23.3 | 22.8 | 22.1 | 21.5 | 20.8 | 20.1 |
| Emissions | | 22.3 | 25.1 | 24.5 | 23.4 | 23.6 | 23.6 | 23.4 | 23.3 | 23.1 | 23.0 | 22.8 |
| LULUCF debit (2021-2025) | | Pursuant to Art 9(2) ESR, AEAs are reduced by the debit generated under the LULUCF Regulation in the period 2021-2025. See chapter 4 of the main report. | | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distance to target | | | 2.0 | 0.6 | 1.1 | 0.3 | -0.3 | -0.6 | -1.1 | -1.6 | -2.2 | -2.7 |
| Cumulative balance of AEAs | | | 2.0 | 2.6 | 3.7 | 4.0 | 3.7 | 3.1 | 2.0 | 0.4 | -1.8 | -4.5 |
| ETS flexibility | 0.0 | Amount of ETS flexibility as per Commission Implementing Decision 2020/2126 and available over the 10-year period 2021-2030. | | | | | | | | | | |
| Maximum LULUCF flexibility | 4.1 | The availability of LULUCF flexibility depends on the amount of LULUCF credits generated under the LULUCF Regulation. The use of the available LULUCF flexibility is limited to 50% of the maximum amount of LULUCF flexibility in the period 2021-2025 and 50% of the maximum amount of LULUCF flexibility in the period 2026-2030. | | | | | | | | | | |
| **Croatia** | | | | | | | | | | | | |
| Estimated AEAs | | | 17.7 | 16.5 | 16.4 | 16.2 | 16.0 | 17.0 | 16.5 | 16.0 | 15.5 | 15.0 |
| Emissions | 18.1 | | 18.7 | 19.2 | 16.3 | 16.1 | 15.9 | 15.8 | 15.6 | 15.4 | 15.2 | 15.0 |
| LULUCF debit (2021-2025) | Pursuant to Art 9(2) ESR, AEAs are reduced by the debit generated under the LULUCF Regulation in the period 2021-2025. See chapter 4 of the main report. | | | | | | | | | | | |
| Distance to target | | | -1.0 | -2.7 | 0.1 | 0.1 | 0.0 | 1.2 | 0.9 | 0.6 | 0.3 | 0.1 |
| Cumulative balance of AEAs | | | -1.0 | -3.7 | -3.6 | -3.5 | -3.5 | -2.2 | -1.3 | -0.7 | -0.4 | -0.3 |
| ETS flexibility | 0.0 | Amount of ETS flexibility as per Commission Implementing Decision 2020/2126 and available over the 10-year period 2021-2030. | | | | | | | | | | |
| Maximum LULUCF flexibility | 0.9 | The availability of LULUCF flexibility depends on the amount of LULUCF credits generated under the LULUCF Regulation. The use of the available LULUCF flexibility is limited to 50% of the maximum amount of LULUCF flexibility in the period 2021-2025 and 50% of the maximum amount of LULUCF flexibility in the period 2026-2030. | | | | | | | | | | |
| **Cyprus** | | | | | | | | | | | | |
| Estimated AEAs | | | 4.1 | 4.0 | 3.8 | 3.7 | 3.6 | 3.9 | 3.6 | 3.4 | 3.1 | 2.9 |
| Emissions | 4.3 | | 4.4 | 4.4 | 4.5 | 4.3 | 4.3 | 4.3 | 4.2 | 4.1 | 4.0 | 3.3 |
| LULUCF debit (2021-2025) | Pursuant to Art 9(2) ESR, AEAs are reduced by the debit generated under the LULUCF Regulation in the period 2021-2025. See chapter 4 of the main report. | | | | | | | | | | | |
| Distance to target | | | -0.3 | -0.5 | -0.6 | -0.6 | -0.7 | -0.4 | -0.6 | -0.7 | -0.9 | -0.4 |
| Cumulative balance of AEAs | | | -0.3 | -0.8 | -1.4 | -2.0 | -2.8 | -3.2 | -3.8 | -4.5 | -5.4 | -5.8 |
| ETS flexibility | 0.0 | Amount of ETS flexibility as per Commission Implementing Decision 2020/2126 and available over the 10-year period 2021-2030. | | | | | | | | | | |
| Maximum LULUCF flexibility | 0.6 | The availability of LULUCF flexibility depends on the amount of LULUCF credits generated under the LULUCF Regulation. The use of the available LULUCF flexibility is limited to 50% of the maximum amount of LULUCF flexibility in the period 2021-2025 and 50% of the maximum amount of LULUCF flexibility in the period 2026-2030. | | | | | | | | | | |
| **Czechia** | | | | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Estimated AEAs | | | 66.0 | 60.9 | 59.3 | 57.7 | 56.1 | 56.4 | 54.3 | 52.3 | 50.2 | 48.1 |
| Emissions | | 65.0 | 61.5 | 60.6 | 61.2 | 56.7 | 56.6 | 55.7 | 54.7 | 53.8 | 52.8 | 43.4 |
| LULUCF debit (2021-2025) | | Pursuant to Art 9(2) ESR, AEAs are reduced by the debit generated under the LULUCF Regulation in the period 2021-2025. See chapter 4 of the main report. | | | | | | | | | | |
| Distance to target | | | 4.4 | 0.3 | -1.9 | 1.0 | -0.5 | 0.8 | -0.4 | -1.5 | -2.7 | 4.7 |
| Cumulative balance of AEAs | | | 4.4 | 4.7 | 2.8 | 3.8 | 3.3 | 4.1 | 3.7 | 2.2 | -0.5 | 4.2 |
| ETS flexibility | 0.0 | Amount of ETS flexibility as per Commission Implementing Decision 2020/2126 and available over the 10-year period 2021-2030. | | | | | | | | | | |
| Maximum LULUCF flexibility | 2.6 | The availability of LULUCF flexibility depends on the amount of LULUCF credits generated under the LULUCF Regulation. The use of the available LULUCF flexibility is limited to 50% of the maximum amount of LULUCF flexibility in the period 2021-2025 and 50% of the maximum amount of LULUCF flexibility in the period 2026-2030. | | | | | | | | | | |
| **Denmark** | | | | | | | | | | | | |
| Estimated AEAs | | | 32.1 | 31.3 | 29.9 | 28.5 | 27.1 | 27.1 | 25.4 | 23.6 | 21.9 | 20.2 |
| Emissions | | 40.4 | 31.9 | 30.7 | 30.3 | 28.3 | 27.2 | 26.1 | 25.0 | 24.1 | 23.3 | 22.4 |
| LULUCF debit (2021-2025) | | Pursuant to Art 9(2) ESR, AEAs are reduced by the debit generated under the LULUCF Regulation in the period 2021-2025. See chapter 4 of the main report. | | | | | | | | | | |
| Distance to target | | | 0.3 | 0.6 | -0.4 | 0.2 | 0.0 | 0.9 | 0.4 | -0.5 | -1.4 | -2.3 |
| Cumulative balance of AEAs | | | 0.3 | 0.8 | 0.4 | 0.6 | 0.6 | 1.5 | 1.9 | 1.4 | 0.0 | -2.2 |
| ETS flexibility | 8.1 | Amount of ETS flexibility as per Commission Implementing Decision 2020/2126 and available over the 10-year period 2021-2030. | | | | | | | | | | |
| Maximum LULUCF flexibility | 14.6 | The availability of LULUCF flexibility depends on the amount of LULUCF credits generated under the LULUCF Regulation. The use of the available LULUCF flexibility is limited to 50% of the maximum amount of LULUCF flexibility in the period 2021-2025 and 50% of the maximum amount of LULUCF flexibility in the period 2026-2030. | | | | | | | | | | |
| **Estonia** | | | | | | | | | | | | |
| Estimated AEAs | | | 6.2 | 6.0 | 5.8 | 5.7 | 5.5 | 5.4 | 5.2 | 5.0 | 4.9 | 4.7 |
| Emissions | | 6.2 | 5.7 | 5.5 | 6.0 | 5.7 | 5.6 | 5.6 | 5.5 | 5.5 | 5.4 | 5.3 |
| LULUCF debit (2021-2025) | | Pursuant to Art 9(2) ESR, AEAs are reduced by the debit generated under the LULUCF Regulation in the period 2021-2025. See chapter 4 of the main report. | | | | | | | | | | |
| Distance to target | | | 0.5 | 0.5 | -0.2 | 0.0 | -0.1 | -0.2 | -0.3 | -0.4 | -0.6 | -0.6 |
| Cumulative balance of AEAs | | | 0.5 | 1.0 | 0.8 | 0.8 | 0.7 | 0.5 | 0.2 | -0.2 | -0.8 | -1.4 |
| ETS flexibility | 0.0 | Amount of ETS flexibility as per Commission Implementing Decision 2020/2126 and available over the 10-year period 2021-2030. | | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Maximum LULUCF flexibility | 0.9 | The availability of LULUCF flexibility depends on the amount of LULUCF credits generated under the LULUCF Regulation. The use of the available LULUCF flexibility is limited to 50% of the maximum amount of LULUCF flexibility in the period 2021-2025 and 50% of the maximum amount of LULUCF flexibility in the period 2026-2030. | | | | | | | | | |
| **Finland** | | | | | | | | | | | | |
| Estimated AEAs | | | 28.8 | 28.0 | 26.6 | 25.3 | 23.9 | 23.0 | 21.6 | 20.1 | 18.7 | 17.2 |
| Emissions | 34.4 | | 27.2 | 26.5 | 25.1 | 23.1 | 22.2 | 21.6 | 20.8 | 20.0 | 19.3 | 18.5 |
| LULUCF debit (2021-2025) | Pursuant to Art 9(2) ESR, AEAs are reduced by the debit generated under the LULUCF Regulation in the period 2021-2025. See chapter 4 of the main report. | | | | | | | | | | | |
| Distance to target | | | 1.6 | 1.4 | 1.5 | 2.2 | 1.7 | 1.4 | 0.8 | 0.1 | -0.6 | -1.2 |
| Cumulative balance of AEAs | | | 1.6 | 3.1 | 4.6 | 6.8 | 8.5 | 9.9 | 10.7 | 10.8 | 10.2 | 8.9 |
| ETS flexibility | 6.9 | Amount of ETS flexibility as per Commission Implementing Decision 2020/2126 and available over the 10-year period 2021-2030. | | | | | | | | | | |
| Maximum LULUCF flexibility | 4.5 | The availability of LULUCF flexibility depends on the amount of LULUCF credits generated under the LULUCF Regulation. The use of the available LULUCF flexibility is limited to 50% of the maximum amount of LULUCF flexibility in the period 2021-2025 and 50% of the maximum amount of LULUCF flexibility in the period 2026-2030. | | | | | | | | | | |
| **France** | | | | | | | | | | | | |
| Estimated AEAs | | | 335.7 | 326.5 | 312.0 | 297.5 | 283.0 | 273.0 | 257.4 | 241.8 | 226.2 | 210.6 |
| Emissions | 401.1 | | 320.2 | 306.2 | 297.8 | 299.6 | 297.1 | 291.0 | 285.0 | 278.9 | 272.8 | 215.0 |
| LULUCF debit (2021-2025) | Pursuant to Art 9(2) ESR, AEAs are reduced by the debit generated under the LULUCF Regulation in the period 2021-2025. See chapter 4 of the main report. | | | | | | | | | | | |
| Distance to target | | | 15.5 | 20.4 | 14.2 | -2.1 | -14.1 | -18.1 | -27.6 | -37.1 | -46.6 | -4.4 |
| Cumulative balance of AEAs | | | 15.5 | 35.8 | 50.0 | 47.9 | 33.9 | 15.8 | -11.8 | -48.8 | -95.4 | -99.8 |
| ETS flexibility | 0.0 | Amount of ETS flexibility as per Commission Implementing Decision 2020/2126 and available over the 10-year period 2021-2030. | | | | | | | | | | |
| Maximum LULUCF flexibility | 58.2 | The availability of LULUCF flexibility depends on the amount of LULUCF credits generated under the LULUCF Regulation. The use of the available LULUCF flexibility is limited to 50% of the maximum amount of LULUCF flexibility in the period 2021-2025 and 50% of the maximum amount of LULUCF flexibility in the period 2026-2030. | | | | | | | | | | |
| **Germany** | | | | | | | | | | | | |
| Estimated AEAs | | | 427.3 | 413.2 | 391.9 | 370.5 | 349.2 | 339.5 | 315.2 | 290.9 | 266.7 | 242.4 |
| Emissions | 484.7 | | 403.8 | 395.0 | 383.4 | 369.6 | 360.1 | 350.7 | 338.2 | 323.9 | 306.8 | 287.5 |
| LULUCF debit (2021-2025) | Pursuant to Art 9(2) ESR, AEAs are reduced by the debit generated under the LULUCF Regulation in the period 2021-2025. See chapter 4 of the main report. | | | | | | | | | | | |
| Distance to target | | | 23.5 | 18.3 | 8.4 | 0.9 | -10.9 | -11.3 | -23.0 | -33.0 | -40.1 | -45.1 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cumulative balance of AEAs | | | 23.5 | 41.8 | 50.2 | 51.1 | 40.2 | 28.9 | 5.9 | -27.1 | -67.2 | -112.3 |
| ETS flexibility | 0.0 | Amount of ETS flexibility as per Commission Implementing Decision 2020/2126 and available over the 10-year period 2021-2030. | | | | | | | | | | |
| Maximum LULUCF flexibility | 22.3 | The availability of LULUCF flexibility depends on the amount of LULUCF credits generated under the LULUCF Regulation. The use of the available LULUCF flexibility is limited to 50% of the maximum amount of LULUCF flexibility in the period 2021-2025 and 50% of the maximum amount of LULUCF flexibility in the period 2026-2030. | | | | | | | | | | |
| **Greece** | | | | | | | | | | | | |
| Estimated AEAs | | | 46.2 | 47.0 | 47.2 | 47.4 | 47.6 | 46.5 | 47.1 | 47.6 | 48.2 | 48.7 |
| Emissions | 63.0 | | 44.4 | 46.3 | 45.3 | 43.1 | 43.0 | 42.5 | 42.0 | 41.6 | 41.1 | 34.0 |
| LULUCF debit (2021-2025) | Pursuant to Art 9(2) ESR, AEAs are reduced by the debit generated under the LULUCF Regulation in the period 2021-2025. See chapter 4 of the main report. | | | | | | | | | | | |
| Distance to target | | | 1.8 | 0.7 | 1.9 | 4.3 | 4.6 | 4.0 | 5.0 | 6.1 | 7.1 | 14.7 |
| Cumulative balance of AEAs | | | 1.8 | 2.5 | 4.4 | 8.7 | 13.4 | 17.4 | 22.5 | 28.5 | 35.6 | 50.2 |
| ETS flexibility | 0.0 | Amount of ETS flexibility as per Commission Implementing Decision 2020/2126 and available over the 10-year period 2021-2030. | | | | | | | | | | |
| Maximum LULUCF flexibility | 6.7 | The availability of LULUCF flexibility depends on the amount of LULUCF credits generated under the LULUCF Regulation. The use of the available LULUCF flexibility is limited to 50% of the maximum amount of LULUCF flexibility in the period 2021-2025 and 50% of the maximum amount of LULUCF flexibility in the period 2026-2030. | | | | | | | | | | |
| **Hungary** | | | | | | | | | | | | |
| Estimated AEAs | | | 49.9 | 43.3 | 42.8 | 42.2 | 41.7 | 41.9 | 41.2 | 40.4 | 39.6 | 38.9 |
| Emissions | 47.8 | | 46.1 | 44.0 | 40.8 | 43.5 | 43.4 | 43.1 | 42.8 | 42.5 | 42.2 | 35.9 |
| LULUCF debit (2021-2025) | Pursuant to Art 9(2) ESR, AEAs are reduced by the debit generated under the LULUCF Regulation in the period 2021-2025. See chapter 4 of the main report. | | | | | | | | | | | |
| Distance to target | | | 3.8 | -0.6 | 2.0 | -1.2 | -1.8 | -1.2 | -1.7 | -2.1 | -2.6 | 3.0 |
| Cumulative balance of AEAs | | | 3.8 | 3.2 | 5.2 | 3.9 | 2.1 | 0.9 | -0.7 | -2.8 | -5.4 | -2.4 |
| ETS flexibility | 0.0 | Amount of ETS flexibility as per Commission Implementing Decision 2020/2126 and available over the 10-year period 2021-2030. | | | | | | | | | | |
| Maximum LULUCF flexibility | 2.1 | The availability of LULUCF flexibility depends on the amount of LULUCF credits generated under the LULUCF Regulation. The use of the available LULUCF flexibility is limited to 50% of the maximum amount of LULUCF flexibility in the period 2021-2025 and 50% of the maximum amount of LULUCF flexibility in the period 2026-2030. | | | | | | | | | | |
| **Ireland** | | | | | | | | | | | | |
| Estimated AEAs | | | 43.5 | 42.4 | 40.5 | 38.7 | 36.8 | 38.8 | 36.0 | 33.2 | 30.4 | 27.7 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Emissions | | 47.7 | 46.4 | 45.9 | 42.8 | 44.3 | 43.3 | 42.0 | 40.6 | 39.1 | 37.5 | 35.6 |
| LULUCF debit (2021-2025) | Pursuant to Art 9(2) ESR, AEAs are reduced by the debit generated under the LULUCF Regulation in the period 2021-2025. See chapter 4 of the main report. | | | | | | | | | | | |
| Distance to target | | | -2.9 | -3.5 | -2.3 | -5.6 | -6.4 | -3.2 | -4.6 | -5.8 | -7.0 | -7.9 |
| Cumulative balance of AEAs | | | -2.9 | -6.5 | -8.8 | -14.3 | -20.8 | -24.0 | -28.5 | -34.4 | -41.4 | -49.3 |
| ETS flexibility | 19.1 | Amount of ETS flexibility as per Commission Implementing Decision 2020/2126 and available over the 10-year period 2021-2030. | | | | | | | | | | |
| Maximum LULUCF flexibility | 26.8 | The availability of LULUCF flexibility depends on the amount of LULUCF credits generated under the LULUCF Regulation. The use of the available LULUCF flexibility is limited to 50% of the maximum amount of LULUCF flexibility in the period 2021-2025 and 50% of the maximum amount of LULUCF flexibility in the period 2026-2030. | | | | | | | | | | |
| **Italy** | | | | | | | | | | | | |
| Estimated AEAs | | | 273.5 | 268.8 | 259.4 | 250.1 | 240.7 | 244.3 | 231.7 | 219.1 | 206.5 | 193.9 |
| Emissions | | 343.1 | 279.9 | 271.5 | 266.6 | 262.6 | 252.1 | 246.6 | 234.9 | 223.9 | 213.8 | 203.7 |
| LULUCF debit (2021-2025) | Pursuant to Art 9(2) ESR, AEAs are reduced by the debit generated under the LULUCF Regulation in the period 2021-2025. See chapter 4 of the main report. | | | | | | | | | | | |
| Distance to target | | | -6.4 | -2.7 | -7.2 | -12.6 | -11.4 | -2.3 | -3.2 | -4.9 | -7.3 | -9.8 |
| Cumulative balance of AEAs | | | -6.4 | -9.2 | -16.4 | -28.9 | -40.3 | -42.6 | -45.8 | -50.7 | -58.0 | -67.7 |
| ETS flexibility | 0.0 | Amount of ETS flexibility as per Commission Implementing Decision 2020/2126 and available over the 10-year period 2021-2030. | | | | | | | | | | |
| Maximum LULUCF flexibility | 11.5 | The availability of LULUCF flexibility depends on the amount of LULUCF credits generated under the LULUCF Regulation. The use of the available LULUCF flexibility is limited to 50% of the maximum amount of LULUCF flexibility in the period 2021-2025 and 50% of the maximum amount of LULUCF flexibility in the period 2026-2030. | | | | | | | | | | |
| **Latvia** | | | | | | | | | | | | |
| Estimated AEAs | | | 10.6 | 8.9 | 8.6 | 8.4 | 8.2 | 8.0 | 7.8 | 7.6 | 7.3 | 7.1 |
| Emissions | | 8.6 | 8.7 | 8.4 | 8.3 | 7.8 | 7.7 | 7.5 | 7.3 | 7.2 | 7.0 | 6.8 |
| LULUCF debit (2021-2025) | Pursuant to Art 9(2) ESR, AEAs are reduced by the debit generated under the LULUCF Regulation in the period 2021-2025. See chapter 4 of the main report. | | | | | | | | | | | |
| Distance to target | | | 2.0 | 0.4 | 0.4 | 0.6 | 0.6 | 0.5 | 0.4 | 0.4 | 0.3 | 0.3 |
| Cumulative balance of AEAs | | | 2.0 | 2.4 | 2.8 | 3.4 | 3.9 | 4.5 | 4.9 | 5.3 | 5.6 | 5.9 |
| ETS flexibility | 0.0 | Amount of ETS flexibility as per Commission Implementing Decision 2020/2126 and available over the 10-year period 2021-2030. | | | | | | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Maximum LULUCF flexibility | 3.1 | The availability of LULUCF flexibility depends on the amount of LULUCF credits generated under the LULUCF Regulation. The use of the available LULUCF flexibility is limited to 50% of the maximum amount of LULUCF flexibility in the period 2021-2025 and 50% of the maximum amount of LULUCF flexibility in the period 2026-2030. | | | | | | | | | |
| **Lithuania** | | | | | | | | | | | |
| Estimated AEAs | | 16.1 | 13.7 | 13.3 | 12.9 | 12.4 | 12.6 | 12.0 | 11.5 | 10.9 | 10.3 |
| Emissions | 13.1 | 14.2 | 13.9 | 13.6 | 13.6 | 13.1 | 12.6 | 12.0 | 11.5 | 10.9 | 10.3 |
| LULUCF debit (2021-2025) | Pursuant to Art 9(2) ESR, AEAs are reduced by the debit generated under the LULUCF Regulation in the period 2021-2025. See chapter 4 of the main report. | | | | | | | | | | |
| Distance to target | | 1.9 | -0.2 | -0.3 | -0.8 | -0.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cumulative balance of AEAs | | 1.9 | 1.7 | 1.5 | 0.7 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.1 |
| ETS flexibility | 0.0 | Amount of ETS flexibility as per Commission Implementing Decision 2020/2126 and available over the 10-year period 2021-2030. | | | | | | | | | |
| Maximum LULUCF flexibility | 6.5 | The availability of LULUCF flexibility depends on the amount of LULUCF credits generated under the LULUCF Regulation. The use of the available LULUCF flexibility is limited to 50% of the maximum amount of LULUCF flexibility in the period 2021-2025 and 50% of the maximum amount of LULUCF flexibility in the period 2026-2030. | | | | | | | | | |
| **Luxembourg** | | | | | | | | | | | |
| Estimated AEAs | | 8.4 | 8.1 | 7.8 | 7.4 | 7.0 | 6.5 | 6.2 | 5.8 | 5.4 | 5.1 |
| Emissions | 10.1 | 8.1 | 7.1 | 6.9 | 6.7 | 6.4 | 6.0 | 5.6 | 5.3 | 4.9 | 4.5 |
| LULUCF debit (2021-2025) | Pursuant to Art 9(2) ESR, AEAs are reduced by the debit generated under the LULUCF Regulation in the period 2021-2025. See chapter 4 of the main report. | | | | | | | | | | |
| Distance to target | | 0.3 | 1.1 | 0.9 | 0.6 | 0.6 | 0.5 | 0.5 | 0.5 | 0.5 | 0.6 |
| Cumulative balance of AEAs | | 0.3 | 1.4 | 2.3 | 2.9 | 3.5 | 4.0 | 4.5 | 5.0 | 5.6 | 6.2 |
| ETS flexibility | 4.0 | Amount of ETS flexibility as per Commission Implementing Decision 2020/2126 and available over the 10-year period 2021-2030. | | | | | | | | | |
| Maximum LULUCF flexibility | 0.3 | The availability of LULUCF flexibility depends on the amount of LULUCF credits generated under the LULUCF Regulation. The use of the available LULUCF flexibility is limited to 50% of the maximum amount of LULUCF flexibility in the period 2021-2025 and 50% of the maximum amount of LULUCF flexibility in the period 2026-2030. | | | | | | | | | |
| **Malta** | | | | | | | | | | | |
| Estimated AEAs | | 2.1 | 1.2 | 1.2 | 1.1 | 1.1 | 1.2 | 1.1 | 1.0 | 0.9 | 0.8 |
| Emissions | 1.0 | 1.3 | 1.5 | 1.3 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| LULUCF debit (2021-2025) | Pursuant to Art 9(2) ESR, AEAs are reduced by the debit generated under the LULUCF Regulation in the period 2021-2025. See chapter 4 of the main report. | | | | | | | | | | |
| Distance to target | | 0.7 | -0.2 | -0.1 | -0.3 | -0.4 | -0.3 | -0.4 | -0.5 | -0.6 | -0.7 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cumulative balance of AEAs | | | 0.7 | 0.5 | 0.4 | 0.0 | -0.3 | -0.6 | -1.0 | -1.5 | -2.0 | -2.7 |
| ETS flexibility | 0.5 | Amount of ETS flexibility as per Commission Implementing Decision 2020/2126 and available over the 10-year period 2021-2030. | | | | | | | | | | |
| Maximum LULUCF flexibility | 0.0 | The availability of LULUCF flexibility depends on the amount of LULUCF credits generated under the LULUCF Regulation. The use of the available LULUCF flexibility is limited to 50% of the maximum amount of LULUCF flexibility in the period 2021-2025 and 50% of the maximum amount of LULUCF flexibility in the period 2026-2030. | | | | | | | | | | |
| **Netherlands** | | | | | | | | | | | | |
| Estimated AEAs | | | 98.5 | 96.7 | 92.9 | 89.2 | 85.4 | 79.8 | 76.5 | 73.2 | 69.9 | 66.6 |
| Emissions | | 128.1 | 92.9 | 84.8 | 84.1 | 88.3 | 87.6 | 85.8 | 84.0 | 82.2 | 80.4 | 78.6 |
| LULUCF debit (2021-2025) | | Pursuant to Art 9(2) ESR, AEAs are reduced by the debit generated under the LULUCF Regulation in the period 2021-2025. See chapter 4 of the main report. | | | | | | | | | | |
| Distance to target | | | 5.6 | 11.8 | 8.8 | 0.8 | -2.2 | -5.9 | -7.4 | -9.0 | -10.5 | -12.0 |
| Cumulative balance of AEAs | | | 5.6 | 17.4 | 26.3 | 27.1 | 24.9 | 19.0 | 11.6 | 2.6 | -7.9 | -19.8 |
| ETS flexibility | 0.0 | Amount of ETS flexibility as per Commission Implementing Decision 2020/2126 and available over the 10-year period 2021-2030. | | | | | | | | | | |
| Maximum LULUCF flexibility | 13.4 | The availability of LULUCF flexibility depends on the amount of LULUCF credits generated under the LULUCF Regulation. The use of the available LULUCF flexibility is limited to 50% of the maximum amount of LULUCF flexibility in the period 2021-2025 and 50% of the maximum amount of LULUCF flexibility in the period 2026-2030. | | | | | | | | | | |
| **Poland** | | | | | | | | | | | | |
| Estimated AEAs | | | 215.0 | 204.4 | 198.6 | 192.9 | 187.1 | 185.9 | 179.0 | 172.1 | 165.3 | 158.4 |
| Emissions | | 192.5 | 207.3 | 196.2 | 200.4 | 191.9 | 188.2 | 186.3 | 184.4 | 182.5 | 180.6 | 165.3 |
| LULUCF debit (2021-2025) | | Pursuant to Art 9(2) ESR, AEAs are reduced by the debit generated under the LULUCF Regulation in the period 2021-2025. See chapter 4 of the main report. | | | | | | | | | | |
| Distance to target | | | 7.7 | 8.1 | -1.8 | 1.0 | -1.0 | -0.4 | -5.4 | -10.3 | -15.3 | -6.9 |
| Cumulative balance of AEAs | | | 7.7 | 15.9 | 14.1 | 15.0 | 14.0 | 13.6 | 8.2 | -2.1 | -17.4 | -24.3 |
| ETS flexibility | 0.0 | Amount of ETS flexibility as per Commission Implementing Decision 2020/2126 and available over the 10-year period 2021-2030. | | | | | | | | | | |
| Maximum LULUCF flexibility | 21.7 | The availability of LULUCF flexibility depends on the amount of LULUCF credits generated under the LULUCF Regulation. The use of the available LULUCF flexibility is limited to 50% of the maximum amount of LULUCF flexibility in the period 2021-2025 and 50% of the maximum amount of LULUCF flexibility in the period 2026-2030. | | | | | | | | | | |
| **Portugal** | | | | | | | | | | | | |
| Estimated AEAs | | | 42.5 | 40.8 | 40.1 | 39.3 | 38.5 | 37.9 | 37.1 | 36.3 | 35.5 | 34.7 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Emissions | | 48.6 | 39.9 | 39.8 | 39.6 | 36.9 | 36.6 | 34.9 | 33.3 | 31.6 | 29.9 | 28.2 |
| LULUCF debit (2021-2025) | Pursuant to Art 9(2) ESR, AEAs are reduced by the debit generated under the LULUCF Regulation in the period 2021-2025. See chapter 4 of the main report. | | | | | | | | | | | |
| Distance to target | | | 2.6 | 1.0 | 0.4 | 2.4 | 1.9 | 3.0 | 3.9 | 4.8 | 5.6 | 6.5 |
| Cumulative balance of AEAs | | | 2.6 | 3.6 | 4.1 | 6.5 | 8.4 | 11.4 | 15.3 | 20.1 | 25.7 | 32.3 |
| ETS flexibility | 0.0 | Amount of ETS flexibility as per Commission Implementing Decision 2020/2126 and available over the 10-year period 2021-2030. | | | | | | | | | | |
| Maximum LULUCF flexibility | 5.2 | The availability of LULUCF flexibility depends on the amount of LULUCF credits generated under the LULUCF Regulation. The use of the available LULUCF flexibility is limited to 50% of the maximum amount of LULUCF flexibility in the period 2021-2025 and 50% of the maximum amount of LULUCF flexibility in the period 2026-2030. | | | | | | | | | | |
| **Romania** | | | | | | | | | | | | |
| Estimated AEAs | | | 87.9 | 76.9 | 75.8 | 74.8 | 73.7 | 76.9 | 74.8 | 72.6 | 70.5 | 68.3 |
| Emissions | | 78.2 | 82.8 | 81.4 | 81.2 | 80.4 | 75.1 | 74.6 | 73.4 | 71.8 | 69.8 | 66.3 |
| LULUCF debit (2021-2025) | Pursuant to Art 9(2) ESR, AEAs are reduced by the debit generated under the LULUCF Regulation in the period 2021-2025. See chapter 4 of the main report. | | | | | | | | | | | |
| Distance to target | | | 5.0 | -4.4 | -5.4 | -5.7 | -1.4 | 2.3 | 1.4 | 0.8 | 0.7 | 2.0 |
| Cumulative balance of AEAs | | | 5.0 | 0.6 | -4.8 | -10.4 | -11.8 | -9.5 | -8.1 | -7.3 | -6.6 | -4.6 |
| ETS flexibility | 0.0 | Amount of ETS flexibility as per Commission Implementing Decision 2020/2126 and available over the 10-year period 2021-2030. | | | | | | | | | | |
| Maximum LULUCF flexibility | 13.2 | The availability of LULUCF flexibility depends on the amount of LULUCF credits generated under the LULUCF Regulation. The use of the available LULUCF flexibility is limited to 50% of the maximum amount of LULUCF flexibility in the period 2021-2025 and 50% of the maximum amount of LULUCF flexibility in the period 2026-2030. | | | | | | | | | | |
| **Slovakia** | | | | | | | | | | | | |
| Estimated AEAs | | | 23.4 | 21.2 | 20.7 | 20.3 | 19.9 | 19.2 | 18.9 | 18.5 | 18.2 | 17.9 |
| Emissions | | 23.1 | 20.3 | 19.6 | 19.8 | 20.7 | 20.2 | 20.4 | 20.5 | 20.6 | 20.4 | 20.5 |
| LULUCF debit (2021-2025) | Pursuant to Art 9(2) ESR, AEAs are reduced by the debit generated under the LULUCF Regulation in the period 2021-2025. See chapter 4 of the main report. | | | | | | | | | | | |
| Distance to target | | | 3.1 | 1.5 | 0.9 | -0.4 | -0.3 | -1.2 | -1.6 | -2.0 | -2.2 | -2.6 |
| Cumulative balance of AEAs | | | 3.1 | 4.6 | 5.5 | 5.2 | 4.9 | 3.7 | 2.1 | 0.1 | -2.2 | -4.7 |
| ETS flexibility | 0.0 | Amount of ETS flexibility as per Commission Implementing Decision 2020/2126 and available over the 10-year period 2021-2030. | | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Maximum LULUCF flexibility | 1.2 | The availability of LULUCF flexibility depends on the amount of LULUCF credits generated under the LULUCF Regulation. The use of the available LULUCF flexibility is limited to 50% of the maximum amount of LULUCF flexibility in the period 2021-2025 and 50% of the maximum amount of LULUCF flexibility in the period 2026-2030. | | | | | | | | | | |
| **Slovenia** | | | | | | | | | | | | |
| Estimated AEAs | | | 11.4 | 11.1 | 10.8 | 10.5 | 10.2 | 9.8 | 9.5 | 9.3 | 9.0 | 8.7 |
| Emissions | | 11.8 | 10.4 | 10.8 | 10.1 | 10.2 | 10.1 | 9.9 | 9.6 | 9.4 | 9.1 | 8.4 |
| LULUCF debit (2021-2025) | | Pursuant to Art 9(2) ESR, AEAs are reduced by the debit generated under the LULUCF Regulation in the period 2021-2025. See chapter 4 of the main report. | | | | | | | | | | |
| Distance to target | | | 1.0 | 0.4 | 0.8 | 0.3 | 0.1 | -0.1 | -0.1 | -0.1 | -0.1 | 0.3 |
| Cumulative balance of AEAs | | | 1.0 | 1.4 | 2.1 | 2.4 | 2.5 | 2.4 | 2.3 | 2.2 | 2.1 | 2.4 |
| ETS flexibility | 0.0 | Amount of ETS flexibility as per Commission Implementing Decision 2020/2126 and available over the 10-year period 2021-2030. | | | | | | | | | | |
| Maximum LULUCF flexibility | 1.3 | The availability of LULUCF flexibility depends on the amount of LULUCF credits generated under the LULUCF Regulation. The use of the available LULUCF flexibility is limited to 50% of the maximum amount of LULUCF flexibility in the period 2021-2025 and 50% of the maximum amount of LULUCF flexibility in the period 2026-2030. | | | | | | | | | | |
| **Spain** | | | | | | | | | | | | |
| Estimated AEAs | | | 201.0 | 198.7 | 192.8 | 186.9 | 181.0 | 178.4 | 171.7 | 164.9 | 158.2 | 151.5 |
| Emissions | | 242.0 | 194.7 | 194.8 | 191.3 | 175.9 | 171.0 | 163.6 | 156.2 | 148.7 | 141.2 | 134.1 |
| LULUCF debit (2021-2025) | | Pursuant to Art 9(2) ESR, AEAs are reduced by the debit generated under the LULUCF Regulation in the period 2021-2025. See chapter 4 of the main report. | | | | | | | | | | |
| Distance to target | | | 6.3 | 3.8 | 1.5 | 11.0 | 10.0 | 14.8 | 15.5 | 16.2 | 17.0 | 17.4 |
| Cumulative balance of AEAs | | | 6.3 | 10.2 | 11.7 | 22.7 | 32.6 | 47.4 | 62.9 | 79.2 | 96.1 | 113.5 |
| ETS flexibility | 0.0 | Amount of ETS flexibility as per Commission Implementing Decision 2020/2126 and available over the 10-year period 2021-2030. | | | | | | | | | | |
| Maximum LULUCF flexibility | 29.1 | The availability of LULUCF flexibility depends on the amount of LULUCF credits generated under the LULUCF Regulation. The use of the available LULUCF flexibility is limited to 50% of the maximum amount of LULUCF flexibility in the period 2021-2025 and 50% of the maximum amount of LULUCF flexibility in the period 2026-2030. | | | | | | | | | | |
| **Sweden** | | | | | | | | | | | | |
| Estimated AEAs | | | 31.3 | 30.7 | 29.6 | 28.5 | 27.3 | 25.5 | 24.6 | 23.6 | 22.6 | 21.6 |
| Emissions | | 43.2 | 29.1 | 27.3 | 26.9 | 28.2 | 28.7 | 27.8 | 26.9 | 26.0 | 25.1 | 24.2 |
| LULUCF debit (2021-2025) | | Pursuant to Art 9(2) ESR, AEAs are reduced by the debit generated under the LULUCF Regulation in the period 2021-2025. See chapter 4 of the main report. | | | | | | | | | | |
| Distance to target | | | 2.3 | 3.4 | 2.7 | 0.2 | -1.4 | -2.2 | -2.3 | -2.4 | -2.5 | -2.6 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cumulative balance of AEAs | | 2.3 | 5.7 | 8.4 | 8.7 | 7.3 | 5.1 | 2.7 | 0.3 | -2.1 | -4.7 |
| ETS flexibility | 5.2 | Amount of ETS flexibility as per Commission Implementing Decision 2020/2126 and available over the 10-year period 2021-2030. | | | | | | | | | |
| Maximum LULUCF flexibility | 4.9 | The availability of LULUCF flexibility depends on the amount of LULUCF credits generated under the LULUCF Regulation. The use of the available LULUCF flexibility is limited to 50% of the maximum amount of LULUCF flexibility in the period 2021-2025 and 50% of the maximum amount of LULUCF flexibility in the period 2026-2030. | | | | | | | | | |

## BOX ON WASTE EMISSIONS

***Key messages***

- *While the waste sector accounts for 3% of total EU greenhouse gas (GHG) emissions, the better use of waste as a resource can help reduce emissions in other sectors.*
- *Member States should quantify and better integrate achieved and expected emission reductions of waste and circular economy policies.*
- *The consumption-based (non-territorial) impacts – in additional to territorial impacts – are sometimes key to understanding the potential of circular economy policies.*

**1. Scope of waste sector**

Achieving the EU's 2050 net-zero climate target demands actions across all economic sectors. These include actions related to materials and how we produce, use, re-circulate and dispose of them. We can track emissions of these actions under the *Waste management* sector in the officially reported GHG inventories[70]. The sector includes:

- solid waste disposal;
- biological treatment of solid waste;
- incineration and open burning of waste;
- wastewater treatment and discharge (further excluded from this box to keep focus on solid waste).

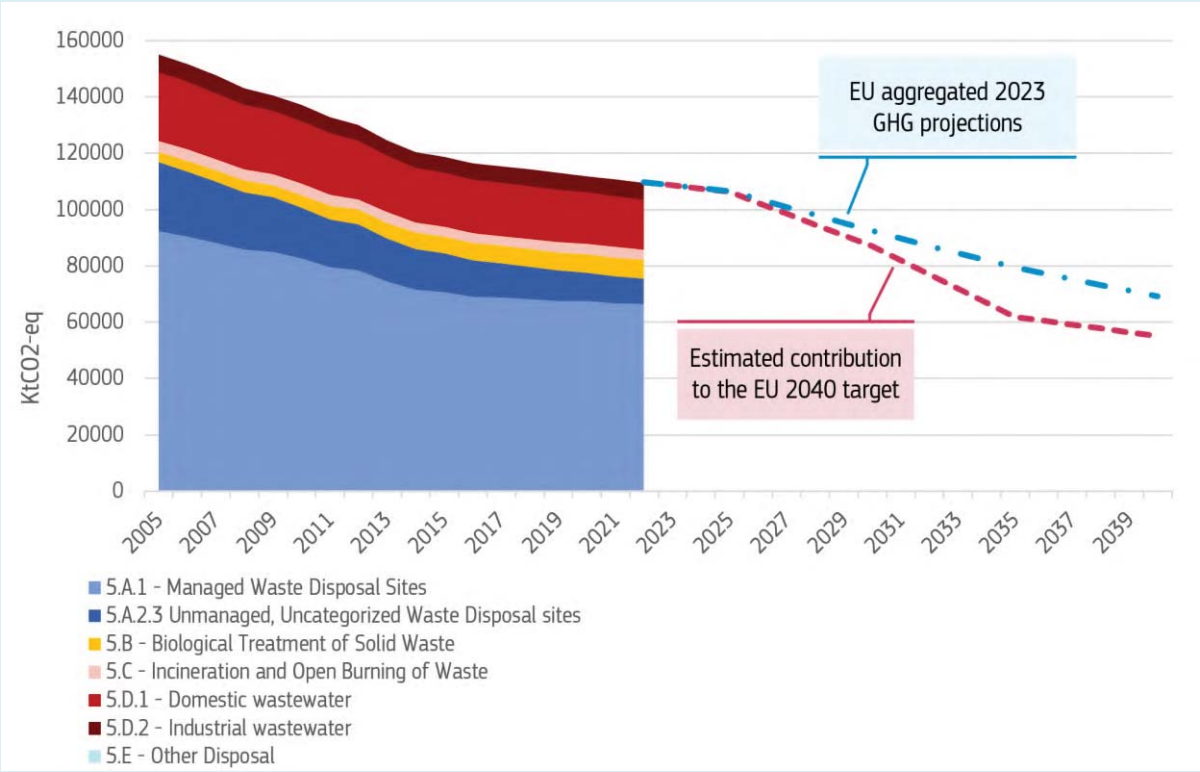
Emissions from energy recovery of waste, processing recycled materials and transporting waste are not reported in the waste sector but in the energy, manufacturing and transport sectors. Therefore, actual emissions generated by waste are in fact higher than reported waste emissions, which shows its cross-sectoral nature. This box focuses mainly on emissions from the waste sector, other aspects like environmental impacts (natural resources, pollution etc.) are not subject of this text.

**2. Waste emissions trends**

While the waste sector accounts for a small part of total EU greenhouse gas (GHG) emissions (i.e. about 3% of total GHG emissions and around 5% of the emissions covered by the EU Effort Sharing Regulation) reducing GHG emissions from waste also has positive effects on our lives and a better use of waste as a resource (by substituting virgin raw materials) can help reduce emissions in other sectors. In 2022, emissions were 30% below the level of 2005. Over the same period, emissions from solid waste disposal (currently representing more than 2/3 of waste emissions) declined by 35%, while wastewater treatment (close to a fifth of current waste emissions) were down by 23%, with a minor contribution from industrial wastewater (i.e. -5%). Conversely, the emissions from the biological treatment and from the open burning of solid waste have increased (i.e. by 86% and 32%, respectively). Waste sector emissions could decrease further once all current EU waste policies are fully implemented. The speed of reduction should slight increase, from an average annual reduction of around 2.7 MtCO2-eq to 2.9 MtCO2-eq up to 2030 and further increase to 3.2 MtCO2-eq between 2030 and 2040, according to the Commission analysis supporting the Communication on the 2040 target.

[70] Source sector CRF5 Waste management in IPCC 2006 Guidelines. Guidelines are available at Publications - IPCC-TFI (iges.or.jp).

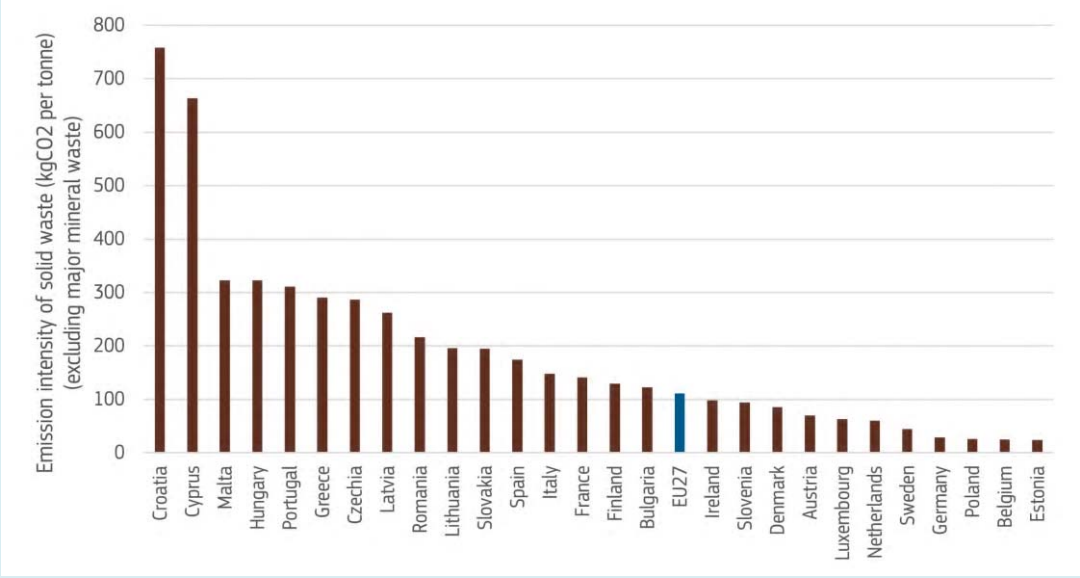
*Figure 8.1: EU GHG emissions from waste (2005 to 2022), by subsectors, plus GHG projections up to 2040 and model-based indicative contribution of the waste sector in achieving the EU climate target.*




**3. Behind emissions trends**

Emissions from waste are driven not only by waste generation but also by several other underlying factors ranging from the emission intensity and composition of the waste-to-waste treatment methods. First, we can look at emission intensity – emissions per tonne of solid waste. Since there is a strong correlation between emission intensity and total emissions, Members States should focus on the reduction of emission intensity of their waste management systems, bearing in mind that waste prevention and reduction should always be prioritized according to the waste hierarchy. The differences among Member States are substantial (see *Figure 8.2*). Croatia produces nearly seven times more GHG emissions per tonne of solid waste than the EU average. On the other hand, Estonia, Belgium, and Poland produce less than a quarter of the EU average.

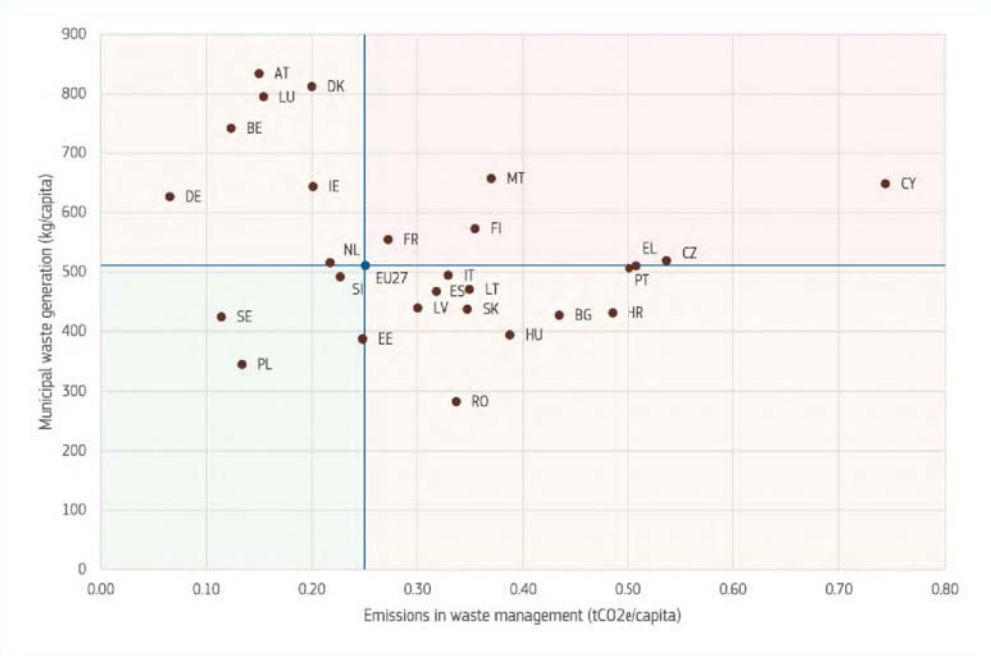
*Figure 8.2: Emission intensity of solid waste (kgCO2e/tonne) (average 2017-2021)*




A similar picture is visible if we look at GHG emissions per capita. Again, emissions per capita show visible differences. Cyprus emits three times more GHG per capita than EU average and eleven times more than Germany, which has the lowest emissions. On this matter, the EEA concludes that waste sector GHG emissions would decrease by 53% from the 2021 level if all Member States reduce their emissions just to the average per-capita emissions of five best performing countries (Germany, Sweden, Belgium, Poland and Austria).

If we combine emission intensity with waste generation, we get another interesting insight: there is no clear correlation between these two metrics (see *Figure 8.3*). Member States with the highest municipal waste production (Austria, Denmark) have below-average emissions. This indicates that despite the high volume of waste, their waste management is very effective in terms of GHG emissions. On the other hand, low volume of waste does not necessarily mean low emission. Romania could be a good example of this – it has the lowest municipal waste production, but emissions are above the EU average.

*Figure 8.3: Emissions in waste management and municipal waste generation*



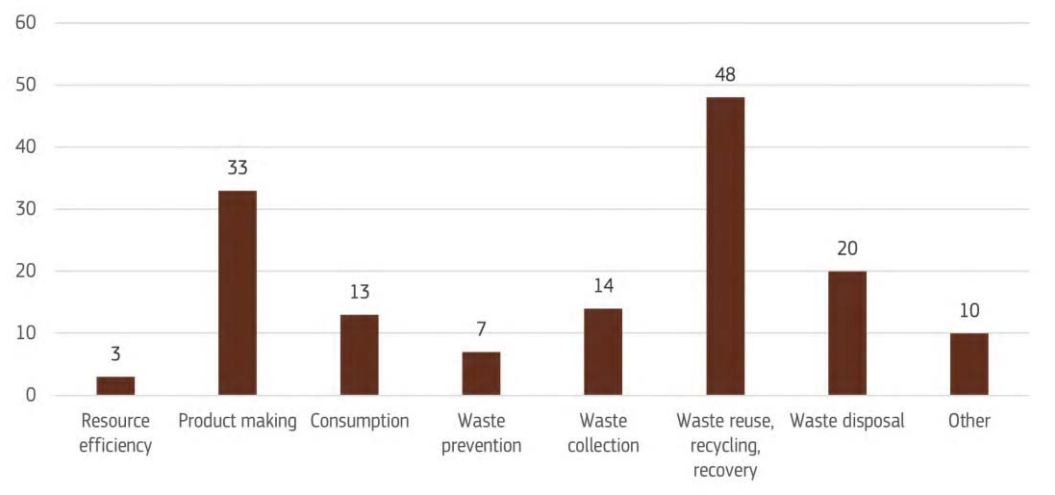
**4. Policies and measures**

In addition to and in implementation of relevant European directives such as the Waste Framework Directive, the Industrial Emissions Directive, and the Landfill Directive, EU Member States reported over 200 policies and measures related to the waste sector in 2023. These measures focus on various parts of the waste chain, including waste prevention, preparation for reuse, recycling, energy recovery, and, to a lesser extent, disposal; and were mostly linked to municipal waste and organic waste types - which are mostly linked with generating emissions from landfills and biological treatment.

Regulatory policies are the most commonly reported by Member States and most are linked to EU policy – specially the Waste Framework Directive and Landfill Directive; reflecting the substantial regulatory requirements in EU waste policy to be met by countries.

Only 15% of waste sector policies and measures have been reported with impact data (i.e., how effective they were at reducing GHG emission). Nearly all policies with impact data refer to the reduction of emissions from landfills. Furthermore, when comparing historical GHG emission data with implemented policies, there was a correlation between countries that had introduced landfill bans on landfilling biodegradable waste and achieving the largest waste sector emission reductions. Ireland is the only exception to this. It has a high landfill tax and targets specific waste streams through a national waste prevention programme while also achieving high emission reduction.

*Figure 8.4: Number of reported policies and measures by category (EU, 2023)*




**5. Circular economy in the spotlight**

The emissions reported under the waste sector focus on the direct reduction of emissions linked to less waste and better waste management. However, the emission reduction potential of a more circular economy – where the value of products and materials is retained for as long as possible – goes beyond just the waste sector.

The circular economy could reduce demand for virgin materials and thus reduce emissions of extraction and processing of these materials. However, emissions from these activities are reported under industry [71]. On the other hand, a higher share of renewable energy could reduce the impacts of energy-intensive parts of the circular economy such as material waste recovery. Total emissions can only be reduced through coordinated policies along the whole value chain from design, production, consumption, and waste reuse.

[71] Source sector CRF2 Industrial processes and product use in IPCC 2006 Guidelines. Guidelines are available at Publications - IPCC-TFI (iges.or.jp).

The circular economy has a cross-cutting character and is therefore considered a prerequisite for climate neutrality in the Circular Economy Action Plan [72].

The cross-cutting character has one significant difficulty. As indicated in the previous section, the potential emission reductions due to circular economy measures are usually unquantified, hidden, or poorly captured in the reporting of policies and measures for reducing GHG emissions (only 6% of reported policies are considered circular economy-related). For example, if glass waste is collected and processed into recyclables and used as secondary raw material in producing new glass, then the glass industry needs less energy than that used for producing the same glass from virgin materials. However, such processes are seldom reported as circular economy measures in the relevant manufacturing sector and their potential might be underestimated. Moreover, realising such potential requires collaboration along the whole value chain and across sectors.

In addition to the challenges faced by the cross-sectoral nature of circular economy-related policies and measures is their cross-border nature: materials consumed in one country may have been extracted in another. Therefore, the benefits of circular actions - from an emissions perspective - may not be entirely taking place within the national entity implementing the policy or measure. Consumption-based emission accounting can track how policies and measures effect GHG emissions across entire value chains and national entities. However, as international reporting focus on territorial-based emissions, it is not appropriate to incorporate this new logic into regular reporting. Nevertheless, to understand the full benefits of the circular economy in policy making it is an important additional step for Member States to undertake in their national policy assessments.

**Sources:**
EEA. Briefing no. 25/2023. Capturing the climate change mitigation benefits of circular economy and waste sector policies and measures EN HTML: TH-AM-24-002-EN-Q - ISBN: 978-92-9480-626-0 - ISSN: 2467-3196 - doi: 10.2800/512574.

[72] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: A new Circular Economy Action Plan For a cleaner and more competitive Europe. COM/2020/98 final

# 9 LULUCF

The revised **LULUCF regulation** sets two compliance periods:

- From 2021 to 2025: the assessment of Member States' progress is based on 'accounted' emissions and removals in the land sector, taking into account historical benchmarks for land use activities, such as the Forest Reference Level for sustainable forest management. Across all land categories, a Member State has to fulfil the 'no-debit' rule, meaning that the 'accounted' emissions do not exceed 'accounted' removals. If a Member State shows more accounted emissions than accounted removals, it has a 'debit' and is therefore not in line with the 'no-debit' rule. Conversely, if a Member State shows more accounted removals than accounted emissions, it has a 'credit' and therefore meets the 'no-debit' rule requirement. If the 'no-debit' rule is not met in a Member State, it will be able to use a number of flexibilities to compensate for the net debit (e.g. by purchasing credits from other Member States). If a net debit remains from the first compliance period, even after using all flexibilities, this debit will be moved to the ESR account of the Member State.
- From 2026 to 2030: the reporting rules are simplified and are based on the sum of reported emissions and removals in all land categories, with the historical benchmarks completely abolished. The revised EU target requires that the EU increases its land-based net removals by additional -42 $MtCO_2eq$ by 2030 as compared to the yearly average of the period 2016-2018. This target is then distributed among Member States by means of binding national targets for 2030 in a way that requires each Member State to increase their ambition in national agriculture and forestry policies[73].

There are several **flexibilities** Member States can make use of under the LULUCF Regulation. The **general flexibilities** include the flexibility with the ESR, as well as transfers of LULUCF surpluses among Member States. If a Member State fails to meet its LULUCF target or budget, it can deduct annual emission allocations under ESR and transfer them to LULUCF, up to the amount required to meet its target. If a Member State outperforms its LULUCF target and budget, it can transfer its LULUCF surplus to another Member State.

For the period 2021 to 2025, specifically, Member States have access to the **managed forest land flexibility mechanism**, subject to the EU as a whole meeting the 'no-debit' commitment. Member States can compensate excess accounted emissions from forest land provided they include measures to ensure conservation or the increase in forest sinks in their long-term strategies under the Governance Regulation, or they provide evidence of natural disturbances and plan measures to prevent or mitigate similar events in the future.

For the period 2026 to 2030, in addition to the general flexibilities, the **land use mechanism** can be used by Member States that do not meet their target, subject to the EU, as a whole, meeting its 2030 target. This includes compensation for natural disturbances as well as a flexibility due to the negative effects of long-term effects of climate change or the negative effects of an exceptionally high proportion of organic soils on land removals.

[73] Handbook on the updated LULUCF Regulation EU 2018/841 - Guidance and orientation for the implementation of the updated regulation - Version 2 (europa.eu)

***Table 9.1: LULUCF** accounted emissions and removals for 2021 and 2022 (2023 submission per Member State and land category), in $ktCO_2eq$* [74]

| Member State | Forest Management | Deforested Land | Afforested Land | Cropland Management | Grassland Management | Wetlands | Total (2021-2022) |
|---|---|---|---|---|---|---|---|
| AT | -8 088.9 | 2 650.9 | -2 829.9 | 908.4 | - 656.0 | | -8 015.5 |
| BE | - 465.3 | 1 509.6 | - 611.1 | 390.3 | - 170.9 | | 652.5 |
| BG | -8 300.6 | 100.8 | - 482.8 | 844.9 | 2 159.4 | | -5 678.4 |
| CY | 97.1 | 16.3 | - 35.5 | - 6.8 | 14.0 | | 85.1 |
| CZ | 23 749.1 | 505.1 | -1 129.7 | - 57.9 | - 305.4 | | 22 761.2 |
| DE | -21 887.8 | 1 308.1 | 303.6 | - 164.1 | -7 156.0 | - 135.2 | -27 731.4 |
| DK | -5 537.6 | 303.5 | -2 679.4 | -5 932.4 | 109.4 | | -13 736.5 |
| EE | 83.2 | 671.2 | - 509.3 | 1 242.3 | 177.7 | | 1 665.2 |
| ES | -3 678.6 | 2 704.6 | -19 448.8 | -7 538.7 | 178.9 | | -27 782.7 |
| FI | 17 329.4 | 5 486.8 | - 328.1 | 1 851.4 | - 143.2 | | 24 196.4 |
| FR | 62 049.7 | 28 422.2 | -23 117.2 | -15 765.2 | 4 053.0 | | 55 642.5 |
| GR | 685.3 | 89.0 | - 85.0 | -1 364.4 | -3 333.0 | | -4 008.1 |
| HR | -2 867.3 | 48.9 | - 479.0 | 20.3 | - 233.8 | | -3 510.9 |
| HU | -8 503.3 | 622.4 | -2 204.0 | 734.3 | 366.1 | | -8 984.6 |
| IE | 828.0 | 382.2 | -6 195.0 | - 219.3 | - 758.8 | -2 403.9 | -8 366.8 |
| IT | -7 400.5 | 3 938.5 | -8 438.6 | - 162.0 | 4 299.1 | | -7 763.7 |
| LT | -3 111.0 | 148.6 | -2 399.2 | -3 024.1 | 1 505.1 | | -6 880.6 |
| LU | - 474.9 | 29.6 | - 21.4 | - 72.9 | 53.5 | | - 486.1 |
| LV | -3 090.5 | 2 427.1 | - 445.9 | 127.6 | - 144.4 | | -1 126.1 |
| MT | 0.1 | - 0.7 | - 0.3 | - 14.9 | 1.6 | | - 14.3 |
| NL | 916.3 | 1 653.4 | -1 297.5 | -2 011.1 | -2 077.6 | | -2 816.5 |
| PL | -5 502.7 | 3 741.4 | -3 556.3 | -1 510.5 | 354.4 | | -6 473.8 |
| PT | 20 681.7 | 1 903.5 | -3 110.9 | -1 338.4 | -2 750.9 | | 15 384.9 |
| RO | -10 243.6 | 2 318.6 | -3 101.9 | -26 134.8 | -7 860.0 | | -45 021.8 |
| SE | -18 700.2 | 5 335.6 | -1 144.8 | 577.5 | 335.3 | | -13 596.7 |

[74] Computation of the accounting status for each Member State and the EU. The method continued the approach applied under the Kyoto Protocol period (2013 to 2020). However, the accounting approach for the period 2021 to 2025 is new and differs from the Kyoto exercise. The accounting follows the specifications laid out in Regulation 2018/841: Article 2, 4, 5, 6, 7 8 and 9. The input data for this analysis has been extracted from the EU Greenhouse Gas Inventory Report 2024 for 1990-2022 based on final Member States' inventory submissions under the EU Governance Regulation (GHGI). The computation of accounting results combines the relevant data from the final GHGI in accordance with the rules laid out in the above articles (Reported data for the years 2005 to 2009 and 2021-2022, from Section 4 of the GHGI). This analysis provides an approximate estimate of the status of a Member State's trend towards compliance with its article 4(1) commitment. It also provides a collective status of achievement of the article 4 commitment, an element that is needed to determine if the flexibility through article 13 of the regulation is available (See Regulation 2018/841 Art 13(2)(b)). Numbers in table rounded up. Calculations cover emissions and removals of the greenhouse gases listed in Section A of Annex I to Regulation 2018/841

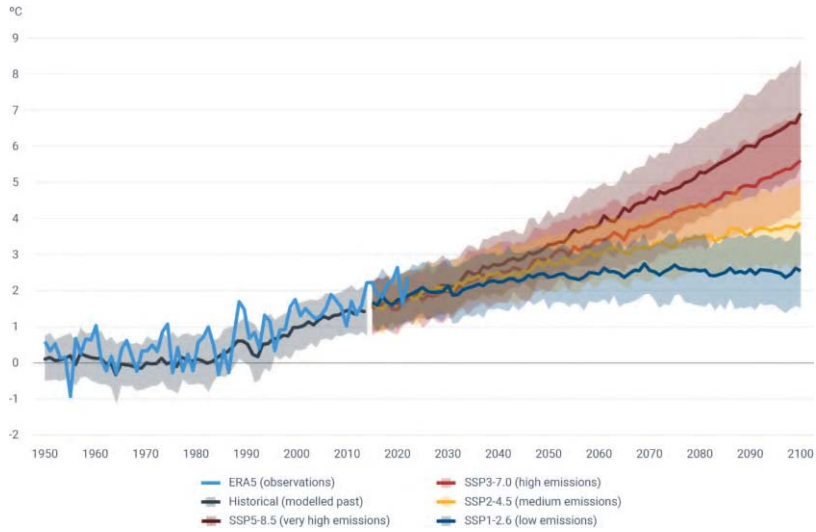
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **SI** | 6 157.2 | 649.4 | - 254.6 | - 66.5 | 208.0 | | 6 693.5 |
| **SK** | -3 061.8 | 115.9 | - 683.1 | - 181.4 | 504.7 | | -3 305.7 |
| **EU** | | | | | | | -68 218.9 |

# 10 PREPAREDNESS FOR AND RESILIENCE TO CLIMATE IMPACTS

## 10.1 EUROPEAN CLIMATE RISK ASSESSMENT (EUCRA)

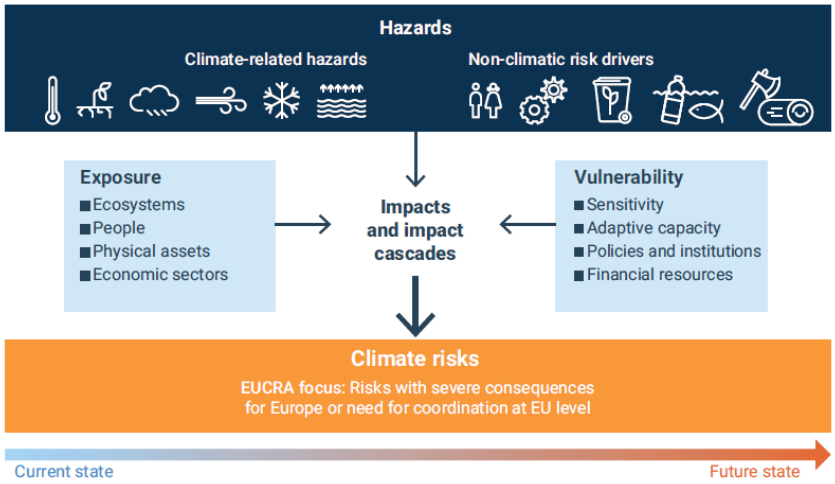
Climate hazards will continue to increase in the coming decades and beyond due to the inertia of the climate system, even if ambitious global emission cuts reduce the potential damage. In the best-case scenario where we limit global warming to 1.5 degrees above pre-industrial levels, Europe will have to learn to live with climate that is 3 degrees warmer, and consequently cope with exponentially more heatwaves and other weather extremes.

***Figure 10.1:*** *Observed and projected temperature increase over European land area*



The fact that climate hazards interact with non-climatic risk drivers underlines the need for systems-approaches.

***Figure 10.2:*** *Methodological framework of EUCRA* [75]




[75] Source: EEA.

Granular assessment of changes in climate impact drivers is the basis for considering climate risks.

***Table 10.1:*** *Projected change in climate impact drivers in Europe*

| | | Northern Europe | | Western Europe | | Central-eastern Europe | | Southern Europe | |
|---|---|---|---|---|---|---|---|---|---|
| | | SSP1-2.6 (low emissions) | SSP3-7.0 (high emissions) | SSP1-2.6 (low emissions) | SSP3-7.0 (high emissions) | SSP1-2.6 (low emissions) | SSP3-7.0 (high emissions) | SSP1-2.6 (low emissions) | SSP3-7.0 (high emissions) |
| Heat and cold | Mean temperature | ↑ | ↑↑ | ↑ | ↑↑ | ↑ | ↑↑ | ↑↑↑ | ↑↑↑ |
| | Cooling degree days | ↑ | ↑↑ | ↑↑ | ↑↑↑ | ↑↑ | ↑↑↑ | ↑↑↑ | ↑↑↑ |
| | Heating degree days | ↓ | ↓↓ | ↓ | ↓↓ | ↓ | ↓↓ | ↓↓ | ↓↓↓ |
| | Frost days | ↓ | ↓↓↓ | ↘ | ↓ | ↓ | ↓ | ↓ | ↓↓ |
| | Daily minimum temperature | ↑ | ↑↑↑ | ↑↑ | ↑↑↑ | ↑ | ↑↑ | ↑↑↑ | ↑↑↑ |
| | Daily maximum temperature | ↑ | ↑↑ | ↑ | ↑↑ | ↑ | ↑↑ | ↑↑↑ | ↑↑↑ |
| | Heatwave days | ↑↑↑ | ↑↑↑ | ↑↑ | ↑↑↑ | ↑↑↑ | ↑↑↑ | ↑↑↑ | ↑↑↑ |
| Wet and dry | Total precipitation | ↗ | ↗ | ⤮ | ⤮ | ⤮ | ⤮ | ↘ | ↘ |
| | Heavy precipitation (1 day) | ↗ | ↑ | ↗ | ↑ | ↗ | ↗ | ↗ | ↗ |
| | Heavy precipitation (5 days) | ↗ | ↗ | ↗ | ↗ | ↗ | ↗ | ⤮ | ⤮ |
| | Consecutive dry days | ⤮ | ↗ | ↗ | ↗ | ↗ | ↗ | ↗ | ↗ |
| | Meteorological drought | ↘ | ↘ | ⤮ | ⤮ | ⤮ | ↘ | ↗ | ↗ |
| | Agricultural drought | ⤮ | ↘ | ↗ | ↗ | ↗ | ↗ | ↑ | ↑ |
| Wind | Mean wind speed | ↘ | ↘ | ↓ | ↘ | ↓ | ↓ | ↘ | ↘ |
| Snow and ice | Snowfall | ↓ | ↓ | ↘ | ↓ | ↘ | ↓ | ↘ | ↓ |

| | Baltic Sea | | Black Sea | | Mediterranean Sea | | North-east Atlantic Ocean | |
|---|---|---|---|---|---|---|---|---|
| | SSP1-2.6 (low emissions) | SSP3-7.0 (high emissions) | SSP1-2.6 (low emissions) | SSP3-7.0 (high emissions) | SSP1-2.6 (low emissions) | SSP3-7.0 (high emissions) | SSP1-2.6 (low emissions) | SSP3-7.0 (high emissions) |
| **Acidity (pH) of seawater** | -0.09 | -0.15 | -0.08 | -0.13 | -0.08 | -0.12 | -0.1 | -0.15 |
| **Sea ice cover** | -2.3 | -3.2 | 0 | 0 | 0 | 0 | -2.5 | -3 |
| **Sea surface temperature** | 1.1 | 1.6 | 1.1 | 1.4 | 0.9 | 1.3 | 0.6 | 0.9 |
| **Relative sea level rise** | 0.05 | 0.07 | 0.19 | 0.2 | 0.22 | 0.24 | 0.18 | 0.19 |

**High agreement:** at least 80% of models of each ensemble show a positive change

**Low agreement:** at least 50% of models of each ensemble show a positive change

**No agreement:** ensembles disagree on the direction of change

**Low agreement:** at least 50% of models of each ensemble show a negative change

**High agreement:** at least 80% of models of each ensemble show a negative change

↑↑↑ increase above 3 standard deviations

↑↑ increase above 2 standard deviations

↑ increase above 1 standard deviation

↗ increase above 0.25 standard deviations

⤮ limited change between 0.25-0.25 standard deviations

↘ decrease below -0.25 standard deviations

↓ decrease below 1 standard deviation

↓↓ decrease below 2 standard deviations

↓↓↓ decrease below 3 standard deviations

**Notes:** Summary of confidence in the direction of projected change in climate impact drivers (colour coding), representing their aggregate characteristic changes for mid-century (2041-2060, in reference to the period 1995-2014) for ensemble-scenario combinations CMIP6 SSP1-2.6, CMIP5 RCP2.6, CORDEX-EUR (0.11°x0.11°) RCP2.6 and CMIP6 SSP3-7.0 within each EUCRA region. Arrows shown are based on detrended standard deviation (1995-2014) multiples and on median changes of the CMIP6 ensemble. A standard deviation of 0.25, 1, 2, 3 corresponds to a moderate, strong, very strong, severe increase/decrease in the text. Values shown are ensemble median changes, except for sea level rise which are ensemble mean changes. Ensemble agreement is not available for sea level rise. Underlying climate variables are: heatwave days (days with bias-adjusted maximum temperatures above 35°C), meteorological drought (standardised precipitation index for 6 months cumulation period), agricultural drought (standardised precipitation evapotranspiration index for 6 months cumulation period).

**Source:** Author's compilation based on data from C3S, 2023h.

A structured risk assessment considers climate hazards, exposure and vulnerability, as well as policy readiness.

***Table 10.2:*** *Risk assessment for 36 major climate risks for Europe*[76]

| Climate risks | Urgency to act | Risk severity | | | Policy characteristics | | |
|---|---|---|---|---|---|---|---|
| | | Current | Mid-century | Late century (low/high warming scenario) | Policy horizon | Policy readiness | Risk ownership |
| **Ecosystems** | | | | | | | |
| Coastal ecosystems | | +++ | +++ | +++ | Medium | Medium | Co-owned |
| Marine ecosystems | | +++ | +++ | ++ | Medium | Medium | EU |
| Biodiversity/carbon sinks due to wildfires (hotspot region: southern Europe) | | +++ | ++ | ++ | Medium | Medium | Co-owned |
| Biodiversity/carbon sinks due to wildfires | | +++ | ++ | ++ | Medium | Medium | Co-owned |
| Biodiversity/carbon sinks due to droughts and pests | | +++ | ++ | ++ | Long | Medium | Co-owned |
| Species distribution shifts (*) | | +++ | ++ | ++ | Medium | Medium | Co-owned |
| Ecosystems/society due to invasive species | | +++ | ++ | ++ | Medium | Medium | Co-owned |
| Aquatic and wetland ecosystems | | +++ | ++ | ++ | Medium | Medium | Co-owned |
| Soil health (*) | | +++ | ++ | ++ | Medium | Medium | Co-owned |
| Cascading impacts from forest disturbances | | + | + | + | Long | Medium | Co-owned |
| **Food** | | | | | | | |
| Crop production (hotspot region: southern Europe) | | +++ | ++ | ++ | Short | Medium | Co-owned |
| Crop production | | +++ | ++ | ++ | Short | Medium | Co-owned |
| Food security due to climate impacts outside Europe (*) | | ++ | ++ | + | Short | Medium | EU |
| Food security due to higher food prices | | ++ | + | + | Short | Medium | Co-owned |
| Fisheries and aquaculture | | ++ | + | + | Short | Medium | Co-owned |
| Livestock production | | ++ | ++ | + | Short | Medium | Co-owned |
| **Health** | | | | | | | |
| Heat stress – general population | | +++ | +++ | +++ | Long | Medium | National |
| Population/built environment due to wildfires (hotspot region: southern Europe) | | +++ | +++ | +++ | Medium | Medium | Co-owned |
| Population/built environment due to wildfires | | +++ | ++ | ++ | Medium | Medium | Co-owned |
| Wellbeing due to non-adapted buildings (**) | | ++ | ++ | ++ | Long | Medium | Co-owned |
| Heat stress – outdoor workers (hotspot region: southern Europe) | | +++ | +++ | +++ | Short | Medium | Co-owned |
| Heat stress – outdoor workers | | +++ | +++ | +++ | Short | Medium | Co-owned |
| Pathogens in coastal waters | | + | + | + | Medium | Medium | Co-owned |
| Health systems and infrastructure | | +++ | ++ | ++ | Medium | Medium | National |
| Infectious diseases | | +++ | ++ | ++ | Short | Advanced | Co-owned |

[76] Source : EEA

| Climate risks | Urgency to act | Risk severity | | | Policy characteristics | | |
|---|---|---|---|---|---|---|---|
| | | Current | Mid-century | Late century (low/high warming scenario) | Policy horizon | Policy readiness | Risk ownership |
| **Infrastructure** | | | | | | | |
| Pluvial and fluvial flooding | Urgent action needed | +++ | +++ | ++ | Long | Medium | Co-owned |
| Coastal flooding | More action needed | +++ | +++ | +++ | Long | Advanced | Co-owned |
| Damage to infrastructure and buildings (*) | More action needed | ++ | ++ | ++ | Long | Medium | Co-owned |
| Energy disruption due to heat and drought (hotspot region: southern Europe) | More action needed | ++ | ++ | ++ | Medium | Medium | Co-owned |
| Energy disruption due to heat and drought | Further investigation | ++ | ++ | + | Medium | Medium | Co-owned |
| Energy disruption due to flooding | Further investigation | ++ | ++ | ++ | Long | Advanced | Co-owned |
| Marine transport | Further investigation | ++ | ++ | ++ | Medium | Medium | Co-owned |
| Land-based transport | Further investigation | ++ | ++ | ++ | Medium | Medium | Co-owned |
| **Economy and finance** | | | | | | | |
| European solidarity mechanisms | Urgent action needed | +++ | ++ | ++ | Short | Medium | Co-owned |
| Public finances | More action needed | ++ | ++ | ++ | Medium | Medium | Co-owned |
| Property and insurance markets | More action needed | ++ | ++ | ++ | Medium | Medium | Co-owned |
| Population/economy due to water scarcity (hotspot region: southern Europe) | More action needed | ++ | ++ | ++ | Medium | Medium | Co-owned |
| Population/economy due to water scarcity | Further investigation | ++ | ++ | ++ | Medium | Medium | Co-owned |
| Pharmaceutical supply chains (') | Further investigation | ++ | + | + | Short | Medium | EU |
| Supply chains for raw materials and components (') | Further investigation | ++ | ++ | ++ | Short | Medium | EU |
| Financial markets | Further investigation | + | + | + | Short | Medium | Co-owned |
| Winter tourism | Further investigation | +++ | +++ | ++ | Medium | Advanced | National |

**Legends and notes**

**Urgency to act**
- Urgent action needed
- More action needed
- Further investigation
- Sustain current action
- Watching brief

**Risk severity**
- Catastrophic
- Critical
- Substantial
- Limited

**Confidence**
Low: +
Medium: ++
High: +++

(') Wide range of evaluations by authors and risk reviewers.
(*) Urgency based on high warming scenario (late century).

EUCRA risk assessments make it possible to identify key considerations for EU policies.

***Table 10.3:*** *EU policies with high adaptation potential, based on their links to major climate risks* [77].

| EU policies with high adaptation potential | No. of major risks linked to policy |
|---|---|
| Biodiversity strategy for 2030 | 11 |
| Critical Entities Resilience Directive | 9 |
| Proposed nature restoration law (not yet adopted) | 8 |
| Farm to fork strategy | 8 |
| Common agricultural policy | 8 |
| Union Civil Protection Mechanism | 8 |
| Water Framework Directive | 7 |
| Birds Directive and Habitats Directive | 7 |
| Forest strategy | 7 |
| Floods Directive | 6 |
| Renovation wave | 6 |
| Energy Performance of Buildings Directive and Energy Efficiency Directive | 6 |
| Corporate Sustainability Due Diligence Directive | 5 |
| Corporate Sustainability Reporting Directive | 5 |
| EU4Health | 5 |
| EU Solidarity Mechanism: Social Cohesion Fund | 5 |
| Marine Strategy Framework Directive | 4 |

**Notes:** This table includes legal instruments (e.g. EU directives), non-legal instruments (e.g. strategies) and funding mechanisms, based on their mentions in EUCRA factsheets and storylines.

[77] Source: EEA.

## 10.2 THE EU MISSION ON ADAPTATION TO CLIMATE CHANGE

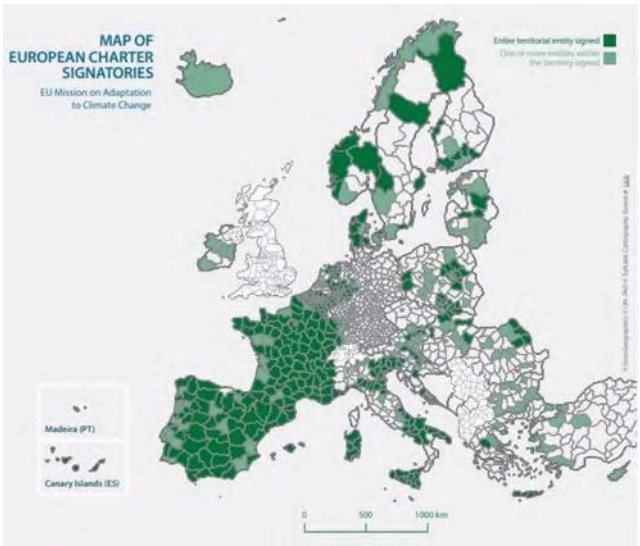
In the face of unprecedented challenges posed by climate change, the EU has embarked on an ambitious journey towards a sustainable and resilient future. The EU Mission on Adaptation to Climate Change under Horizon Europe, the EU's key funding programme for research and innovation, is a significant pillar in this transformative endeavour. Supporting European regions, cities, and local authorities in their efforts to build resilience against the impacts of climate change, the Mission aims to support at least 150 European regions and communities in their work to achieve climate resilience by 2030.



The Mission provides broad support to European regions, local authorities, and communities in preparing and planning climate resilience solutions. This support includes the Mission Portal, an online platform which provides data, knowledge, and decision-making support; showcases success stories; and informs on webinars, news and events related to the Mission.

### Mission Charter signatories

EU countries, regions and cities have an essential role to play in implementing the Mission, because they are key agents of change in deploying new technologies and experimenting innovative solutions that address regional and local needs. Regional and local authorities that share the Mission's ambition have signalled their interest in signing the Mission Charter and joining the Mission. They have declared their interest and readiness to cooperate, mobilise resources and develop activities in their respective region and communities to achieve their adaptation goals.




Other entities, such as research institutions,

academics, practitioners, or businesses, have been invited to endorse the Charter and join the Mission's network of organisations working together towards climate resilience as Friends of the Mission.

The 311 signatories of the Mission Charter as of autumn 2024 include: 294 EU regions and local authorities from 25 EU Member States; and 17 regions and local authorities from Horizon Europe's Associated Countries. There are an additional 63 Friends of the Mission.

**Mission projects**

The Charter signatories, Friends of the Mission and wider European regions and local authorities are supported by 43 Mission-funded projects and well over 100 Mission-related projects. These projects are at the forefront of research and development in innovative climate adaptation and resilience approaches. They go beyond theory by delivering practical and tangible outcomes through guidance, tools, data, and on-the-ground experimentation, and by implementing solutions identified in the Mission case studies. By providing essential resources through its centralised implementation platform, MIP4Adapt[78], and the Mission projects, the Mission empowers regional and local authorities to accelerate their climate preparedness.


***Project CLIMAAX - Better understanding climate risk at the regional level*** [79]

The EU-funded CLIMAAX project embodies the urgency of supporting cities and regions in carrying out accurate risk assessments as this is critical to building up the EU's resilience to climate change. Many European regions and communities have limited experience in and resources for integrating the available local and global data, models and concepts into context-specific climate risk assessments. The CLIMAAX project addresses this issue.

[78] https://climate-adapt.eea.europa.eu/en/mission/the-mission/about-mip4adapt
[79] https://www.climaax.eu/

### A toolbox for climate resilience

The project is built on three key elements:

- a framework for regional risk assessments, which can be applied anywhere and takes into account diverse conditions and challenges on the ground;
- a free, open and pan-European toolbox designed to enable regions to access European data sets and overlay these with their own local data; and
- funding to carry out regional risk assessments, using CLIMAAX tools.

***Project RESIST - Accelerating the delivery of climate adaptation solutions*** [80]

Every city faces its own unique climate risks. By pairing regions across Europe, the EU-funded RESIST project aims to share best practices and solutions for building resilience against climate change impacts. The impact of climate change is already being felt: from flooding in Spain to wildfires in Greece and scorching heatwaves across much of Europe. The RESIST project is focused on providing climate change solutions geared towards specific regions, cities and local authorities, which each have their own unique socio-economic profile and are facing climate-related challenges such as floods, droughts, heatwaves, wildfires and soil erosion.

### Multistranded approach

The project applies the 'quintuple helix' innovation model, which emphasises the role of interactions between academia, business, government, citizens and the environment. The project's management is confident that this approach will result in over 100 new and innovative climate adaptation solutions being developed during the project. The innovations, which will be developed with the support of the project's research and industry partners, will be tested in four EU regions: South-West Finland, Central Denmark, Catalonia and Central Portugal. The knowledge and adaptation pathways tested in these leading regions will then be transferred to eight twinned regions through mutual-learning activities and digital twins.

### Mission solutions

Mission solutions support regions and local authorities in their adaptation work. Regional and local authorities need to quickly identify, plan and implement relevant adaptation measures to combat the impact of climate change. Some measures may need to be implemented over many years due to their scope and scale and the time they may take to deliver benefits (as illustrated by the length of time it takes for a tree to grow and cast shade). The Adaptation Stories showcase the successful implementation of climate adaptation solutions in regions of Europe that other regions may wish to replicate. They demonstrate the power of cooperation and innovative approaches to addressing climate challenges and creating a more resilient and sustainable future for Europe. The European Commission Risk Data Hub, supports the implementation of the Mission on Adaptation, through serving as a centralized platform for collecting, harmonizing, and disseminating regional climate related hazard, loss and risk data.

[80] https://resist-project.eu/

## 10.3 ADAPTATION STORIES

The Adaptation Stories [81] showcase real-life examples of regional or local actions and good practices in planning, funding, implementing, and monitoring climate adaptation solutions. They are intended to inspire others to act on climate adaptation - an example: Zagreb where green infrastructure and nature-based solutions have been deployed widely to deal with heat waves in the context of urbanisation and climate change.


## 10.4 THE EU MISSION ADAPTATION COMMUNITY

The Mission's Community of Practice [82] facilitates the exchange of knowledge and experiences and strengthens coordination and collaboration between diverse adaptation practitioners. Its membership comprises regional and local authorities that are Charter signatories; Mission projects; regional and local authorities participating in the implementation of Mission projects; the Commission and other EU institutions; national authorities; and Friends of the Mission [83].


[81] Adaptation stories (europa.eu)

[82] https://futurium.ec.europa.eu/en/eu-mission-adaptation-community

[83] Other useful links: https://climate-adapt.eea.europa.eu/en/mission
https://climate-adapt.eea.europa.eu/en/mission/news/news/eu-mission-on-adaptation-to-climate-change-releases-new-report-showcasing-progress-and-priorities

# 11 COMMISSION'S ASSESSMENT OF LONG-TERM STRATEGIES

Stable long-term strategies are a key element in the preparation of the economic transformation needed to achieve climate neutrality by 2050. Long-term strategies show the opportunities for transforming our economy, allow the national discussions to mature, build trust within our society and send clear signals to guide investors while raising awareness and ownership of the transformation needed.

The **Governance Regulation** [84] sets out a process for the Member States to prepare, by 1 January 2020, their first long-term strategies with a perspective of at least 30 years, and new strategies by 1 January 2029 and every 10 years thereafter. Where necessary, Member States should update those strategies every five years.

Since 2021, in line with Article 15(9) of the Governance Regulation, the Commission has regularly assessed whether the national long-term strategies are adequate for the collective achievement of the objectives and targets of the Energy Union and provide information on any remaining collective gap. The main conclusions and the relevant analysis have been included in the staff working document accompanying the annual Climate Action Progress Reports. In its last assessment (2023 Climate Action Progress Report) [85] the Commission concluded that:

> *'Whereas most of the national strategies received to date reflect the ambition to be climate neutral by 2050, they do not yet allow to conclude that the long-term strategies are adequate for the collective achievement of the objectives and targets of the Energy Union. A rough estimate based on the submitted national long-term strategies […] points to a reduction of GHG emissions of around 85% by 2050 for the EU as a whole. […] Providing more detailed information on any remaining collective gap would have required a more complete and detailed set of strategies. Member States are therefore encouraged to consider updating and, where needed, to increase both the ambition and the quality of their national long-term strategies.'*

The Commission has also enforced the EU law against failure to submit national long-term strategies. In September 2022, in view of the substantial delay of Bulgaria, Ireland, Poland and Romania in notifying their national long-term strategies under the Governance Regulation, the Commission opened formal infringement proceedings and sent letters of formal notice to these countries [86]. The proceedings have since been closed for Bulgaria, Ireland and Romania [87], following the submission of their strategies, but the infringement proceeding against Poland is ongoing. The Commission will consider the next steps according to further developments. Based

[84] Article 15 of Regulation (EU) 2018/1999.

[85] https://climate.ec.europa.eu/document/download/60a04592-cf1f-4e31-865b-2b5b51b9d09f_en

[86] On 22 September 2022, the Commission sent letters of formal notice to Bulgaria (INFR(2022)2086), Ireland (INFR(2022)2088), Poland (INFR(2022)2089) and Romania (INFR(2022)2090) under Regulation (EU) 2018/1999.

[87] The infringement proceedings for Ireland and Romania were closed in Decembre 2023 and in February 2024, respectively.

on its reply to the Commission's letter, Poland appears to be intending to submit its long-term strategy by the end of 2024.

Since October 2022, two additional Member States, Ireland and Romania, have submitted their long-term strategy to the Commission [88]. Both strategies define a clear goal of achieving climate neutrality by 2050. Romania's long-term strategy presents alternative scenarios, including a pathway to approach climate neutrality by 2050, although the removal of the remaining 1% (3 MtCO2-eq) of GHG emissions by 2050 is subject to further analysis. In July 2024, Ireland submitted an updated version of its national long-term strategy. This presents more detailed future emissions pathways, including for the agriculture and LULUCF sectors, but also allows flexibility to account for the fact that optimal pathways will evolve over time.

Overall, by October 2024, all the Member States, except Poland, had submitted their long-term strategies required by the Governance Regulation. Of these, 16 Member States [89] clearly expressed their aim to achieve climate neutrality or carbon neutrality [90] by 2050 or before [91]. Others aim to be largely climate neutral [92] or to achieve reductions of 80-95% by 2050. However, only 10 Member States have reported legally binding goals or targets [93]. Two third of the strategies have been supported by quantitative projections based on different modelling scenarios. The associated emissions reductions may be consistent with the delivery of the specified goals, but this is not always clearly stated. Likewise, where a target has been set, it is not always clear if it is legally binding.

The national long-term strategies also provide useful information at sectoral level that allows strengths and remaining challenges to be identified and recognised. However, coverage varies significantly between Member States or there is a lack of details on the precise scope, particularly on the expected role of land use and removals (see Table 11.1). In this respect, it is worth mentioning that the current LULUCF Regulation provides that Member States may use the managed forest land flexibility only if their long-term strategy includes ongoing or planned specific measures to ensure the conservation or enhancement of forest sinks and reservoirs [94].

[88] A summary of the submitted strategies can be found in the links below, for Ireland and Romania, respectively: https://ec.europa.eu/clima/sites/lts/lts_ie_summary_en.pdf https://ec.europa.eu/clima/sites/lts/lts_ro_summary_en.pdf.

[89] Denmark, Ireland, Spain, France, Italy, Latvia, Lithuania, Luxembourg, Hungary, Austria, Portugal, Romania, Slovenia, Slovakia, Sweden and Finland.

[90] Neutrality means by definition that residual emissions are compensated by removals, but not all Member States provided the respective share of emission reductions and removals and the level of ambition for actual reductions varies.

[91] Finland by 2035 and Sweden by 2045.

[92] Germany was aiming to be largely climate-neutral in 2050, but it should be noted that the long-term strategy that it submitted to the Commission in January 2020 was prepared in 2016. According to its Climate Change Act (as amended in July 2021), Germany is now aiming to achieve climate neutrality by 2045.

[93] Denmark, Estonia, Ireland, Spain, France, Luxembourg, Hungary, Malta, the Netherlands and Sweden NL. In addition to the information provided in its national long-term strategy, Germany has also enshrined climate targets in legislation.

[94] Article 13.2.(a) and 8.1 of the Regulation (EU) 2018/841.

***Table 11.1**: Summary of the main features of the national long-term strategies submitted by the EU Member States*

| Long-term strategies' main features | AT | BE | BG | HR | CZ | DK | EE | FI | FR | DE | GR | HU | IE | IT | CY | LV | LT | LU | MT | NL | PT | RO | SK | SI | ES | SE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Climate neutrality by 2050 or earlier | X | | | | | X | | X | X | | | X | X | X | | X | X | X | | | X | X | X | X | X | X |
| Modelling projections and scenarios | X | | X | X | X | X | X | X | X | | X | X | X | X | X | | | | X | | X | X | X | X | X | |
| Emission projections by sectors | X | X | X | X | | X | X | X | X | | | X | X | X | X | X | X | | X | | X | X | X | X | X | X |
| Emission removals in LULUCF | X | | X | | | X | X | X | X | | | | X | X | X | | | | | | X | X | X | X | X | X |
| Estimated share of renewable | X | | X | X | | X | | X | | | X | X | X | X | X | | X | X | | X | X | X | | X | X | X |
| Estimated energy consumption | X | | X | X | | X | | X | | | X | X | | X | X | X | | | | | X | X | | X | X | |
| Estimated investment needs | | | X | X | X | | X | X | X | | X | X | X | | | X | | | X | | X | X | X | X | X | |
| Socio-economic impacts of transition | | | | | | | X | X | X | | X | X | | X | X | X | | | | | X | X | X | | X | X |
| Adaptation Policies and Measures | X | X | X | X | X | X | X | | X | | | X | X | X | X | | X | X | X | | | X | X | | X | X |
| Legally binding long-term goal | | | | X | | X | X | | X | | | X | X | | | | | X | X | X | X | | | | X | X |

*Notes: in the case of DK and SK, emission projections by sector, the estimated share of renewable and energy consumption, end in 2040*

The inclusion of the recommended contents [95] also varies between Member States. There are gaps in needs for research, development and innovation; estimated long-term investment; $CO_2$ intensity of GDP; and, to a lesser extent, the expected contributions of renewable energy, energy efficiency and agriculture-specific emission reductions (see Table 11.2 for more details) [96].

A rough estimate based on the submitted national long-term strategies and (where data are missing) on other available information [97], points to a reduction in GHG emissions (excluding LULUCF) of around 86% by 2050 for the EU as a whole. This means that roughly 630 $MtCO_2eq$ still needs to be cut or absorbed in order to achieve climate neutrality by 2050 [98]. This is a slight improvement compared with last year's assessment and is due to the latest submissions of Ireland and Romania. However, the overall assessment has not changed. The national long-term strategies received to date do not yet make it possible to conclude that they are sufficiently ambitious to ensure the collective achievement of the objectives and targets of the Energy Union.

The assessment presented above more than justifies the need for Member States to update their strategies every 5 years, as indicated by Article 15(1) of the Governance Regulation. The Commission therefore calls on the Member States to update and, where appropriate, increase both the ambition and the quality of their national long-term strategies in the course of 2025.

[95] See Annex IV to Regulation (EU) 2018/1999.

[96] For a more detailed assessment of the national long-term strategies submitted by Member States, please refer to DG CLIMA's dedicated website: https://ec.europa.eu/info/energy-climate-change-environment/implementation-eu-countries/energy-and-climate-governance-and-reporting/national-long-term-strategies_en.

[97] Where possible, these estimates use information from the national long-term strategies in a specific order. First, the national targets or (when these are unavailable or unclear) scenario results (i.e. in the case of a range of values, the most ambitious scenario is considered). In the case of national binding targets adopted after the submission of the strategy, updated values have been used (e.g. in the case of Germany). Where data could not be retrieved from their long-term strategies, use was made of information that the Member States submitted to the Commission under another reporting exercise (i.e. the integrated NECPs and/or 2023 GHG projections). Only when national information was not available were data from the 2020 Reference Scenario EU Reference Scenario 2020 (europa.eu) used as a last resort. Overall, three quarters of the 2020 EU GHG emissions are covered by national sourced information. Unfortunately, the aggregated data and analyses are less meaningful for $CO_2$ removal and energy data, for which there are significant data gaps in the national long-term strategies.

[98] This does not include the international maritime and international aviation under the EU law.

***Table 11.2**: Overview of the national long-term strategies submitted by the EU Member States*

| Country (date of submission) | Overall LTS goal by 2050 | Projected GHG emission reductions by 2050 (% change compared with 1990) | all gases emissions | including LULUCF | incl. International maritime and aviation | Share of renewable energy in gross final energy consumption by 2050 | Projected final energy consumption by 2050 (% change compared with 2005) | Highlights from investment needs, enabling policies and socio-economic impact | Key reporting gaps |
|---|---|---|---|---|---|---|---|---|---|
| **Austria** (27/12/2019) | Climate neutrality | (-74%, -84%) | yes | no | yes | (76%, 93%) | (-52%, -38%) | positive impact on GDP and jobs<br>natural and technical sinks needed to reach carbon neutrality | CO2 intensity of GDP of GDP<br>investment needs<br>socio-economic impact |
| **Belgium** (02/03/2020) | Different regional goals | (-85%, -87%) (excluding ETS sector) | ? | no | no | n.a. | n.a. | investment needs in buildings<br>climate risks for agricultural system<br>address energy poverty | information at national level<br>GHG and CO2 intensity of GDP<br>emission reductions for ETS and LULUCF |
| **Bulgaria** (27/10/2022) | Unspecified | (-78%, -84%) | yes | no | no | (61%, 70%) | (79, 87 TWh) | positive impact on jobs and wellbeing<br>investment need < 15bn up to 2050<br>technical sinks to reach carbon neutrality | GHG and CO2 intensity of GDP<br>emission reductions by sub-sector<br>socio-economic impact |
| **Croatia** (24/06/2021) | Unspecified | (-57%, -73%) | yes | no | ? | (53.2%, 65.6%) | (-25%, -37%) | overall impact on GDP uncertain<br>around 40 000 new green jobs<br>additional investment above 1.5% of GDP | reductions and removals in LULUCF<br>socio-economic impact<br>emission reductions industrial sectors |
| **Cyprus** (14/09/2022) | Unspecified | (-28%, -100%) | yes | yes | ? | (51%, 95%) | (1996, 1875 Ktoe) | cost of the transition modest to low<br>gradual closure of thermal power plants<br>natural and tech. sinks to reach neutrality | GHG and CO2 intensity of GDP<br>emission reduction in buildings<br>socio-economic impact |
| **Czechia** (20/12/2019) | quantitative GHG emission reduction target | -80% | yes | no | no | n.a. | n.a. | investment peak with expansion of CCS<br>strengthen energy taxation<br>Increase share of nuclear in energy mix | GHG and CO2 intensity of GDP<br>emission reductions by sector<br>socio-economic impact |
| **Denmark** (20/12/2019) | Climate neutrality | n.a. | yes | yes | no | n.a. | n.a. | targets enshrined in law<br>doubling organic farming<br>increase spending in green research | public consultation<br>emission reductions power & buildings<br>socio-economic impact |
| **Estonia** (30/12/2019) | quantitative GHG emission reduction target | -80% | yes | no | no | n.a. | n.a. | targets enshrined in law<br>large investment needed in renewable<br>minor impact on GDP and jobs | CO2 intensity of GDP<br>emission reductions in buildings<br>RES, FEC/PEC targets |
| **Finland** (22/04/2020) | Carbon neutrality by 2035 | (-87.5%, -90%) | yes | no | ? | (64%, 80%) | (-16%, -5%) | slightly positive impact on GDP and jobs<br>employment sensitive to arable lands<br>annual investment ~3% of GDP | CO2 intensity of GDP<br>emission reductions in buildings<br>strategies for related R&D&I |

| Country (date of submission) | Overall LTS goal by 2050 | Projected GHG emission reductions by 2050 (% change compared with 1990) | all gases emissions | including LULUCF | incl. International maritime and aviation | Share of renewable energy in gross final energy consumption by 2050 | Projected final energy consumption by 2050 (% change compared with 2005) | Highlights from investment needs, enabling policies and socio-economic impact | Key reporting gaps |
|---|---|---|---|---|---|---|---|---|---|
| **France** (12/05/2020) | Carbon neutrality | -83% | yes | no | no | n.a. | n.a. | targets enshrined in law<br>positive impact on GDP<br>annual investment ~3.5% of GDP | GHG and CO2 intensity of GDP<br>reductions and removals in LULUCF<br>share of renewable energy in 2050 |
| **Germany** (02/01/2020) | Largely climate neutral | (-80%, -95%) | yes | no | no | n.a. | n.a. | document outdated compared with recent review of the country's target aimed at reaching climate neutrality by 2045 | GHG and CO2 intensity of GDP<br>emission reductions by sector<br>investment & socio-economic impact |
| **Greece** (08/01/2020) | Unspecified | (-83%, -95%) | ? | ? | ? | (82%, 114%) | n.a. | increase use of heat pumps (buildings) and biofuel (transport)<br>investment needs EUR 0.1 to EUR 1.1 bn per year | GHG and CO2 intensity of GDP<br>emission reductions agriculture & waste<br>socio-economic impact |
| **Hungary** (21/09/2021) | Climate neutrality | -100% | yes | yes | no | close to 90% | (-30%, -37%) (to 2017) | positive impact on GDP and jobs<br>annual investment ~4.8% of GDP<br>avoided damage and benefits > costs | reductions and removals in LULUCF<br>emission reductions in buildings |
| **Ireland** (30/07/2024) | Climate neutrality | n.a. | yes | no | yes | 90% (most ambitious scenario) | n.a. | targets enshrined in law<br>investment needs up to EUR 235 bn over 2031-2050<br>strong focus on adaptation strategies | socio-economic impact<br>FEC/PEC targets |
| **Italy** (11/02/2021) | Climate neutrality | (-84%, -87%) | yes | no | no | (85%, 90%) | -49% | slightly negative impact on GDP<br>boost sustainable finance<br>focus on adaptation strategies | emission reductions in waste<br>Investment needs<br>socio-economic impact |
| **Latvia** (27/12/2019) | Climate neutrality | -85% (by 2040) | ? | yes | ? | n.a. | -37% (primary energy consumption) | positive impact on GDP<br>annual investment ~1.4% of GDP<br>creation of new (green) jobs | CO2 intensity of GDP<br>emission reductions in buildings<br>adaptation policies and measures |
| **Lithuania** (23/07/2021) | Climate neutrality | -100% (20% reduction from LULUCF & CCS) | yes | yes | yes | 90% | final & primary energy intensity 2.4 times lower than 2017 | positive impact on GDP and jobs<br>4% of GDP invested in R&D&I by 2040<br>focus on adaptation strategies | public consultation<br>GHG and CO2 intensity of GDP<br>emission reductions by sector |
| **Luxembourg** (04/11/2021) | Climate neutrality | -100% (including LULUCF) | yes | yes | no | 100% | n.a. | Support sustainable finance<br>ensure a just transition for citizens and enterprises | emission cuts in 2050 for all sectors<br>reductions and removals in LULUCF<br>estimated investment needs |
| **Malta** (21/10/2021) | Unspecified | -82% | yes | no | no | n.a. | n.a. | increased job opportunities<br>improved air quality and health<br>investment in renewables > EUR 2bn to 2050 | CO2 intensity of GDP<br>LULUCF, RES, FEC/PEC targets |

| Country (date of submission) | Overall LTS goal by 2050 | Projected GHG emission reductions by 2050 (% change compared with 1990) | all gases emissions | including LULUCF | incl. International maritime and aviation | Share of renewable energy in gross final energy consumption by 2050 | Projected final energy consumption by 2050 (% change compared with 2005) | Highlights from investment needs, enabling policies and socio-economic impact | Key reporting gaps |
|---|---|---|---|---|---|---|---|---|---|
| **Netherlands** (18/12/2019) | Quantitative GHG emission reduction target | -95% | yes | yes | no | n.a. | n.a. | net-zero requires large scale CO2 capture by 2030, limited impact on GDP and jobs increase income disparities | reductions and removals in LULUCF emission reductions in all sectors by 2050 investment needs |
| **Portugal** (15/01/2020) | Carbon neutrality | (-85%, -90%) | ? | no | ? | (86%, 88%) | (-36%, -35%) | positive impact on GDP and jobs annual investment ~1.2% of GDP better air quality | GHG and CO2 intensity of GDP strategies related to R&D&I adaptation policies and measures |
| **Romania** (14/12/2023) | Carbon neutrality | -99% (including LULUCF) | yes | yes | no | 86.1% | -30% | positive impact on GDP Investment needs 1.5 times larger REF 100K new green jobs by 2050 | Removal of the remaining 1% of GHG emissions in 2050 still subject to analysis |
| **Slovakia** (11/03/2020) | Climate neutrality | -80% | ? | no | ? | n.a. | n.a. | positive impact on GDP negative impact on jobs & wages annual investment ~4.2% of GDP | GHG and CO2 intensity of GDP emission reductions in buildings LULUCF, RES, FEC/PEC targets |
| **Slovenia** (19/07/2021) | Climate neutrality | (-80%, -90%) | ? | no | no | at least 60% | at least -33% | positive impact on GDP and jobs additional investment from EUR 66 to EUR 72 bn focus on a climate resilient society | GHG and CO2 intensity of GDP emission reductions industrial sectors |
| **Spain** (11/12/2020) | Climate neutrality | -90% | yes | no | yes | 97% | -44% | positive impact on GDP and jobs negative impact on jobs & wages annual investment ~1% of GDP | CO2 intensity of GDP emission reductions agriculture & waste emission reductions for industrial sectors |
| **Sweden** (19/12/2019) | Climate neutrality by 2045 and negative emissions thereafter | -85% (by 2045) | yes | no | no | n.a. | final energy intensity 50% lower than 2005 | limited impact on GDP and jobs better air quality focus on adaptation strategies | GHG and CO2 intensity of GDP share of renewable energy investment & socio-economic impact |

*Notes: (1) An 'unspecified' goal refers to cases where the goal was not expressed in clear terms (e.g. 'to approach', 'to move towards', etc.). (2) Germany's long-term strategy, as submitted to the Commission in January 2020, reflects the goal of the Climate Action Plan 2050 adopted in November 2016. According to the Climate Change Act, as amended in July 2021, Germany now aims to achieve climate neutrality by 2045. (3) In April 2021, Denmark submitted an update of its long-term strategy under Article 18(1)(a) and Annex VI(b) of the Governance Regulation. This update is intended to reflect the Danish Climate Act, which was adopted in June 2020; and which sets a near-term target of reducing Denmark's total GHG emissions by 70% by 2030 compared with the 1990 level and sets a long-term target of achieving climate neutrality by 2050 at the latest. (4) Since July 2023, when the Climate Act entered into force, the Netherlands has had a legally binding target of achieving climate neutrality by 2050. (5) Projected GHG emission reductions are all expressed as a percentage change compared with 1990 levels (except for Belgium, Portugal and Slovenia (where reduction rates refer to the 2005 GHG emission levels); Malta (the 2020 level); and France (the 2015 level)) as a target or as the extreme values of the projected range. In Denmark's long-term strategy, projections refer to a scenario with existing measures that are not in line with the goal and have therefore not been reported in the table. (6) '?' means that the long-term strategy does not provide sufficient or clear information on the exact scope of projected GHG emission reductions. In the case of Spain, only international maritime emissions were included in the projections. (7) Where feasible, final energy consumption has been expressed as a percentage change to the 2005 consumption level. (8) Annual investment needs are generally considered as additional to a 'business as usual' (BAU) or 'with existing measures' (WEM) scenario for 2020-2050. (9) Key reporting gaps are meant to provide only a general view of the long-term strategy's completeness and do not distinguish between mandatory and non-mandatory elements.*

# 12 EXAMPLES OF FUNDING OF CLIMATE RELATED PROJECTS

## 12.1 EXAMPLE OF PROJECT FUNDED BY THE INNOVATION FUND

The **Innovation Fund (IF)** is one of the world's largest funding programmes for the deployment of net-zero and innovative technologies in EEA countries. Financed by revenues from the EU Emissions Trading System (EU ETS), the IF is one of the EU's funds for climate policy, focusing on energy, industry and mobility and fostering competitiveness.

The IF aims to create financial incentives for companies and public authorities to invest in cutting-edge, low-carbon technologies and support the EU's transition to climate neutrality. Thanks to the EU ETS and assuming a carbon price of EUR 75/tCO2, it is estimated that the IF will have around EUR 40 billion available between 2020 and 2030. The IF has already awarded around EUR 6.5 billion to more than **115 innovative projects** through its previous calls for proposals.

### 1. H2GS: H2 Green Steel [99]

The IF has granted EUR 250 million to a steel plant in Boden in northern Sweden to build a greenfield, integrated, industrial-scale, renewable hydrogen, green iron and green steel plant. The H2 Green Steel (H2GS) project's innovation involves electrifying the entire production process, increasing energy efficiency and replacing coal with renewable hydrogen. It will ultimately reduce $CO_2$ emissions by up to 95%.

The plant will use fossil-free electricity to produce the renewable hydrogen needed to bring 5 million tonnes (Mt) of high-quality green steel to the market by 2030. The process involves converting iron ore into direct-reduced iron (DRI) using hydrogen, which reacts with the ore's oxygen and forms steam as a byproduct. Hot DRI and steel scrap is then melted in an electric arc furnace, sending waste heat to the district heating channels of Luleå-Boden, and processing slag into products to be used in other industries. The liquid steel is solidified into solid products through an integrated continuous casting and rolling process. This method reduces energy consumption by 70% and eliminates the use of natural gas typically found in traditional processes.

The project is expected to be operational by December 2026 and should avoid emissions of over 33.4 $MtCO_2$-eq over a 10-year operational period. It will create 2 000 direct jobs, contribute to the creation of 10 000 further indirect jobs and help to achieve the EU's ambition (as set out in the EU industrial strategy) of decarbonising heavy industry.

### 2. IRIS: Innovative low carbon hydrogen and methanol production by large scale carbon capture [100]

The IF has granted EUR 126.79 million to a first-of-a-kind carbon capture storage and utilisation (CCUS) project in Corinthia in Greece. IRIS will decarbonise the Agioi Theodoroi Refinery by applying carbon capture technology to its steam methane reformer (SMR). The post-combustion capture technology that has been selected for IRIS will allow both

[99] https://ec.europa.eu/assets/cinea/project_fiches/innovation_fund/101133206.pdf

[100] https://ec.europa.eu/assets/cinea/project_fiches/innovation_fund/101133015.pdf

unperturbed ultra-low-carbon hydrogen production and continuous high-pressure steam generation.

The bulk of the captured carbon will be sequestered in an offshore storage facility in the northern Aegean, but a small amount will be used to produce 10 000 tonnes of e-methanol per year for use as an energy carrier in both mobility and industrial applications. Besides its use within the refinery, the hydrogen that is produced will be used as fuel in transport applications. E-methanol will be used for maritime applications as a low-carbon substitute for marine fuels. The project will also promote the scalability of the CCUS chain to two other refinery units, potentially decreasing the total refinery carbon footprint by a further 25%.

Entry into operation is planned for mid-2028. The project should avoid 8.58 $MtCO_2eq$ over a 10-year operational period, creating up to 2 000 jobs during construction and 21 permanent jobs during the project's operating lifetime. At the EU level, it will particularly help to achieve both the Net-Zero Industry Act target of 50 million tonnes a year of $CO_2$ storage capacity by 2030 and the REPowerEU target of reducing fossil fuel consumption in industry and transport.

### 3. SHEEFT: Solar Heliup Energy for flat rooftops [101]

The IF has granted EUR 3.2 million to a solar photovoltaic (PV) panel project in Le Cheylas in France. Thanks to the IF's support, SHEEFT will deploy industrial-sized manufacturing of ultra lightweight solar PV panels designed for existing large building rooftops with low bearing capacities.

SHEEFT's innovative nature lies in its installation concept, which involves directly bonding the panel to a waterproofing membrane, thus reducing weight by 60% compared with conventional solutions. This technology, which is well adapted to flat rooftops and is weather resistant, is based on a patented design that uses ultra-thin glass.

In line with the REPowerEU plan, the project's production capacity is set at 100 megawatt peaks (MWp) per year and aims to avoid 363 660 tonnes of $CO_2$ equivalent over a 10-year period. The project will create 100 direct jobs and 150 indirect jobs. It is scheduled to begin operating in late 2024.

### 4. T-HYNET: Tarragona Network Hydrogen [102]

The IF is backing the development of a cutting-edge 150-megawatt (MW) capacity alkaline electrolyser project in Spain's Tarragona industrial area. Thanks to the IF's EUR 62 million grant, T-HYNET will become Spain's largest electrolyser initiative, continuously producing 2.7 tonnes of renewable hydrogen per hour.

The electrolyser's state-of-the-art design features advanced alkaline technology, increased use of digital tools, and increased water-use efficiency by minimising water discharge and maximising water recovery. The renewable hydrogen that will be produced will be transported by a hydrogen pipeline to industrial off-takers and injected into the nearby natural gas network. The project's strategic location in Catalonia's Hydrogen Valley and the Ebro Hydrogen Corridor will facilitate hydrogen transmission to off-takers across the EU.T-HYNET is expected to create 900 direct and 1 100 indirect jobs, and to avoid emitting 1.4 million tonnes of $CO_2$ over a 10-year operational period. Aligning with the European hydrogen strategy and RePowerEU initiatives, construction is set to be completed by the end of 2026.

[101] https://ec.europa.eu/assets/cinea/project_fiches/innovation_fund/101156515.pdf

[102] https://ec.europa.eu/assets/cinea/project_fiches/innovation_fund/101133010.pdf

## 12.2 EXAMPLE OF PROJECT FUNDED BY THE MODERNISATION FUND

The **Modernisation Fund**[103] supports the modernisation of the energy systems and the improvement of energy efficiency in 13 lower-income EU Member States (Bulgaria, Croatia, Czechia, Estonia, Greece, Hungary, Latvia, Lithuania, Poland, Portugal, Romania, Slovenia and Slovakia). Established in 2018 for the 2021-2030 period, the fund aims to help the beneficiary Member States achieve their climate and energy targets and the objectives of the European Green Deal.

Financed by the EU Emissions Trading System (EU ETS), the fund primarily focuses on six priority areas: renewable energy generation and use, renewable heating and cooling, energy efficiency across sectors, energy storage and network modernisation, low-income household support, and just transition in carbon-dependent regions. A maximum of 20% can be allocated toward non-priority investments that reduce greenhouse gas emissions but do not fall in the priority areas.

The Modernisation Fund operates under the responsibility of the beneficiary Member States, who work in close cooperation with the European Investment Bank (EIB) and the Commission. Together, the Commission, the EIB and 16 EU Member States compose the Investment Committee for the Modernisation Fund (Investment Committee) that approves the investments, while the EIB examines Member State proposals.

1. **Support the production of electricity from renewable energy sources in Croatia**

The Modernisation Fund has agreed to disburse EUR 80 million in support of a renewable energy sources (RES) production scheme in Croatia.

The investment aims to bolster the construction and installation of RES production facilities of photovoltaic (PV) panels, biomass and biogas. Furthermore, this scheme will benefit projects and enterprises in manufacturing industries and in activities related to steam and air conditioning supply, including ETS installations.

The overall objective of this scheme is to address market failures related to negative externalities in the energy sector and limited grid transmission capabilities. The desired outcome is to reduce energy procurement costs for beneficiaries and to encourage investment in RES installations at production plants and associated facilities throughout Croatia.

The scheme foresees installing an energy capacity of 80 megawatts (MW) and energy storage capacity of 20 MW and should generate energy consumption savings of 140 000 Megawatt hours (MWh) and avoid around 60 000 tonnes of CO2 emissions during a typical operational year. On a national scale, the scheme contributes to the goals set in the National Energy and Climate Plan. The construction of facilities for dispersed energy production at points of consumption will also have long-term positive impacts on the national electricity grid, such as reduction of the peak load or reduction of losses in the grid.

On a European scale, this scheme contributes to achieving the goals set forth by the European Green Deal and in the RePowerEU plan, by reducing greenhouse gas emissions and increasing the share of renewable energy. EUR 40 million have already been disbursed to Croatia for projects under this scheme.

2. **Contract for Difference Support Scheme for the production of electricity from renewable sources onshore wind and solar photovoltaic energy in Romania.**

[103] https://climate.ec.europa.eu/eu-action/eu-funding-climate-action/modernisation-fund_en

In 2024, the Modernisation Fund made a first tranche of EUR 5 million to Romania to implement a contract for difference support scheme. This scheme seeks to develop 5 gigawatts (GW) of onshore wind and solar photovoltaic (PV) capacities through two auctions between 2023 and 2025, aiming to support 50-250 beneficiaries of all sizes.

Led by the Romanian Ministry of Energy, this scheme works as a variable premium payment for each megawatt hour (MWh) of electricity generated and delivered to the grid. The payment is calculated based on the difference between a competitively fixed price (strike price) and the market price (reference price). The total support from the Modernisation Fund for the scheme will be determined following the two auction rounds, based on the actual strike prices.

The objectives for this scheme are well-aligned with the RePowerEU plan and the Green Deal Industrial plan as the scheme is contributing to increasing the share of renewable energy sources in the energy mix and reducing greenhouse gas emissions. The scheme also supports the national decarbonisation objectives of the 2021-2030 national energy and climate plan, with a focus on 2023-2025, while maintaining energy security and generation diversification. It will also aid the local economy with increasing jobs and skill diversification.

## 12.3 LAND AND NATURE

### LIFE PeatCarbon

LIFE PeatCarbon will help restore peatlands ecosystems in Latvia and Finland by demonstrating approaches to the climate-smart management of degraded peatlands and testing innovative methods for GHG monitoring. The project is expected to restore 5 076 and 338 hectares of peatland in Latvia and Finland respectively. This will save 37 117 $tCO_2eq$ per year in Latvia and 3 500 $tCO_2eq$ per year in Finland.

### SWIFTT project: Climate change risks in Forestry

The SWIFTT project, financed by Horizon Europe, will provide a scientifically sound and technically feasible way to help monitor and manage forest risks: windthrow, insect outbreaks, and forest fires. SWIFTT will enable forest managers to adapt to climate change with affordable, simple and effective remote sensing tools backed up by powerful machine learning models. The solution will offer a monthly health monitoring service including early warnings, using Copernicus satellite imagery to detect and map the various risks to which forests and their managers are exposed. Early threat detection aids timely intervention. SWIFTT will be tested in real conditions by several end-users from the forest industry, which include Fürstliches Forstamt, Groupe Coopération Forestière and the Rigas Mezia. Once completed, SWIFTT's maps detailing areas of windthrow damage, insect outbreaks, and fire risk will enable forest managers to act proactively and allocate resources efficiently for a timely intervention. With SWIFTT's sustainable, effective, and low-cost forest management tools, Europe will be better positioned to combat climate change and preserve its biodiversity through healthier forests. The solution will help to monitor and protect up to 40 ml of ha of global forests by 2030, saving foresters over EUR 468 ml in monitoring costs.

## 12.4 SUSTAINABLE MOBILITY

### Connecting Europe Facility (CEF)

In July 2024, the Commission announced grants of over EUR 7 billion to improve sustainable, safe and smart transport infrastructure throughout the EU. This funding, which is the largest under the current Connecting Europe Facility (CEF) transport programme, will support 134 projects aimed at expanding and modernising the Trans-European Transport Network (TEN-T). 80% of the total investment will go to rail projects, to strengthen cross-border connections along the EU's TEN-T core network. These include Rail Baltica [104], the Lyon-Turin connection between France and Italy and the Fehmarnbelt undersea tunnel linking Denmark and Germany.

Around 20 maritime ports in Germany, Ireland, Greece, Spain, Croatia, Cyprus, Lithuania, Malta, the Netherlands, Poland and Finland will receive support for infrastructure upgrades. Some will introduce sustainable practices such as the supply of shore-side electricity to ships and renewable energy transport.

## 12.5 PREPAREDNESS AND RESILIENCE

### Mission Regions4Climate

The Burgas region in **Bulgaria** faces a series of climate-related challenges (including flooding and urban heat and air pollution) due to rising temperatures and the characteristics of its terrain and wetlands. These are compounded by urban density and limited green space.

To combat these climate challenges, the region adhered to the Mission Adaptation Charter and is part of the Mission Regions4Climate project. Thanks to the supported Smart Adaptation Challenge Suite (an innovative digital tool that gathers the latest data from diverse sources), the Burgas region can bridge the science-stakeholder-policy gap, raise citizens' awareness, and improve the use of existing data.

The Burgas region has introduced innovative community-involving planning solutions and enhanced flood risk prediction. It implements multifunctional nature-based solutions which also mitigate the effects of urban heat islands, address air pollution and increase urban resilience. The region is using digital simulations for knowledge-sharing and a tailormade climate resilience model to improve decision-making. A local climate resilience group that involves a wide range of stakeholders has been established to monitor, steer and consult on the implementation of pilot actions, as well as to suggest corrective measures where needed.

### LIFE UrbanStorm

LIFE UrbanStorm developed climate-resilient urban storm water management systems in Estonia to better manage flash floods in urban environments. Over the project lifespan, which ended in 2023, annual rainwater emergencies in the city of Viimsi fell from 21 to 13; and from 7 to 0 in the demonstration area in the capital Tallinn. The number of floods in Viimsi was more than halved.

### 100KTREEs: Climate change adaptation in cities

The ambition of the HORIZON Europe project 100KTREES is to make cities a better and healthier place to live by encouraging municipalities to plant more trees and to optimize the impact of tree planting by leveraging Copernicus data. The benefits of urban trees planting

[104] https://eceuropaeu.sharepoint.com/sites/commission-en-direct/SitePages/EuropeandBeyond/rail-baltica-2024.aspx

include: improvements in air quality, increasing carbon sequestration, reduction of urban heat islands, improvement in urban biodiversity, reduce risk of pluvial flooding, reduce noise levels. In particular, the project is developing a toolbox were valorisation of tree impacts, cost benefit analysis, and what-if scenarios (long and short term) are considered, providing valuable business cases for the end-users for planting trees in cities and effectively implement climate adaptation strategies. During the development of the 100KTREEs toolbox, two end-users represented in the consortium, the city of Copenhagen and the city of Sofia, will be proactively engaged for continued feedback on its usability and utility. Co-creation workshops will be organized to collect the requirements of the involved municipalities. At the end of the project the toolbox will be offered to city clients as SaaS (Software as a Service).

**Destination Earth's Digital Twins enhancing climate resilience**

This pioneering information system, once ready, will enable the testing of adaptation options and policies, considering the evolution of the Earth system in a warming world. At its core are several innovative components including two digital twins, and an AI-enabled digital ecosystem which intends to connect users to a portfolio of novel applications and services.

The Weather-Induced Extremes Digital Twin offers global information at kilometer-scale resolution for several days ahead, also creating a capability to 'zoom in' on severe events across Europe. It intends to support authorities to safeguard lives and properties and prepare for extreme events in a warming world.

To help adapting to the future climate, the Climate Digital Twin will enable the use of next-generation kilometer-scale climate models, delivering data and impact-relevant climate indicators both regularly and on-demand. This advancement will support climate-related actions, such as risk assessments, and at a later stage the assessment of adaptation options.

## 12.6 SOCIETY AND COMMUNITIES

**LIFE Climate Smart Chefs**

The LIFE Climate Smart Chefs project has created the digital Foodprint tool to design climate-smart menus that empower the EU's chefs to become active challengers of climate change and promoters of low emission, nutritious and affordable diets. About 500 chefs in the EU have used Foodprint to reformulate recipes, so that they now use 34% less water than before and have reduced process $CO_2$ emissions by 49%.

**LIFE Cool Square**

The LIFE Cool Square project will undertake a significant greening of the Damsterplein of Groningen in the Netherlands. Turning it into a climate-adaptive, resilient and multifunctional urban location will mitigate heat island effects and reduce the negative health impacts associated with traffic. By the time the project concludes in 2026, it is expected to increase the use of Damsterplein by Groningen residents by 50% and to reduce traffic speed by 15% – leading to lower air pollutant levels (NOx and PM) and reduced noise emissions.

## 12.7 INTERNATIONAL INITIATIVES

In June 2023, the Commission and the High Representative adopted a joint communication laying out how the EU will address the growing impact of climate change and environmental degradation on peace, security and defence.

The four main priorities of the Communication are to:

- **Strengthening planning, decision-making and implementation**, through reliable and accessible evidence-based analysis and data on the climate and security nexus;
- **Operationalising the response to environment, climate and security challenges in EU external action and instruments**;
- **Enhancing** climate adaptation and mitigation measures of EU Member States' **civilian and military operations and infrastructure** to lower costs, carbon footprints, while maintaining operational effectiveness;
- **Reinforcing international partnerships** through multilateral, plurilateral and bilateral fora and with partners such as UN, OSCE, NATO, African Union.

Copernicus' Emergency Management Service plays an important role in supporting early-warning capacities, as well as the Copernicus Land Monitoring Service providing geospatial information on land cover and its change, water cycle and Earth's surface energy variables.

Example of use of geospatial observation data and analysis:

Commission and EEAS services are producing an annual comprehensive climate and security trend analysis. Use of data, analysis and indicators on climate and environment-related risks is promoted, including by the establishment of a climate and security hub located at the EU's Satellite Centre.

The Commission and ESA are working together under the Joint RTD-EOP Earth System Science initiative to jointly advance Earth system science and its contribution in responding to the global challenges faced by society, including accelerating the use of Earth-observing satellites and the information which they provide to address climate change.