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EU Climate Action Progress Report 2023

{SWD(2023) 338 final} - {SWD(2023) 339 final}

1 EMISSION TRENDS AND PROGRESS IN CLIMATE ACTION

GREENHOUSE GAS EMISSIONS AND THE EU'S INTERNATIONAL COMMITMENTS

In March 2023 the Intergovernmental Panel on Climate Change (IPCC) confirmed that global warming, induced by anthropogenic greenhouse gas (GHG) emissions is increasing the frequency and severity of climate and weather extremes, leading to widespread and adverse impacts on people and nature across the globe. Every increment of warming will intensify the impacts, and urgent global climate action is needed to limit global warming and to adapt to its impacts. Global GHG emissions need to fall by 43% by 2030 and by 84% by 2050 below 2019 levels, while global net zero CO_2 emissions must be reached in the early 2050s if we are to limit temperature increase to 1.5°C with no or limited overshoot. Reducing GHG emissions has many co-benefits, including for air quality, health, biodiversity and energy security.[1]

Europe has been warming twice as much as the global average since the 1980s, with far-reaching impacts on the region's socio-economic fabric and ecosystems.[2] The year 2022 saw further devastating impacts associated with a warming climate, with extreme weather events becoming more and more common. The late spring and summer heatwaves, with record-breaking temperatures in many locations, resulted in a record number of days with very strong heat stress, leading to over 61 000 excess deaths across Europe.[3] Hot and dry spring and summer conditions, which triggered drought across most of Europe, and fuelled numerous large wildfires, were followed by heavy precipitation and intense flooding in the autumn, causing dozens of fatalities.[4] Overall, summer 2022 was Europe's warmest ever recorded.[5] Temperature records continued to be broken in 2023, confirming the extra-ordinary pace of climate change. July was the hottest month on record with global temperatures 1.5°C warmer than the pre-industrial average. The rising temperatures and increasing frequency of extreme events contributed to numerous wildfires, and by the end of July 2023, they had affected more than 182 000 hectares across the EU, 40% above the 2003-2022 average,[6] while unprecedented floods hit parts of Europe.[7]

In 2022, **global emissions** were back to their pre-pandemic increasing trend, reaching 53.8 billion tonnes of CO_2 equivalent (CO_2-eq), well above 2019 emissions. Preliminary JRC data[8] show that global GHG emissions rose by 1.4% in 2022 compared to 2021 levels, against a 3.4% growth of global GDP over the same period, as the global economy continued rebounding from the pandemic. Transport was the main driver of increased GHG emissions (+4.7%, or 361 MtCO_2-eq), although still below the pre-pandemic level, followed by fuel

[1] IPCC, 2023. Climate Change 2023: Synthesis Report. A Report of the Intergovernmental Panel on Climate Change. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, 36 pages. (in press).

[2] WMO, State of the climate in Europe 2022. WMO-No. 1320.

[3] Heat-related mortality in Europe during the summer of 2022 | Nature Medicine

[4] European State of the Climate 2022 by Copernicus: ESOTCsummary2022_final.pdf (copernicus.eu)

[5] For key facts on extreme whether events, see EEA Extreme weather: floods, droughts and heatwaves (europa.eu).

[6] OBSERVER: Global Wildfire Watch: Copernicus EMS and CAMS Monitor Wildfires in 2023 | Copernicus

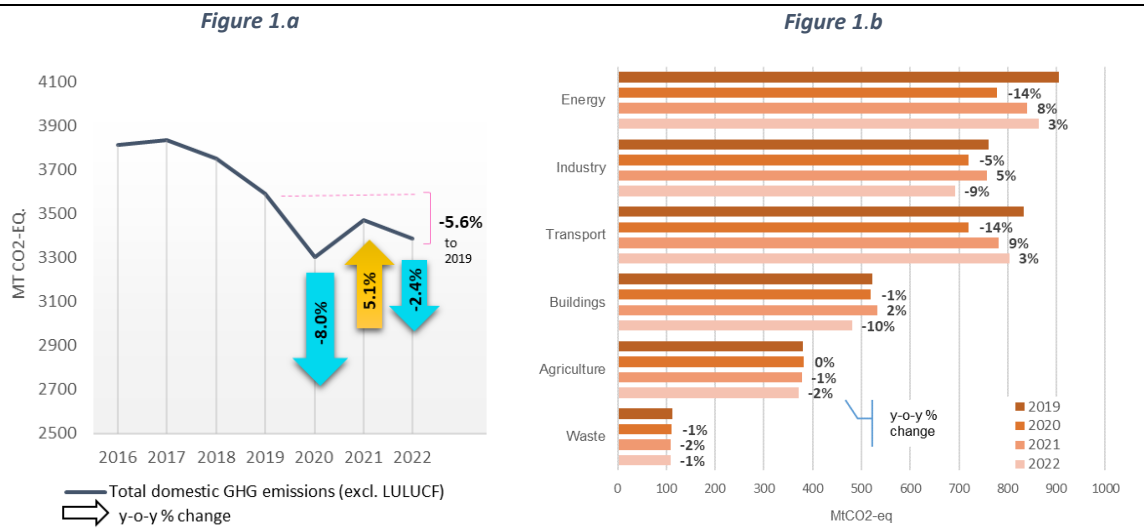
[7] Copernicus Emergency Management Service

[8] EDGAR (Emissions Database for Global Atmospheric Research) Community GHG Database comprising IEA-EDGAR CO_2, EDGAR CH4, EDGAR N2O, EDGAR F-GASES version 8.0, https://edgar.jrc.ec.europa.eu/report_2023.

production[9] (+2.6%, or 157 $MtCO_2$-eq) and power (+0.9%, or 136 $MtCO_2$-eq). Among the larger emitters, the most significant increases were in Indonesia (+10%, or 113 $MtCO_2$-eq) and India (+5%, or 189 $MtCO_2$-eq), while China showed a limited increase (+0.3%, or 52 $MtCO_2$-eq).

In the EU, provisional data[10] for 2022 show that total GHG emissions (excluding land use, land-use change, and forestry, and international aviation) decreased by 2.4% compared to 2021, continuing the 30-years descending trend, whilst EU GDP grew by 3.5% in the year 2022 (Figure 1.a). Emissions covered by the EU Emissions Trading System (EU ETS) fell by 0.2% and non-ETS emissions decreased by 2.9%.

Figure 1: EU GHG emissions (excluding land use, land-use change and forestry) and by sector[11]



Exceptional events over the last 3 to 4 years have made the assessment of GHG emission trends more complex and continue to have an impact on 2022 emissions. For more clarity, this report therefore assesses the year-on-year change in emissions and compares to the pre-pandemic level. The COVID-19 lockdowns and restrictions led to an unprecedented but temporary drop in GHG emissions of 8% in 2020. In 2021, the economic recovery affected regions and sectors differently. Some sectors, such as the transport sector and travel-related emissions, recovered fully only in 2022. The energy crisis that started in 2021 continued in 2022, exacerbated by Russia's unprovoked and unjustified invasion of Ukraine, which drove energy prices to record highs, particularly gas prices. In addition, decreased level of nuclear[12]

[9] Fuel production, processing and refining

[10] The Governance Regulation ((EU) 2018/1999) requires Member States to report approximated GHG inventories annually by 31 July. Based on this reported data, the EEA compiles a Union approximated GHG inventory or, if a Member State has not communicated its approximated GHG emissions by that date, on the basis of EEA's own estimates. This provides an early estimate of GHG emissions ahead of the full GHG inventory.

[11] Based on 2023 GHG inventory and approximated EU GHG inventory for 2022, based on Member States' submissions, excluding international bunkers. Notes: (1) Energy sector refers to electricity and heat production and petroleum refining. (2) Industry includes fuel combustion in manufacturing and construction and emissions in industrial processes and product use. (3) Buildings include emissions from energy use in residential and tertiary buildings, and energy use in agriculture and fishery sectors (1.A.4 GHG inventory code).

[12] Mainly due to temporary shutdown of several nuclear rectors in France for technical maintenance and/or additional inspections.

and low hydro power production[13] have led to an increase in the use of coal and lignite for power generation, above the level recorded in 2021. The high energy prices also triggered action to reduce demand for both industrial and household energy.

EU emissions by sector show these changes (Figure 1.b). Emissions in energy and transport are expected to increase in 2022, although remaining below 2019 pre-pandemic levels, while significant cuts in emissions are expected in buildings and industry, mainly because of the continued increase of energy prices. Despite the slight decline in 2022, emissions in agriculture remain broadly at the same level as ten years ago.

Provisional 2022 data for GHG net removals from the Land Use, Land-use Change and Forestry (LULUCF) sector appear to suggest a break in their recent declining trend, with an expected increase in carbon sinks of 6% compared to 2021, although approximated emissions remain subject to large revisions. Consequently, in 2022 total net GHG emissions (including LULUCF) decreased by 3.0% on a yearly basis, a reduction of 32.5% compared to 1990 level.

In the EU, verified emissions from aircraft operators increased significantly, by 75% compared to 2021 as the industry recovers from the very low levels of activity during the COVID-19 pandemic.

TOWARDS THE CLIMATE-NEUTRALITY OBJECTIVE

In addition to assessing the progress made in climate policy under the Governance Regulation,[14] for the first time this year this report assesses progress under the European Climate Law,[15] including the collective progress made by Member States towards the EU's goal to achieve climate-neutrality by 2050.[16] It looks at progress on several aspects and from several sources and takes account of the complexity inherent in the many possible paths to achieve a net-zero and resilient economy.

Overall, provisional 2022 data show that the EU's domestic GHG net emissions (i.e. including LULUCF and excluding international transport) are falling steadily, in line with the linear path to achieve the EU's 2030 GHG reduction target (i.e. -55%) and the EU's 2050 climate neutrality objective.[17] However, the pace of emission reduction needs to pick up, to almost triple the average annual reduction achieved over the last decade (see Figure 2.a). Relative to past mitigation efforts, the most significant cuts in emissions are needed in buildings and transport, where the pace of decarbonisation is sluggish or even moving in the opposite direction. At the same time, action in the LULUCF sector is essential to achieve a significant boost in carbon removals. Although reaching the emissions cuts required from agriculture looks achievable when looking at progress over the past three decades, the lack of substantial progress in recent years is a concern, calling for a gear change (Figure 3.b).

[13] Partly due to drought and high water temperatures in many parts of the EU.

[14] Articles 29 and 35 of the Regulation on the Governance of the Energy Union and Climate Action (Reg. (EU) 2018/1999).

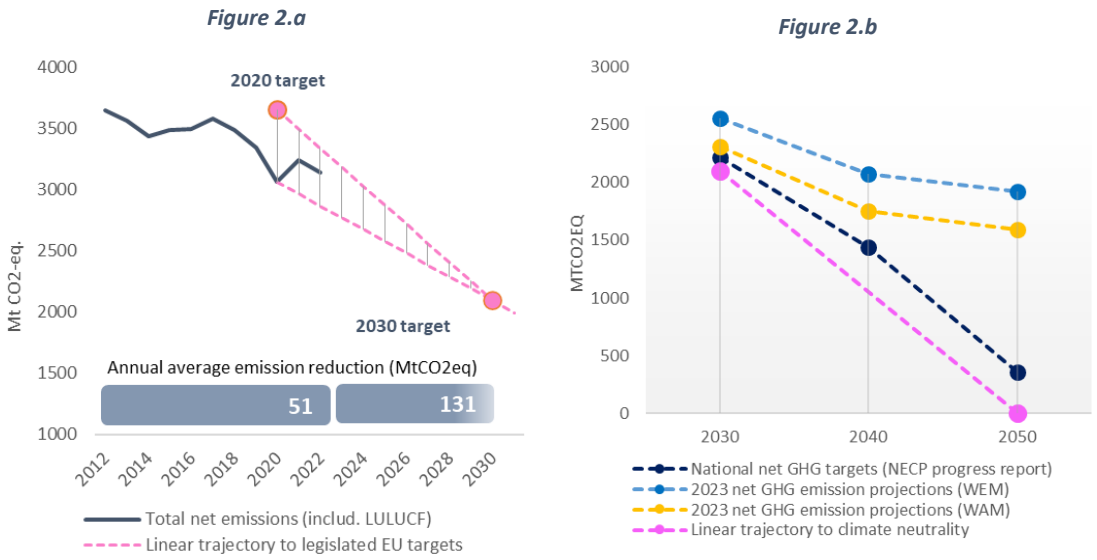
[15] Articles 6 to 8 of the European Climate Law (EUR-Lex - 32021R1119 - EN - EUR-Lex (europa.eu)).

[16] 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.

[17] The EU 2030 target as represented in the chart and the related progress assessments does not fully align with the exact legal scope of the 2030 target, which includes all emissions and removals regulated under EU law. While the EU ETS covers emissions from all flights within the European Economic Area (EEA) and departures to Switzerland and to the UK, these emissions (less than 2% of total GHG emissions) are not taken into account in this assessment. More information on ETS aviation emissions in chapter 2.

Although sizeable, such emission reductions are not unprecedented. In the two years before the pandemic, emissions were down by an annual average of 120 million tonnes of CO_2 equivalent, due to progress in energy efficiency and the fast deployment of renewables. In 2022, all actors in the EU, including energy intensive industry, decreased their demand for energy compared to pre-pandemic levels, with savings of more than 18% of gas compared to the five years before.[18]

Figure 2: EU GHG net emissions, targets and aggregated Member States' projections[19]



The energy crisis also sparked unprecedented momentum for renewable energy. In 2022, a record high of around 60 GW of wind and solar were installed in the EU[20] and heat pump market broke a new record, with around 3 million units (+37%) sold.[21] Despite a continued contraction in car markets and higher manufacturing costs, the share of electric cars sold in Europe reached 21.6% in 2022, while the availability of publicly accessible chargers surged by more than 50% compared to 2021.[22]

To hold this course, however, action by EU Member States is essential. On 15 March 2023, Member States updated their GHG projections and for the first time took stock of the progress achieved towards the objectives, targets and contributions set out in their initial integrated

[18] 5-year average compared to gas consumption between August 2022 and June 2023 (State of Energy Union Report 2023).

[19] Based on the 2023 GHG inventory and approximated EU GHG inventory for 2022, based on Member States' submissions, excluding international bunkers. Linear trajectories for GHG emissions and removals are based on legislated EU 2030 targets. The -55% 2030 target (European Climate Law) considers a contribution of removals limited to -225 $MtCO_2eq$. The national GHG targets are from Member States' submissions of NECP progress report (Annex I, Table 1). Any missing data are replaced by other targets or milestones that Member States submitted to the Commission under other reporting exercise (i.e. national long-term strategies, integrated national energy and climate plans, or the 2021 GHG projections). The annual average emission reduction after 2030 is based on a linear trajectory to EU climate neutrality. This is without prejudice to the pace required by the new 2040 target the Commission will propose in accordance with the Climate Law.

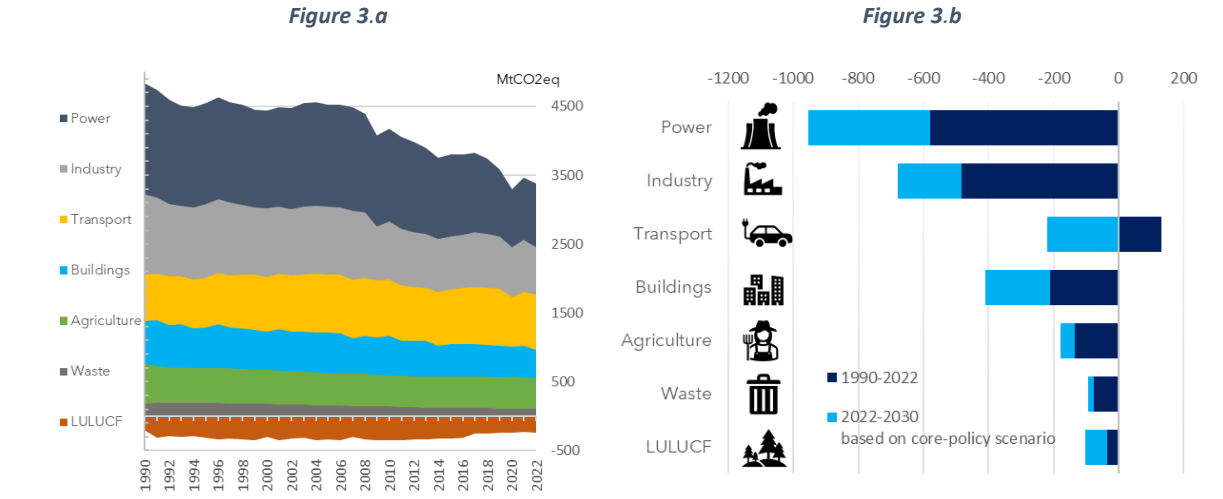
[20] Annual EU solar power growth increased by 47% from 28.1 GW in 2021. The new added capacity of 41.4 GW of solar power in 2022 is equivalent to the power needs of 12.4 million European homes. New report reveals EU solar power soars by almost 50% in 2022 - SolarPower Europe. New wind energy capacity in 2022 amounted to around 16 GW, up 40% on 2021. The EU built only 16 GW new wind in 2022: must restore investor confidence and ramp up supply chain | WindEurope.

[21] European Heat Pump Association, based on 21 markets, the number of heat pumps sold in 2022 replaced roughly 4 bcm of natural gas, avoiding about 8 million tonnes of CO_2 emissions. Market data – European Heat Pump Association (ehpa.org)

[22] Global EV Outlook 2023 (IEA).

National Energy and Climate Plans (NECP). The existing NECPs reflect past targets, before the EU raised its climate ambition under the European Green Deal. This assessment also feeds into the important process of updating the integrated NECPs by the Member States, which is now underway.

Figure 3: EU GHG emissions and removals by sector, past trends and required reductions[23]



In the 2023 NECP progress reports, over half the Member States set the objective to achieve climate neutrality by 2050 or earlier, in line with their national long-term strategies. Most of the Member States have also indicated quantitative national GHG targets up to 2050.[24] Once aggregated for the EU-27, the national GHG targets reported by Member States at different reporting exercises[25] indicate some gaps to the EU legislated objectives (i.e. a gap of around 3% to the -55% net GHG reduction target by 2030 and of 8% to the net-zero GHG emissions by 2050), although they reflect the will to meet the objectives set at EU level (see Figure 2.b).[26]

Member States' GHG emission projections provide additional indications of the expected evolution of EU GHG emissions. The latest projections submitted in March 2023 give a clearer measure of the risk of the EU missing its climate targets. Taking account of existing policy measures, aggregated projections at EU level indicate a gap of 15 percentage points to the EU 2030 GHG reduction target of 55%, and a narrower gap of 5 percentage points when factoring in additional policy measures (Figure 2.b). EU Member States still need to take

[23] Based on the 2023 GHG inventory and model-based outcomes of core policy scenario supporting the initiatives delivering the European Green Deal. Negative values for the LULUCF sector indicate an increase of GHG removals. Notes: (1) Energy sector refers to electricity and heat production and petroleum refining. (2) Industry includes fuel combustion in manufacturing and construction and emissions in industrial processes and product use. (3) Buildings include emissions from energy use in residential and tertiary buildings. (4) Agriculture includes both non-CO_2 emissions and emissions from the energy use in agriculture and fishery sectors.

[24] As reported under Annex I, Table 1 of Commission Implementing Regulation (EU) 2022/2299 of 15 November 2022. See SWD on the Assessment of progress towards the objectives of the Energy Union and Climate Action accompanying the State of the Energy Union 2023.

[25] Missing NECPR values were replaced by national GHG targets submitted by Member States to the Commission in the past (e.g. for the 2021 NECP or long-term strategies), when available. As targets might be expressed in different global warming potential (i.e. AR4 or AR5), these values are indicative only.

[26] International maritime and aviation emissions could widen these gaps once included in the scope of EU climate targets.

additional mitigation measures to achieve climate neutrality by 2050 to cut around 1 600 million tonnes of CO_2 equivalent (or 34 percentage points).

EU Member States have also reported progress on more than 3000 individual policies and measures (PaMs), the large majority specifically aiming to reduce GHG emissions and increase carbon removals. Of the measures specifically addressing decarbonisation, around a third are *newly* implemented (i.e. from 2022 or later). The number of measures for climate mitigation reported in 2023 is 19% higher than in the previous reporting cycle. This is consistent with the EU's higher climate ambition and reflects the work to prepare the updated national energy and climate plans, with the final plans due by June 2024.[27]

Figure 4: Number of single policies and measures (decarbonisation dimension) by affected sector and aggregated reported expected emission savings and increase net removals[28]

Figure 4.a

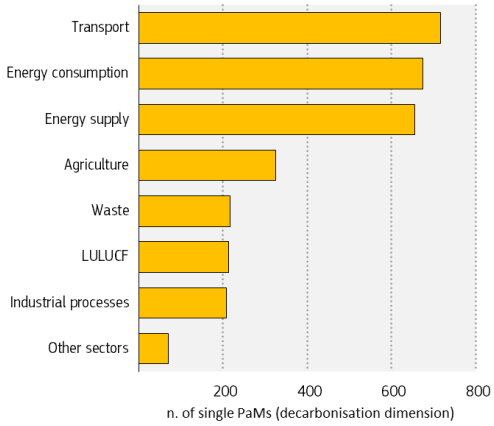
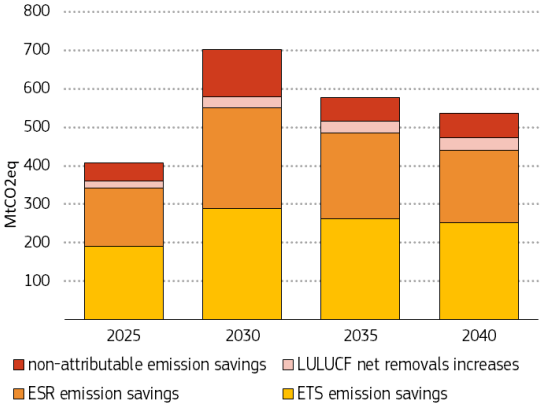


Figure 4.b



The sectors with the most measures are transport (23%), energy consumption (22%), and energy supply (21%), partly reflecting the sectoral challenges and priorities (Figure 4.a). Information on the expected (ex-ante) emissions savings from these measures is important to assess expected progress from the planned and implemented measures. Unfortunately, in 2023, only 18 Member States reported quantitative ex ante savings for at least one year and one measure. This is lower than in 2021, making the aggregate assessment particularly difficult (Figure 4.b). It again highlights the need for Member States to step up action to assess the effects of implemented policies more systematically, both ex ante and ex post.

In conclusion, although GHG emissions continue to fall, as shown by the most recent data, and there are encouraging signs of action on the ground, progress towards the EU's climate objectives appears insufficient. Action is most needed in areas where:

- emission reductions still required are significant (buildings, transport),
- recent progress made is too slow (agriculture),

[27] Updated NECPs should reflect necessary increased ambition from the Fit for 55 package, the REPowerEU initiative and energy crisis measures adopted by the EU in the last year, given guidance issued by the European Commission in December 2022 on the update of NECPs, and pending in-depth review of the Governance Regulation.

[28] Values based on Annex IX to the NECP progress reports submitted by Member States, as of 31 August 2023. Member States could indicate more than one sector. This explains why the sum of measures across all affected sectors is higher than the current total number of individual measures.

- figures have not evolved in the right direction (land use, land-use change, and forestry).

The assessment shows that to get on a safer – more certain – path towards climate neutrality by 2050, the EU and its Member States need to significantly increase the pace of change. The Fit-for-55 legislative package must be adopted fully, and all parts rapidly implemented. More detailed monitoring is needed to assess progress on enabling factors that drive emissions in the different sectors to better highlight areas where progress is lacking or more action is needed.

PROGRESS ON CLIMATE ACTION IN THE EU

The "Fit for 55" package sets the EU on a path to reach its climate targets in a fair, cost-effective and competitive way. Most of the key proposals in the package have been adopted by co-legislators[29] and EU policies are now aligned with the updated 2030 target set in the European Climate Law. Implementing the new legislation under the Fit for 55 package[30] will enable the EU and its Member States to reduce net GHG emissions by at least 55% compared to 1990 levels by 2030[31](see Ch. 1 of the staff working document – 'Technical information').

The revised EU ETS Directive increases the level of ambition in the existing system from 43% to 62% emissions reductions by 2030, compared to 2005 levels and extend the system to also apply to international maritime transport. A separate carbon pricing system will apply to fuel combustion in road transport and buildings and small-emitting sectors[32] (ETS2) with a 42% emission reduction target compared to 2005 across the sectors covered. The amended Effort Sharing Regulation (ESR) increased, for the sectors that it covers, the EU-level GHG emission reduction target from 29% to 40% by 2030, compared to 2005, which translates in updated 2030 targets for each Member State. The new LULUCF Regulation sets an overall EU-level objective of 310 Mt CO_2 equivalent of net removals in the LULUCF sector in 2030.

To ensure a just transition towards climate-neutrality, the EU created a new fund, the Social Climate Fund, to accompany the new ETS2, which will address the impacts of carbon pricing in new sectors and provide support for vulnerable households, micro-enterprises and transport users. Together with the Just Transition Fund supporting the territories most affected by the transition (see chapter 6), they will ensure that no-one is left behind. Empowerment of energy consumers is also enhanced by the latest legislative initiatives related to the electricity market. Under the Net Zero Industry Act (NZIA), the Commission will support the setting up of specialised academies for up-skilling and re-skilling.

In 2022 and 2023, the Commission made additional proposals to speed up the transition to climate neutrality**.** For example, the legislators reached a provisional agreement on the revised Fluorinated greenhouse gases (F-gases) Regulation which will further reduce the emissions from those highly potent GHGs. The Commission proposed more ambitious emissions reductions targets for heavy-duty vehicles**.** The Commission also put forward the

[29] This includes the revised EU ETS Directive, a new ETS for buildings, road transport and fuels, the Market Stability Reserve, the Effort Sharing Regulation, CO_2 standards for cars and vans, the Land Use, Land Use Change and Forestry Regulation, the Carbon Border Adjustment Mechanism, the establishment of the Social Climate Fund, FuelEU Maritime, the Alternative Fuel Infrastructure Regulation (AFIR), ReFuel EU Aviation, the Energy Efficiency Directive and the Renewable Energy Directive. Only the proposed revised energy taxation directive is still pending agreement.

[30] Cf. Chapter 2 of the staff working document – 'Technical information'.

[31] The legislation as adopted is estimated to result in a net domestic reduction of GHG emissions of 57% by 2030 compared to 1990. An overview of targets is presented in Chapter 1 of the staff working document – 'Technical information'.

[32] CO_2 emissions from fuel combustion in industry not covered by the existing EU ETS.

REPowerEU plan with specific measures to reduce the EU's energy dependence on Russian fossil fuels, and to speed up implementation of the European Green Deal with new actions, while building on the Fit for 55 package. To enhance the competitiveness of Europe's net-zero industry and to boost innovation, in particular in green technologies, the Commission put forward a Green Deal Industrial Plan. Chapter 2 of the staff working document – 'Technical information' presents an overview of recently adopted policy contributing to the alignment of EU level policies with climate objectives.

In November 2021, the Commission updated its Better Regulation instruments to ensure that new EU policies are consistent with climate goals. All proposed EU measures should now be assessed for their consistency with climate objectives- the climate neutrality objective and the objective to ensure progress on adaptation- as part of the impact assessment process, in line with the European Climate Law (the climate-consistency check). Good progress has been made in implementing this check. Since the beginning of 2022, out of the 27 impact assessments deemed relevant for this assessment (out of 57 impact assessments scrutinised by the Regulatory Scrutiny Board[33]), 20 were found to have sufficiently assessed consistency of the initiative with climate objectives, while 7 impact assessments did not sufficiently assess climate aspects. This represents almost 75% of relevant cases and reflects the fact that it is a new requirement. With more experience in implementing the climate consistency check, compliance with this new impact assessment requirement could be further improved.

While good progress has been made to ensure that EU policies put the EU on a path towards a net zero economy, the recent emissions trends in the transport sector and the very slow pace of emissions reductions in agriculture, along with a decline of the carbon sink, raise concerns (see Chapters 3 and 4). Despite progress on green finance from private sources, significant additional investment is needed to finance the green transition. This needs action, in particular to redirect finance to enable the transition of 'brown' sectors (see Chapter 6).

As required by the European Climate Law, the Commission will publish a communication on the EU's climate target for 2040 in early 2024, setting a path from the already-agreed intermediate 2030 target to net-zero emissions by 2050. This will provide the information needed to ensure that measures and investments to implement the EU's 2030 targets are also well aligned with the pathways to climate neutrality by 2050. The 2040 target will provide predictability and keep progress on track to climate neutrality.

Climate change is already impacting nature and people more intensely, more frequently and over a wider geographical area than previously thought.[34] Progress is being made in the assessment of climate risks. In spring 2024, the Commission will respond to the evidence provided in a scientific European Climate Risk Assessment report on the evolution of climate risks and the need for further action in a communication on managing EU climate risks**.** In parallel, wide-ranging action is underway to implement the other aspects of the EU's 2021 adaptation strategy (see Chapter 5).

PROGRESS ON CLIMATE ACTION IN THE EU MEMBER STATES

The next chapters of the report will assess the progress made by the Member States in specific policy areas. This section gives a bird's eye view of GHG emissions trends towards climate mitigation objectives, including the EU's objective to achieve climate neutrality by 2050, and

[33] Impact assessment submitted for the first time to the Regulatory Scrutiny Board between January 2022 and April 2023 and for which an interservice consultation was launched by 23/05/2023.

[34] IPCC Sixth Assessment Report, Impacts, Adaptation and Vulnerability, February 2022.

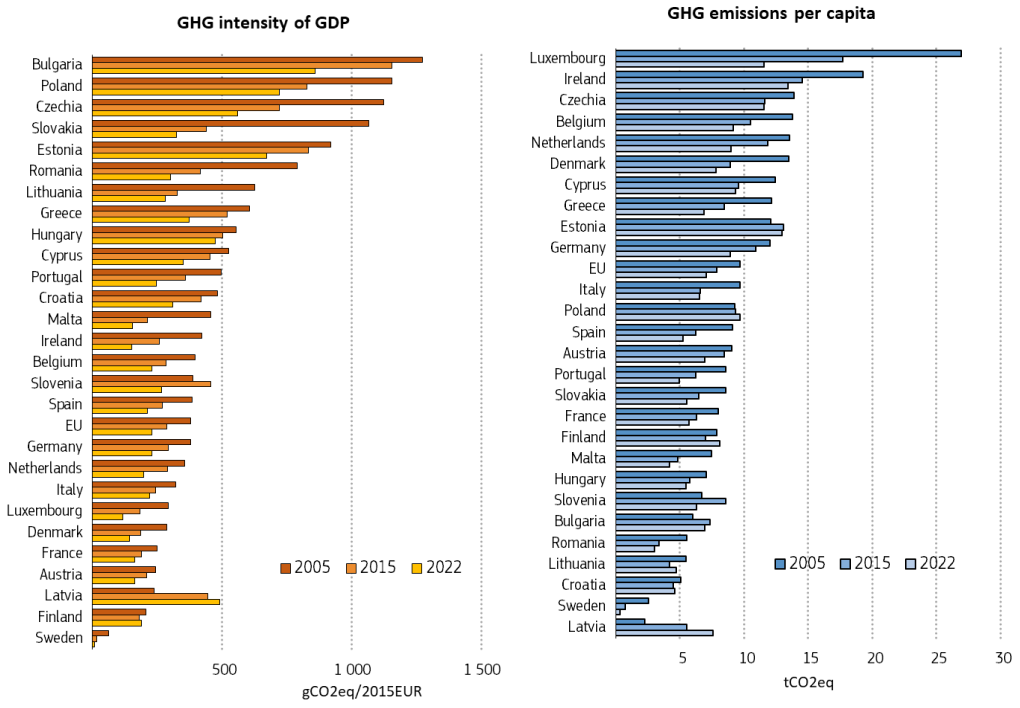
builds on the detailed analysis provided in Chapter 5 of the staff working document – 'Technical information'.

Over the last three decades, the EU has substantially reduced its GHG emissions, overachieving its 2020 commitment under the UNFCCC[35] and its target under the Kyoto Protocol's second commitment period in 2013-2020 (KP2).[36] Total GHG emissions under the UNFCCC (excluding LULUCF and including international aviation) fell by 34% in the EU-27 + UK compared to 1990. This is a reduction of 1.94 billion tonnes of CO_2-eq by 2020. (For more details see Chapter 4 of the staff working document – 'Technical information').

However, in the most recent years, progress across Member States has been mixed. Between 2015 and 2022, net GHG emissions have been rising in Latvia, Finland, and Lithuania, and, to a lesser extent, in Cyprus, Poland, Malta, Estonia, and Ireland. GHG emissions were reduced but only slowly in Czechia, Italy, Hungary, Croatia, France, and Denmark. The reasons vary by country. In Finland, Latvia and Estonia the upward emissions trend is mainly related to the sharp decline of the capacity of the land use, land-use change and forestry sector to act as a carbon sink, while for Lithuania, transport and building also contribute to the increase in emissions. Transport emissions increased in Hungary, Malta and Poland, while in Ireland emissions in agriculture continued to grow.

Since 2005, there has been a clear downward trend in GHG emissions per capita and in the GHG intensity of GDP in all EU Member States except Latvia (Figure 5). More rapid progress by countries with higher emitting ratios has led to significant convergence towards the EU average. However, between 2015 and 2022, the downward converging trend seems to have halted for most EU Member States.

Figure 5: GHG intensity of GDP and GHG emissions per capita by EU Member States



[35] Under the UNFCCC, the EU and its Member States (including the UK) committed to a joint, economy-wide target to reduce GHG emissions by 20% compared to 1990 levels by 2020 ('the Cancun pledge').

[36] Under the Kyoto Protocol's second commitment period in 2013-2020, the EU, its Member States, the UK and Iceland committed jointly to reducing GHG emissions by 20% on average in comparison to 1990.

Information on the expected impact of current and additional policies on GHG emissions submitted by Member States can be used to gain insights into the progress they are making, or are expecting to make, towards the EU's climate objectives. By 2030, based on the GHG projections submitted by EU Member States in March 2023, six countries (Poland, Ireland, Estonia, Czechia, Luxembourg, and Latvia) expect emissions per capita to be significantly higher than 5 tonnes of CO_2-eq, which is the average EU GHG per capita broadly consistent with the EU -55% target.[37] On the climate-neutrality objective, all Member States except Finland, Portugal, Slovenia and Sweden still project sizeable net GHG emissions in 2050 even taking into account current and additional policies (see Table 6, in Chapter 5 of the staff working document – 'Technical information'), despite the fact that almost all have declared a climate-neutrality goal by 2050, or earlier.

Trajectories are also important. Figure 6 compares projected emissions[38] between 2022 and 2050 for each Member State with a benchmark trajectory, built as the median of the seven climate neutrality paths that form the basis of the advice of the European Scientific Advisory Board on Climate Change on the 2040 ambition.[39] The EU-level emissions of the median path were then distributed across Member States according to the country's share of EU emissions in the core policy scenario used for the European Green Deal initiatives.[40]

Figure 6: Overshoot of projected GHG emissions against an indicative path to climate neutrality by 2050 (in % of benchmark emissions, total emissions excluding LULUCF)

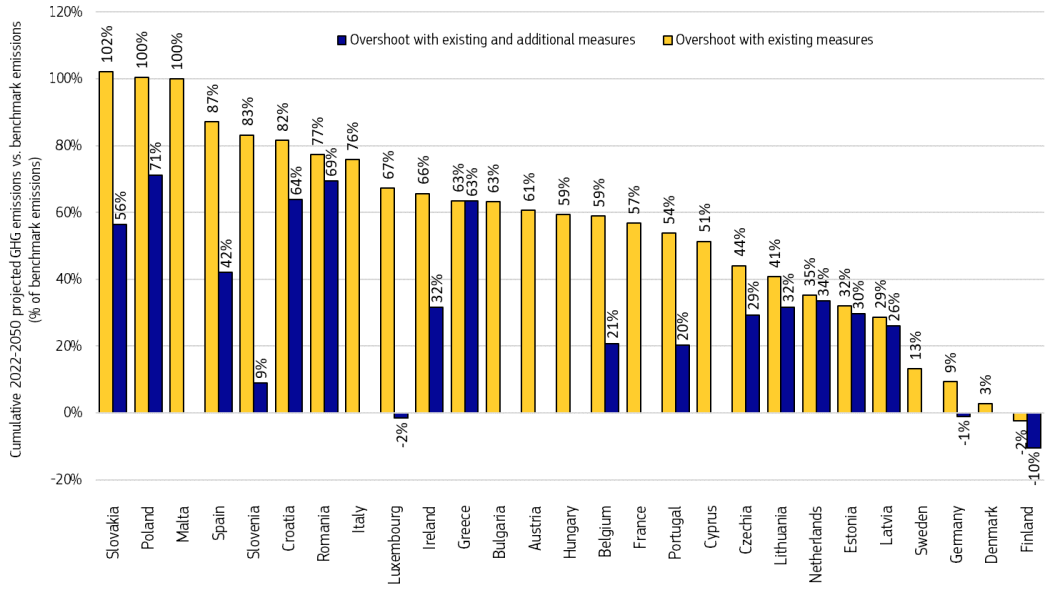


Figure 6 shows stark differences in progress towards climate neutrality across the EU's members. Factoring in existing measures[41] (WEM, the yellow bars), between 2022 and 2050,

[37] Net GHG emissions consistent with EU 2030 target (around 2100 $MtCO_2eq$), divided by the latest Eurostat population projections for EU-27 by 2030 (around 550 million EU residents), is equal to 4.7 tonnes of CO_2eq per capita.

[38] Excluding LULUCF emissions and removals.

[39] Scientific advice for the determination of an EU-wide 2040 climate target and a GHG budget for 2030–2050 (europa.eu)

[40] Policy scenarios for delivering the European Green Deal (europa.eu). After 2030, the distribution key has been kept constant.

[41] Projections 'with existing measures' (i.e. WEM) encompass the effects, in GHG emissions, of policies and measures adopted and implemented.

Slovakia, Poland and Malta expect to emit more than twice the emissions of the benchmark path to climate neutrality. A further 15 Member States project their cumulative emissions to overshoot the climate-neutrality benchmark by more than 50% without additional policies.[42] When factoring in the impact of additional policy measures[43] (WAM, the blue bars) the overshoots decrease, although the gaps remain significant (above 50%) for Slovakia, Poland, Croatia, Romania and Bulgaria.[44]

Similar results are produced when taking a linear trajectory as the indicative benchmark. Here, the largest overshoots are for Malta, Italy, Greece, Austria and Hungary under the WEM scenario, and for Poland, Romania, Bulgaria, and Croatia under both WEM and WAM scenarios (see Table 6, Chapter 5 of the staff working document – 'Technical information').[45]

These analyses based on Member States' GHG emission projections reflect different levels of ambition and implementation, but also the completeness and quality of data submitted. By the end of April 2023, more than a month after the official deadline, only 20 Member States had submitted their projections via the e-platform. Late submissions undermine the quality control and follow-up process of resubmissions. In addition, although not being mandatory, nine Member States[46] did not submit projections with additional measures, which were then gap-filled with projections using the 'existing measures' scenario, and for Belgium's projections that lacked information beyond 2030, 2021 GHG projections were used. The Commission therefore urges Member States to improve their emissions projections and support analytical capacity and tools. Projections are an important guide for decarbonisation, to assess progress towards the climate-neutrality objective and to support sound policy design and decisions.

In 2023, all Member States reported progress on policies and measures. Although the number of measures has increased, there are still significant differences among Member States in the number of reported measures. Belgium, Spain, Luxembourg, and France reported the most measures and Bulgaria, Austria, Greece and Malta the least (Figure 7).[47]

Compared to the previous reporting exercise (2021), the greatest increase in reported measures is in Cyprus and Luxembourg, followed by Spain, Portugal, Finland, Italy, and Estonia. Bulgaria, Austria and Malta reported a significant decrease. At the same time, more than a third of measures reported by Lithuania, Estonia, Croatia, Ireland, and Bulgaria appear to be new (in place as of 2022 or later). In terms of the affected sectors (Figure 7.b), the relative high share of policies and measures affecting agriculture and LULUCF sectors in Latvia and Finland should be noted, given recent trends in these sectors, although the reported expected emission savings are not significant.[48]

[42] ES, SL, HR, RO, IT, BG, LU, IE, EL, AT, HU, BE, FR, PT and CY.

[43] Projections 'with additional measures' (i.e. WAM) encompass the effects, in GHG emission reductions, of policies and measures adopted and implemented, as well as policies and measures that are planned (e.g. measures under discussion having a realistic chance of being adopted and implemented after the date of submission of the national plan).

[44] Only 18 Member States have submitted their GHG emission projections under the 'with additional measure' scenario.

[45] The metric compares cumulative projected net GHG emissions (including LULUCF) with cumulative emissions underlying a linear trajectory from the 2021 net GHG emissions levels of each Member States to climate-neutrality by 2050.

[46] CY, DK, FR, EL, IT, MT, AT, HU, and SE.

[47] The number of reported PaMs could reflect the granularity of reported policies and measures. For example, both Belgium and France report their PaMs at a highly disaggregated level (e.g. many regional policies and measures are reported), while other Member States report their PaMs in a more aggregated level. Values are those available on 31/08/ 2023.

[48] Annex IX of Commission Implementing Regulation (EU) 2022/2299 of 15 November 2022). For more, see the SWD on the assessment of progress towards the objectives of the energy Union and climate action accompanying the State of the Energy Union 2023.

Figure 7: Number of single policies and measures reported by Member States: status of implementation and affected sectors[49]

Figure 7.a

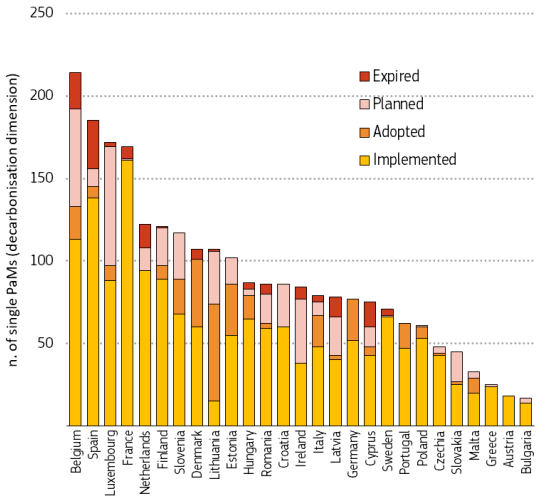
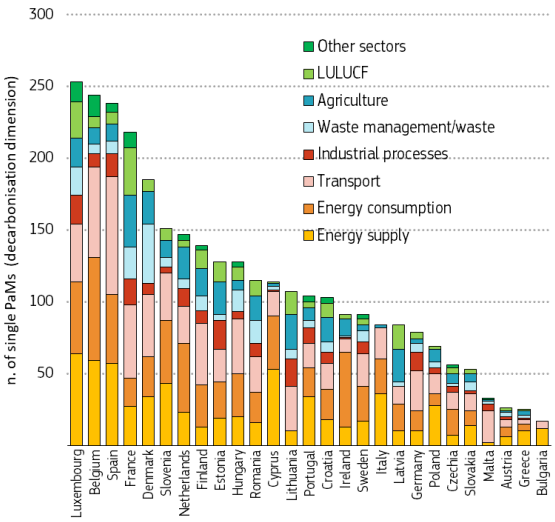


Figure 7.b



The EU 2030 climate target and the EU climate-neutrality objective by 2050 require ending subsidies for fossil fuels, creating favourable conditions for energy efficiency and renewable energy and focusing on the needs of the vulnerable for a just energy transition. Total fossil fuel subsidies had remained stable or slightly decreased for a number of years, reaching EUR 56 billion in 2021, but have surged recently due to measures to cushion the impact of the energy crisis. The Commission estimates that fossil fuel subsidies in 2022 more than doubled compared to 2021, reaching EUR 122 billion. Member States must accelerate action to end fossil fuel subsidies.[50]

Overall, the level of progress by Member States in recent years falls significantly short of the effort required over the coming decades to meet both the medium and the long-term EU climate targets. Member States should rapidly accelerate action by making tangible progress on planned policies and by taking additional, urgent measures in line with the country-specific recommendations issued in the European Semester process of economic policy coordination. Several Member States also face sectoral challenges and weaknesses that need to be remedied without further delay.

In particular based on the available information, the level of progress towards the EU climate-neutrality objective appears insufficient for Poland, Ireland, Latvia, Malta, and Croatia, and, to a lesser extent, for Austria, Estonia, Czechia, Cyprus, Italy and Romania.

However, this current assessment does not reflect the more ambitious climate intentions that Member States should include in their revised national energy and climate plans (NECPs). By

[49] Values based on Annex IX of NECP progress reports submitted by Member States, by 15/08/2023. Member States could indicate more than one affected sector, so the sum of PaMs across all affected sectors can be higher than the total number of single PaMs with a decarbonisation dimension.

[50] 2023 Report on Energy Subsidies in the EU, annexed to the 2023 State of Energy Union Report.

30 June 2023, Member States had to submit their draft updated NECPs to the Commission.[51] The draft NECPs should contain the policies and measures that each Member State envisages to meet their climate and energy targets. The Commission is in the process of assessing the draft NECPs and will issue recommendations to the Member States by the end of the year. Member States are encouraged to take these recommendations into account in their final updated NECPs due by 30 June 2024. The Commission urges Member States to seize the opportunity of updating their NECPs to plan additional measures, to align the expected emissions with the EU's higher level of ambition on climate policy.

Large-scale, long-term projects need to be supported by reliable 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. Given the scale of the challenges ahead, the Commission will consider issuing recommendations under Article 7(2) of the Climate Law, together with recommendations on the draft NECP updates.

[51] By 6 October 2023, 16 Member States had submitted draft updated NECPs. 6 Member States foresee a higher ambition in their draft NECPs compared to their reported projections in March 2023.

2 THE EU EMISSIONS TRADING SYSTEM

The EU Emissions Trading System (EU ETS) is a cornerstone of EU's climate action. It covers around 36% of EU's total GHG emissions, from the electricity and heat generation, manufacturing industry and aviation within Europe.[52] By setting a cap on the total emissions, the system ensures that these emissions decrease over time. Within the cap, allowances are distributed primarily via auctioning, which raises revenues for Member States' budgets to support climate action and energy transformation. With the allowance price determined by the market, the ETS incentivises cost-effective emission reductions.

By 2022, the EU ETS had helped drive down emissions from power and industry installations by 37.3% compared to 2005 levels. These emission reductions have been largely driven by the energy sector - a switch from coal to gas and an increased deployment of renewable energy sources. Latest emission trends in the EU ETS, however, also reflect the impacts of the COVID-19 pandemic and the energy crisis (*see Emission Trends*).

In parallel, the EU ETS has raised over EUR 152 billion in auction revenues that Member States have largely used to support projects in renewable energy, energy efficiency and low-emission transport. In the wake of the energy crisis, Member States have also used their ETS revenues to address negative impacts on consumers and industries.

The revision of the EU ETS under the Fit for 55 package will help bring down emissions faster and across more sectors. The European Parliament and Member States in the Council agreed to tighten the cap on emissions whilst extending the system to emissions from maritime transport (*see Action in aviation and maritime transport*). A reduction in free allocation will help step up emission reductions across manufacturing industry and aviation. At the same time, more resources are leveraged to support decarbonisation in ETS sectors. The revision commits Member States to using all ETS revenues (or an equivalent thereof) for climate action, energy transformation and addressing social challenges of carbon pricing, and also increases the sizes of the Innovation and Modernisation Funds (see Ch. 2 of the staff working document – 'Technical information' for more details).

The revision of the EU ETS entered into force on 5 June 2023 with most changes taking effect from 1 January 2024. Work on the implementing legislation is ongoing. More on the functioning of the EU ETS in 2022 is available in the Carbon Market Report 2023.

EMISSION TRENDS

In 2022, overall EU ETS emissions decreased by 0.2% compared to the previous year.[53] This reflects a slight decrease in emissions from power and industry installations and a continued rebound in emissions from aviation after the COVID-19 pandemic. Looking to before COVID-19, however, emissions have remained on the decline. In 2022, emissions were around 8% lower than in 2019.

The EU's economic recovery continued in 2022, with GDP growing 3.5%. Even so, emissions from the energy sector and manufacturing decreased slightly by 1.8% compared to 2021. This is in part due to the energy crisis and its impacts. On the one hand, natural gas supply became restricted, and higher natural gas prices caused an increase in coal use for power generation.

[52] Including departing flights to Switzerland and the United Kingdom.

[53] Based on data from the EU Registry as of 30 June 2023.

On the other hand, the energy crisis contributed to an increase in inflation and a reduction in industrial demand.

Electricity and heat generation – a slight increase in emissions

Emissions from electricity and heat generation in 2022 rose by 2.4% compared to 2021. Although electricity and heat demand decreased due to higher energy prices and milder weather, sectoral emissions increased due to a switch back from gas to coal for energy generation. The switch was prompted by both high prices of natural gas, and droughts in many parts of the EU which reduced output of nuclear and hydro power.

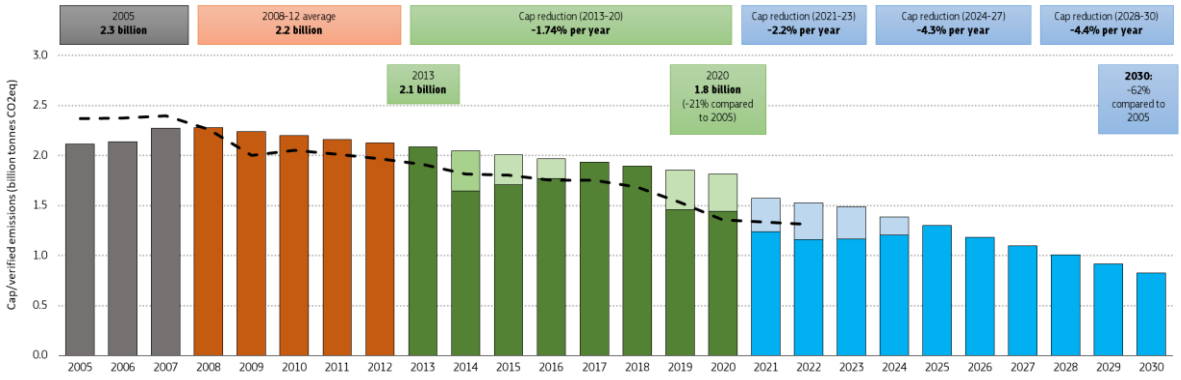
Industry – a net decline in emissions

Manufacturing industry saw a reduction of emissions of 6.5% in 2022 compared to 2021. With higher energy prices leading to reduced output, sectors such as cement, iron and steel and chemicals reported significant emissions reductions in 2022. At the same time, emissions in the oil and gas-producing sectors rose, as refineries increased output to profit from increased fossil fuel prices.

Aviation – emissions continue to rebound

In the EU, verified emissions from aircraft operators increased significantly, by 75% compared to 2021. This reflects a continued rebound of air traffic from the COVID-19 pandemic but is still almost 27% lower than in 2019.

Figure 8: Verified ETS emissions 2005-2022, Member States projections with existing measures 2021-2030, ETS cap phases 2, 3 and 4, and accumulated surplus of ETS allowances 2008-2021 including UK (Northern Ireland), Norway and Iceland NB: adjust for cap phase 4.[54]



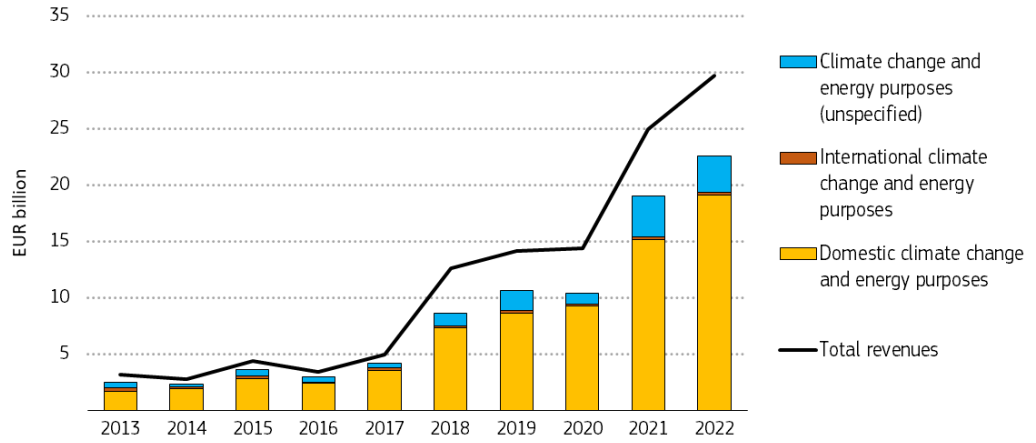
[54] Emissions cap in the EU ETS (considering the 2023 revision of the ETS Directive, i.e. rebasing in 2024 and 2026, inclusion of the maritime transport sector in 2024, and the linear reduction factor of 4.3% in 2024-27 and of 4.4% from 2028), compared with verified emissions. Aviation is not included. Due to scope changes, 2005-7 figures are not directly comparable to the latest. Legend: bars (cap), light shade bars in 2014-16 (allowances backloaded in phase 3), light shade bars since 2019 (feeds of allowances to the Market Stability Reserve), dash line (verified emissions).

REVENUES RAISED BY THE EU ETS

The EU ETS generates substantial revenues from the sale of allowances that can be used for climate action (see Chapter 6).

As the carbon price increased during 2022, so did ETS auction revenue, amounting to some EUR 38.8 billion in total, 7.7 billion more than in 2021 (Figure 9).[55] Of these EUR 38.8 billion, EUR 29.7 billion went directly to the 27 Member States. They reported that in 2022 an average of 76% of revenues was spent for climate and energy purposes,[56] the same as in 2021 and in line with an average of 75% over the 2013-2020 period. About 25% of Member State revenues are earmarked for specific climate and energy actions, 27% went into dedicated environmental funds and 48% went to national budgets. More information can be found in the staff working document – 'Technical information'.

Figure 9: Auctioning revenues received by EU Member States and report usage (2013-2022)



Since 2021 several Member States use part of their auction revenue to cushion the social impact of the energy price crisis.

ACTION IN AVIATION AND MARITIME TRANSPORT

Maritime

Maritime transport is a substantial CO_2 emitter, generating around 3-4% of total EU CO_2 emissions. In 2022, emissions, as collected under the Monitoring, Reporting and Verification Regulation[57], increased by 7% compared to the previous year, as the sector recovered from the COVID-19 pandemic downturn. In May 2023, as part of the revised EU ETS Directive, the EU Maritime MRV Regulation was amended to extend its scope to cover non-CO_2 emissions (CH4 and N2O) as well as new ship types and sizes. The EU ETS will therefore cover CO_2 emissions from large ships calling at EU ports as of 2024 and non-CO_2 emissions as of 2026. At international level, the EU successfully supported the increase in ambition of

[55] EU-27 + EEA countries + Northern Ireland + Innovation Fund + Modernisation Fund.

[56] The remaining 24% is not necessarily spent on other purposes. Part will be spent in later years or go to general budget used for multiple purposes, including climate change and energy.

[57] Regulation (EU) 2015/757.

the 2018 International Maritime Organization greenhouse gas reduction strategy. The revised strategy, agreed in July 2023, sets a goal of net zero emissions from ships "by or around, i.e. close to, 2050" and indicative checkpoints set at reducing GHG emissions from ships by at least 20% - striving for 30% - in 2030 and at least 70% - striving for 80% - in 2040, both in comparison to 2008 levels.

Aviation

The overall climate impact of aviation is currently two to four times higher than the effect of its past CO_2 emissions alone, with non-CO_2 accounting for 66% of the aviation climate impact. There is no monitoring yet by Member States of aviation non-CO_2 emissions. From 1st January 2025, the revised ETS Directive tasks aircraft operators to monitor and report the non-CO_2 effects per flight on a yearly basis. By 31 December 2027, based on the results of the application of the MRV framework of non-CO_2 aviation effects, the Commission will submit a report and, where appropriate, a legislative proposal to mitigate the non-CO_2 effects by expanding the scope of the ETS to include them.

A BALANCED EU CARBON MARKET

Since 2019, the EU ETS functions with the Market Stability Reserve, which addresses the historical surplus of allowances built up in the system and improves resilience of EU carbon market to demand shocks. Based on the total number of allowances in circulation every year, the Reserve either withdraws or releases allowances, managing their supply to future auctions. This helps maintain a robust price signal in the ETS, to incentivise emission reductions and be factored into investment appraisal.

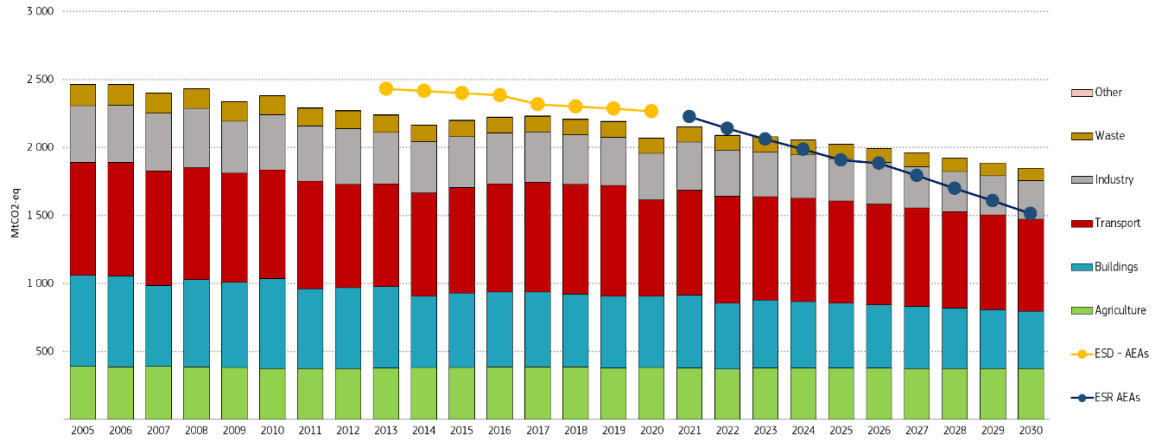
In 2022, the surplus of allowances in the EU ETS was just over 1.1 billion allowances. With this, the Reserve continues to withdraw allowances from the EU carbon market in 2023. From 2023 onward, allowances held in the Reserve above a certain threshold lose their validity. This means they can no longer be released to the market. On 1 January 2023, a little over 2.5 billion allowances became invalid. This is more than all the international credits used for compliance in the EU ETS to date. Thanks to the Market Stability Reserve and an ambitious long-term climate policy outlook of the European Green Deal, the price signal in the EU ETS remained robust in 2022 with only a short period of market volatility in March, triggered by Russia's aggression against Ukraine.

3 EFFORT SHARING EMISSIONS

The Effort Sharing legislation covers GHG emissions from domestic transport (excluding CO_2 emissions from aviation), buildings, agriculture, small industry and waste. They account for around 60% of the EU's domestic emissions. The Effort Sharing legislation sets binding national targets to reduce emissions in these sectors compared to 2005 levels, under the Effort Sharing Decision[58] (ESD) for the period 2013-2020 and under the Effort Sharing Regulation[59] (ESR) for the period 2021-2030.

Based on approximated data, emissions from the effort sharing sectors in 2022 were 3% lower than in 2021. It followed the rebound of emissions in 2021, after the pandemic. The reduction in emissions resulted in particular from the buildings sector which showed an emission decrease of more than 9% compared to 2021. Small industry showed the second largest emission reduction with a decrease of almost 6% compared to 2021. The transport sector is the largest sector under the ESR, accounting for over one third of total effort sharing emissions, and the only one that saw its emissions increase, by over 2% from 2021 to 2022.

Figure 10: Emissions in sectors covered by effort sharing legislation 2005-2030 and annual emission allocations, EU-27[60]



RESULTS OF THE EFFORT SHARING DECISION 2013-2020

In the period 2013 to 2020 all Member States met their effort sharing obligations under the ESD in every year. The EU overachieved its 2020 emission reductions target by more than six percentage points. EU-27 emissions covered by the ESD were 16.3% lower in 2020 than they were in 2005. Compared to 2013, the EU-27 emissions were 7.2% lower in 2020. 2020 was the last year covered by the ESD. Member States could not carry-over (bank) AEAs for use in future years under the ESR.

However, in 2020, emissions from four Member States exceeded their annual emissions allocations (AEAs).[61] Cyprus used surplus AEAs from previous years (banking) to cover their

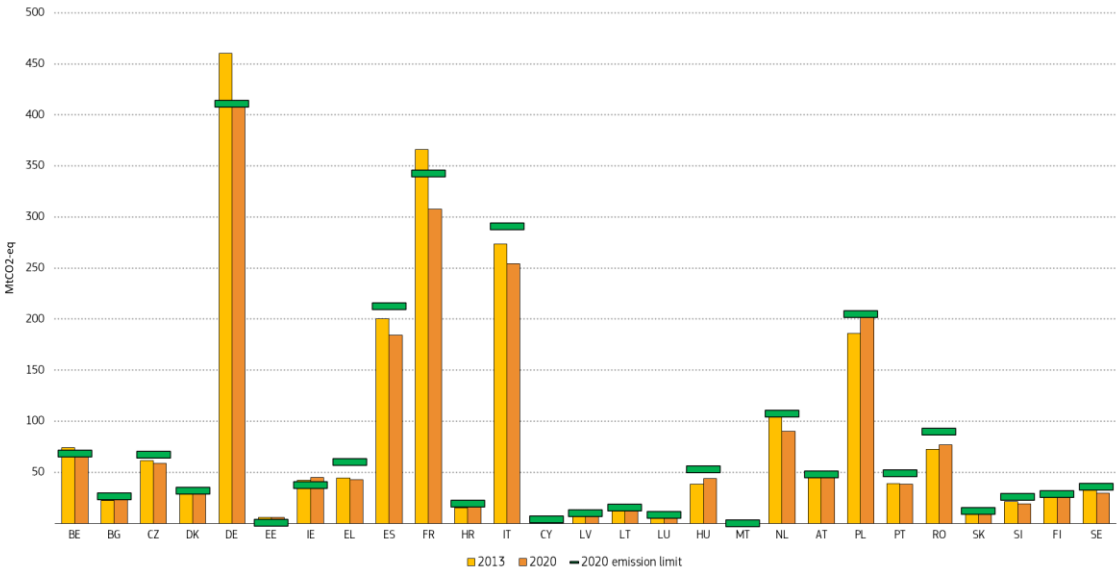
[58] Decision No 406/2009/EC of 23 April 2009.

[59] Regulation (EU) 2018/842 of 30 May 2018, as amended by Regulation (EU) 2023/857 of 19 April 2023.

[60] From inventory data for the years 2005-2022, and from projections for the years 2023-2030 as reported by Member States under Regulation (EU) 2018/1999, compiled and checked by the EEA. The ESD AEAs are expressed in GWP AR4, all other numbers are in GWP AR5. Figures include EU-27 only.

excess emissions. Malta and Germany covered their excess emissions by buying AEAs. Malta bought them from Bulgaria and Germany from three different countries (Bulgaria, Czechia and Hungary). Ireland used international credits from the Clean Development Mechanism[62] and bought AEAs from Slovakia to meet its obligations under the ESD.

Figure 11: Change in ESD emissions between 2013 and 2020, against 2020 annual emission allocations[63]



PROGRESS UNDER THE EFFORT SHARING REGULATION 2021-2030

In April 2023, the ESR was amended to deliver a higher ambition for 2030. This increased the ESR EU-wide target to reduce emissions from 29% (for EU-27) to 40% by 2030 compared to 2005 levels. The overall ESR target was translated into increased national GHG emission reduction targets by 2030 and more ambitious GHG emissions limits for 2023 - 2030. The amendment also changed some of the flexibilities that are available for Member States to comply with their annual GHG emission limits and targets and strengthened other provisions (for more details see Chapter 2 of the staff working document – 'Technical information'). Iceland and Norway also implement the Effort Sharing Regulation, but the trend in (projected) emissions is only made for the EU Member States below.[64]

[61] Annual emission allocations are annual emission limits for GHG emissions in the effort sharing sectors for each Member State.

[62] The Clean Development Mechanism (CDM), defined in Article 12 of the Kyoto Protocol, allows a country with an emission-reduction or emission-limitation commitment (Annex B Party) to implement an emission-reduction project in developing countries.

[63] The graph shows Member States ESD emissions in 2013 (yellow bar) and 2020 (orange bar), compared to its AEAs for 2020 (green line) before the use of any flexibilities under the ESD.

[64] The developments in Iceland and Norway are reflected in the annual Climate Progress Report prepared by the EFTA Surveillance Authority.

In 2021, EU-wide emissions in the ESR sectors remained 3.3% below the aggregated emissions limit, with emissions exceeding AEAs in five Member States.[65] Based on approximated data, EU-wide ESR emissions in 2022 are estimated to be 2% below he aggregated emissions limit. In 2022, nine Member States are expected to generate emissions that exceed their AEAs.[66] The final ESR emissions for 2021 and 2022 will only be determined after a comprehensive review in 2027, when the compliance cycle for each of the years 2021 to 2025 will take place. Member States can then use the flexibilities available under the ESR to comply with their annual emission limits. However, the emission projections that Member States submitted in March 2023 can be used at this stage to gain insights on progress towards ESR targets. Aggregated projections show that EU-wide ESR emissions are expected to fall by 32% in 2030 compared to 2005 levels including planned measures (see Figure 12). This is less than the EU-wide ESR target to reduce emissions in 2030 by 40% compared to 2005 levels.

Based on Member States' latest emission projections, the Commission also assessed Member States' progress towards their annual emission limits over the period 2021-2030, taking into account the flexibilities available under the ESR.[67] Based on the assumption that Member States would use saved AEAs from previous years (banking) and/or the existing ETS flexibility to cover excess ESR emissions, 19 Member States would still have excess emissions in at least one year over the 2021-2030 period.[68] Eight Member States already have excess emissions in the first compliance period (2021 to 2025), which poses a bigger challenge as there is less time to develop additional policies to drive down emissions.[69] In particular Cyprus, Italy, and Romania would already have excess emissions in the period 2021- 2023, as well as Croatia but to a lesser extent.[70]

Under Article 9(2) of the ESR, any debit (i.e., excess emissions) under the LULUCF Regulation in the period 2021 to 2025 is automatically deducted from Member States' AEAs under the ESR first compliance period. Based on available estimated LULUCF emission data for 2021 - 2025, trends in Czechia, Estonia, Finland, France, Portugal, and Slovenia are concerning (see Chapter 4). If these LULUCF trends are confirmed, it may be challenging for those countries to achieve their LULUCF targets and also lead to challenges in achieving their ESR targets each year in the first compliance period.[71]

[65] Austria, Cyprus, Denmark, Ireland and Italy. Denmark already indicated the intention to use the flexibility with the LULUCF Regulation to cover the excess emissions in 2021, if confirmed in 2027 after the comprehensive review of the ESR emissions.

[66] The 2021 ESR emissions are based on final inventory data and 2022 ESR emissions are based on approximated inventory data, both reported in 2023.

[67] Article 8 of the ESR provides that in case the Commission finds that there is not sufficient progress, Member States must prepare a corrective action plan.

[68] AT, BG, CY, CZ, DE, DK, EE, FR, HR, HU, IE, IT, LT, LV, MT, NL, PL, RO, SK.

[69] CY, HR, HU, IE, IT, LT, MT, RO.

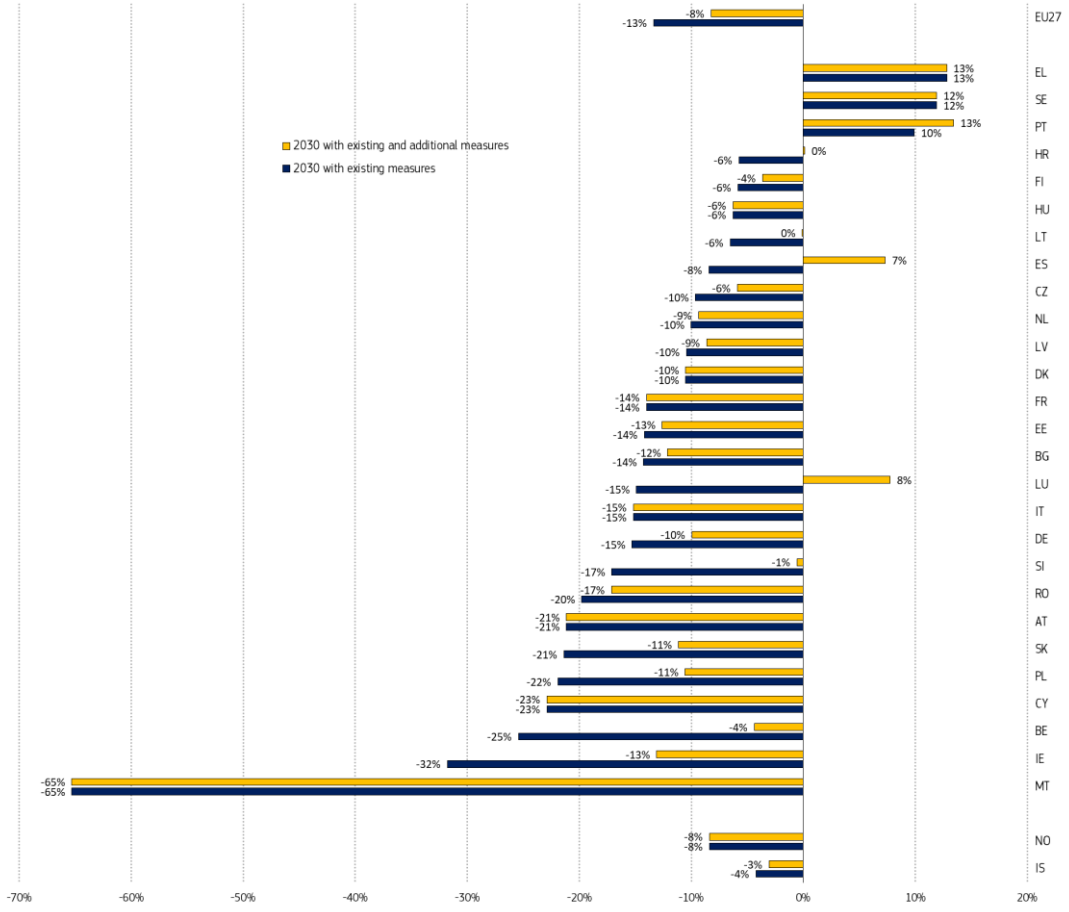
[70] Available historical and approximated data is used for Member States' ESR emissions in 2021 and 2022 and projections for other years; Final ESR emissions will only be established following a comprehensive review in 2027 (for 2021-2025) and 2032 (for 2026-2030). The AEAs for 2026-2030 are estimated as they will only be set after a comprehensive review in 2025. For more details, see Chapter 2 of the staff working document – 'Technical information'.

[71] For the purposes of this assessment, the excess emissions under LULUCF in the period 2021 – 2025 are equally distributed over the years 2021 to 2025 for calculating the reduction in AEAs under the ESR. Flexibilities under the LULUCF Regulation are not taken into account.

To comply with their ESR emission limits, some Member States can increase their amounts of ETS flexibility.[72] Member States that perform well under the LULUCF Regulation can use such overachievement, up to a limit, to cover any excess emissions in ESR. Member States can also transfer AEAs among each other to match emissions with AEAs.[73] However, based on current projections, there may only be a limited amount of AEAs available for purchase.

In conclusion, based on the information available at this stage and taken account of the substantial gap highlighted by the analysis above, Member States are encouraged to reflect on additional measures to reduce their emissions under the ESR, in particular as part of the ongoing NECP update process. Some Member States have planned higher ambition for emissions covered by the ESR in their draft NECPs. Therefore, a more complete overview will be available in the Commission's assessment of draft updated NECPs due by the end of this year. After the submission of the final updated NECPs by Member States, the Commission will come back to the assessment of whether Member States are making sufficient progress. Insufficient progress may trigger the need for a corrective action plan under Article 8 of the ESR.

Figure 12: Gap between ESR 2030 targets and projected GHG emissions



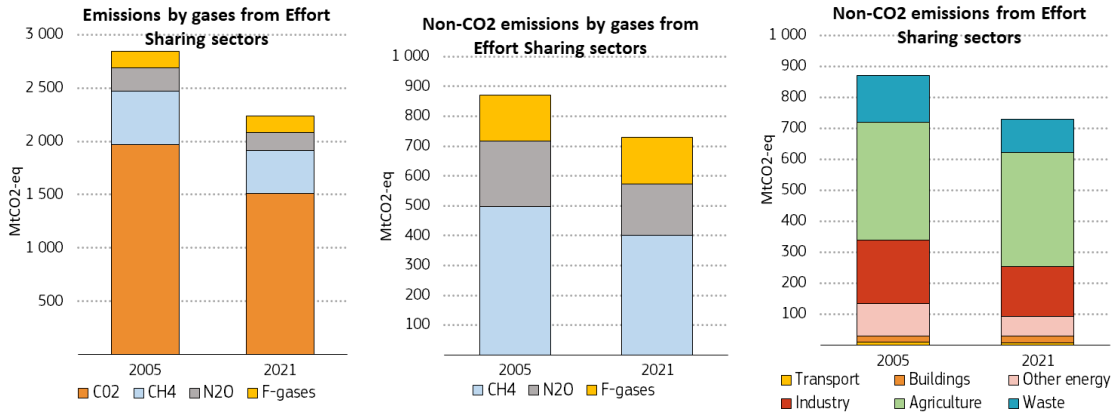
[72] Belgium, the Netherlands, Sweden and Malta. ETS flexibility allows a Member State to notify to the Commission an amount of EU ETS allowances to be available for ESR compliance. The EU ETS allowances are deducted from the amounts that would normally be auctioned under the EU ETS.

[73] Iceland and Norway can also buy AEAs from and sell AEAs to Member States.

EMISSION TRENDS BY TYPE OF GAS UNDER THE EFFORT SHARING LEGISLATION

Around two thirds of total emissions from the effort sharing sectors are CO_2 emissions, the remaining third are non-CO_2 emissions. Non-CO_2 greenhouse gases include methane (CH_4), nitrous oxide (N_2O), and fluorinated gases (NF_3, HFCs, PFCs, SF_6, HFCs). While most of the emissions in the energy sector are covered by the EU ETS, methane emissions in this sector fall under the ESR. These non-CO_2 gases are emitted from a range of sectors and processes, and all have much higher global warming potentials than CO_2 by degrees of tens to tens of thousands depending on the gas. As a result, non-CO_2 emissions have an important impact on climate change and are key sources of potential emission reductions in several sectors. Mitigating non-CO_2 emissions can lessen global temperature increases rapidly. Reducing non-CO_2 emissions is also important to achieve our targets under the ESR. Around half of the non-CO_2 emissions come from the agriculture sector. All sectors have reduced non-CO_2 emissions from 2005 to 2021 but the most significant reductions were made in the non-ETS energy ('other energy') and the waste sector. Over the same period, non-CO_2 emissions from agriculture and buildings have remained relatively stable. Most emission reductions were nitrous oxide emissions from non-ETS industry and the waste sector, and methane in the waste sector, while the level of F-gas emissions has remained relatively stable. The EU methane strategy aims to reduce methane emissions in the energy, as well as in the agriculture and waste sectors, and thus also supports the achievement of the ESR targets.

Figure 13: Non-CO_2 emissions under the ESR in 2005 and 2021, by sector and by gas type.



F-gases

Fluorinated gases ('F-gases') have a global warming effect up to 25 000 times greater than CO_2. F-gas emissions in the EU amount to 2.5 % of the EU's total GHG emissions. Hydrofluorocarbons (HFCs) are the most important F-gases. Regulating F-gases at the EU level has been rather effective. After 2014, a decade-long trend of rising emissions of F-gases was reversed due to the current F-gas Regulation (Regulation (EU) No 517/2014). EU-27 emissions fell by slightly over 20% from 2014 to 2021 and the supply of hydrofluorocarbon (HFC) gas to the market fell by 47% in CO_2-eq between 2015 and 2019, notably due to refrigeration shifting to more climate-friendly alternatives. The EU Regulation was also successful in terms of facilitating the global agreement reached in 2016 to phase down HFCs under the Montreal Protocol ("Kigali Amendment") which is estimated to prevent around 0.3-0.5 degrees Celsius of global warming by 2100. A political agreement has been reached on the Commission's proposal of April 2022 for a new F-gas Regulation for additional emission savings by 2050; formal adoption is expected by the end of 2023. The amount of HFCs must

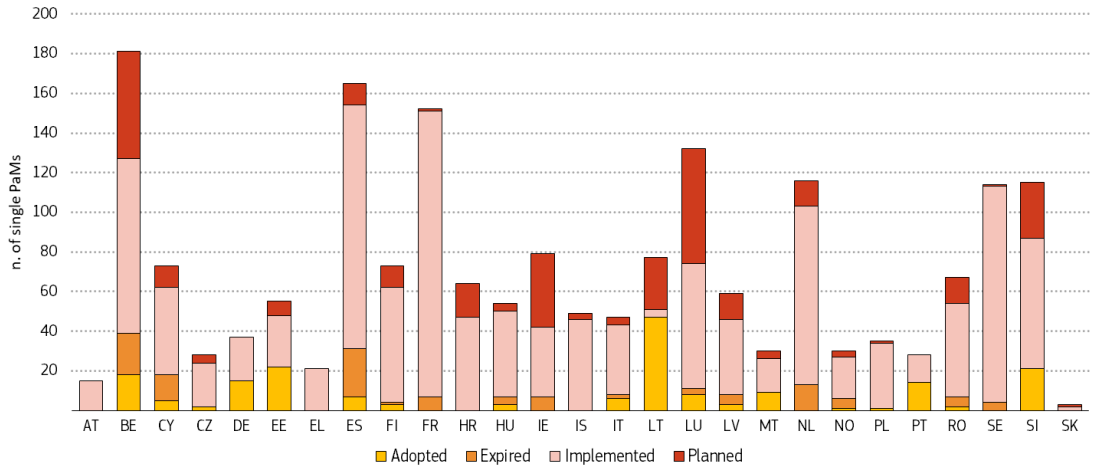
be reduced by around 95% in 2030 and 100% in 2050 compared to 2015.[74] These saved F-gas emissions will support Member States' efforts to reach their target under the Effort Sharing Regulation.

NATIONAL POLICIES AND MEASURES IN THE ESR SECTORS

EU legislation supports Member States to meet their targets under the ESR. Some policies in key sectors of the ESR are described in the next section.

In the 2023 integrated national energy and climate progress reports (NECPRs), Member States reported policies and measures (PaMs) that they have implemented or plan to implement to reduce GHG emissions and to achieve their current 2030 targets under the ESR. Member States have reported 1900 single measures related to the ESR, 10% more compared to the previous reporting round.[75]

Figure 14: Number of single policies and measures reported by Member States for the ESR sector[76]



EMISSION TRENDS AND POLICIES IN KEY SECTORS

Buildings

Buildings account for 40% of energy consumed and 36% of energy-related direct and indirect GHG emissions in the EU. Heating, cooling and hot water account for 80% of the energy that households consume. To achieve the 55% emission reduction target, by 2030 the EU should reduce buildings' GHG emissions by 60%, their final energy consumption by 14% and energy consumption for heating and cooling by 18%.[77] The Recovery and Resilience Facility[78] and

[74] For the quota system when measured in terms of the climate impact (CO_2eq).

[75] Compared to EEA database on greenhouse gas policies and measures in Europe. This includes all PaMs, expired, adopted, implemented, and planned.

[76] The number of PaMs has been established based on PaMs as reported by Member States with an explicit reference to the ESR as an objective. This is likely to underestimate the number of ESR PaMs, as not all PaMs with a sectoral policy objective that is closely linked to reducing emissions in the ESR (e.g., the Energy Performance of Buildings Directive) are qualified by Member States as ESR PaMs.

[77] Compared to 2015 levels, See *SWD(2020) 176 final*.

[78] Recovery and Resilience Scoreboard (europa.eu)

Cohesion Policy allocate a significant portion of funds to improve energy efficiency in buildings (see Chapter 6).

The Report on renovation of the national stock of residential and non-residential buildings and on nearly-zero energy buildings provides a first assessment of the implementation and progress of the 2020 national Long Term Renovation Strategies (LTRSs), based on the 2023 integrated NECP progress reports. It shows the level of ambition of LTRSs is not always in line with climate neutrality in 2050, with some progress observed in the NECPRs, e.g., towards GHG emission reduction targets in many countries, but without revisions of ambition. It also highlights the need to improve tracking of the evolution of the building stock in Member States and the streamlining and harmonisation of indicators and definitions.

The proposed revision of the Energy performance of buildings directive aims to enhance long-term renovation strategies (renamed national Building Renovation Plans) with a clear roadmap for a highly energy efficient and decarbonised building stock by 2050 (cf. Ch. 2 of staff working document – 'Technical information').

Agriculture

EU agricultural emissions represent around one-tenth of the overall GHG emissions, of which roughly two-thirds come from livestock. Since 2005, emissions have stagnated- inventory data show a slow annual decrease of 0.7 $MtCO_2$-eq between 2005 and 2021. The latest GHG projections from Member States indicate that under existing measures the pace of emission cuts will not change by 2030 (-1% compared to 2021, or an annual average reduction of 0.6 $MtCO_2$-eq). However, with additional measures, aggregated projected emissions from agriculture point to a visible decline by 2030 (5%, or 2.2 $MtCO_2$-eq annual average reduction). It is clear that more effort is needed to implement mitigation measures in the agricultural sector (Figure 15.a).

Figure 15: GHG emissions in the agriculture sector (EU, 2005-2021) and 2023 reported policies and measures for the agriculture sector (by objectives)

Figure 15.a

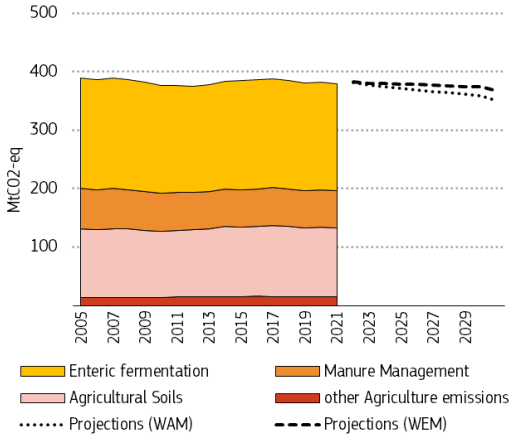


Figure 15.b

In 2023, Member States reported more than 300 measures aimed at reducing emissions in the agriculture sector, equal to 13% of total reported measures with decarbonisation dimension (see Figure 15.b), mainly to reduce fertilisers and manure use on cropland (22%) and to improve livestock management (16%). Many of these measures are supported through

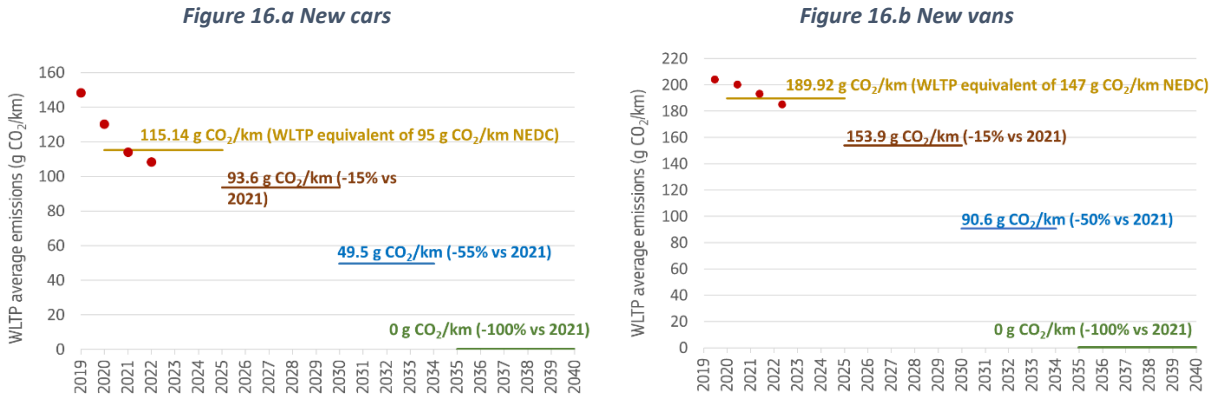
funding under the new Common Agriculture Policy (CAP), some others through national financing (State aid).

Transport

Transport emissions represent more than one-fifth of the overall EU domestic GHG emissions, of which the large majority from road transport (i.e. around 95%, or 75% when international bunkers are included). Since 2005, emissions have only slightly decreased. Inventory data show an annual decrease of 4 $MtCO_2$-eq between 2005 and 2021, a pace clearly insufficient to meet the EU 2030 target as outlined in the Commission's analysis.[79]

Passenger cars and vans generate more than 70% of all road transport CO_2 emissions in the EU. CO_2 emission standards for new cars and vans and for heavy-duty vehicles are key drivers for reducing road transport GHG emissions. According to provisional monitoring data for vehicles registered in the EU, Iceland, and Norway in 2022,[80] the average Worldwide harmonised Light vehicles Test Procedure (WLTP)[81] CO_2 emissions from **new cars and new vans** continued to decrease, to 108.2 CO_2/km from 114.1 g CO_2/km in 2021 for cars and to 185.3 g CO_2/km from 193.3 g CO_2/km in 2021 for vans. This continues the steep downward trend in CO_2 emissions triggered by the stricter targets that apply since 2020. By 2022, emissions from new cars and vans had decreased by 27% and 9%, respectively, compared to 2019 levels (Figure 16). The sharp decrease is due to the surge in the share of zero-emission vehicle registrations. In 2022, 13.4% of new cars and 5.9% of new vans had no tailpipe emissions (up from 2.2% and 1.4% in 2019, respectively). The recently adopted revised CO_2 standards require a further decrease in emissions. As of 2030, and compared to the 2021 baseline, emissions need to be reduced by 55% for new cars and 50% for new vans. By 2035, all new cars and vans should be zero-emission.

Figure 16: Average CO_2 emissions (dots) and EU fleet-wide targets (lines) for new cars (left) and vans (right)



Heavy-duty vehicles (HDV), such as lorries, buses, and coaches, generate almost 30% of all CO_2 emissions from road transport. Existing legislation requires manufacturers to reduce

[79] Based on modelling outcomes of the core policy scenario supporting the initiatives delivering the European Green Deal, between 2022 and 2030 the annual average emission reduction in the transport sector should be around 22 $MtCO_2$/eq. https://energy.ec.europa.eu/data-and-analysis/energy-modelling/policy-scenarios-delivering-european-green-deal_en.

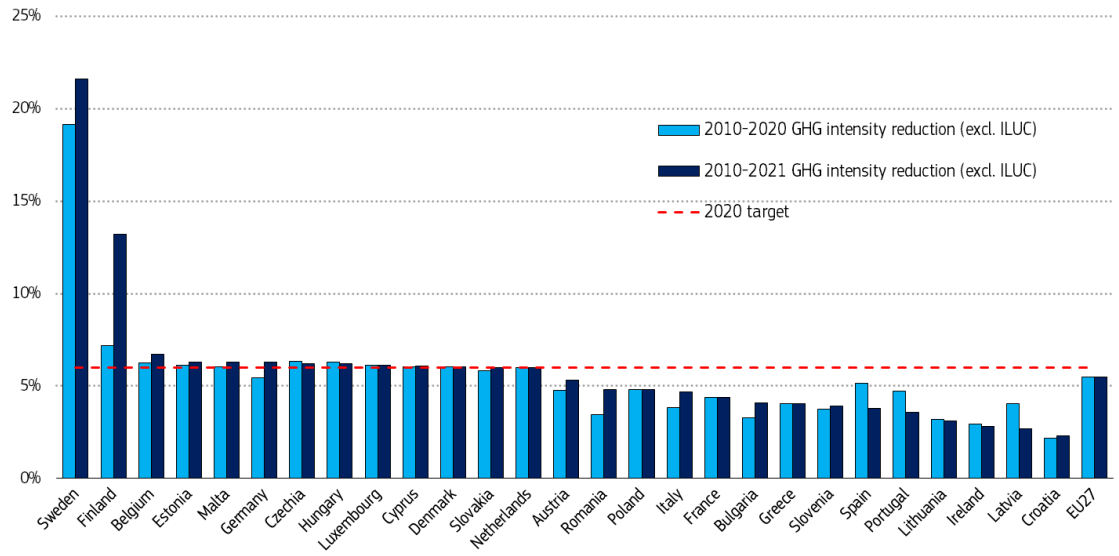
[80] Monitoring of CO_2 emissions from passenger cars and vans – Regulation (EU) 2019/631; published by the EEA.

[81] Determined during type-approval using the Worldwide harmonised Light vehicles Test Procedure.

emissions of certain lorries by 15% by 2025 and 30% by 2030 compared to 2019 levels. In 2023, the Commission proposed revised CO_2 standards for HDV further tightening existing standards and extending the scope to smaller lorries, buses, coaches and trailers. The proposed Regulation requires CO_2 emissions reductions of 45% from 2030, 65% from 2035, and 90% from 2040 onwards compared to 2019 baseline. It also sets a 100% zero-emission target for new urban buses from 2030.

The **Fuel Quality Directive** also contributes to reducing transport emissions; it requires the life-cycle GHG emission intensity of fuels to be reduced by 6% by 2020 compared to 2010 levels. The average GHG intensity of fuels supplied in 2021 was 5.5% lower than in 2010. The progress by EU fuel suppliers varies greatly across Member States (Figure 17).

Figure 17: Reductions in GHG intensity of fuels achieved by EU fuel suppliers in EU-27, 2010-2020 and 2010-2021 (Source: EEA)



4 LAND USE, LAND USE CHANGE AND FORESTRY

The **land use, land-use change, and forestry (LULUCF)** sector plays a significant role in achieving the EU's climate neutrality goal. In the EU, the LULUCF sector absorbs more GHGes than it emits, removing significant volumes of carbon from the atmosphere. The sector also provides biomaterials that substitute fossil or carbon intensive materials, which is equally important in the transition to a climate-neutral economy. However, **carbon removals have declined at a worrying speed in recent years**.

This trend is mostly due to a **decrease in forest related removals, triggered mainly by an increase in harvesting**. To a lesser extent, it is also caused by reduced carbon sequestration in ageing forests in certain Member States, due to lower growth rates. Climate change itself is having an increasing impact too. The growing frequency and severity of disturbances such as wind throw, insect, and fungus outbreaks, forest fires, and droughts is undermining the role of forests as a carbon sink and has in some cases turned them temporarily into carbon sources. There are many indications that, because of climate change, the future robustness of Europe's forest sinks is far from guaranteed. The slowing of forest area expansion has also contributed to the fall in removals, but with a smaller impact. At EU level, cropland, grassland, wetlands, and settlements are mainly sources of LULUCF emissions, with managed organic soils generating particularly high emissions.

A GREATER ROLE FOR THE LULUCF SECTOR TO SUPPORT CLIMATE ACTION

The revised LULUCF Regulation[82] sets out how the sources of emissions and removals in the land use sector contribute to EU climate goals, with a target to achieve land-based net carbon removals of -310 million tonnes of CO_2 equivalent by 2030.[83] To reach this, targets are allocated to Member States based on the total managed land area in their territory. The 2030 target of each Member State requires them to increase their climate ambition for their land-use policies.

The revised regulation sets two compliance periods:

- From 2021 to 2025: the assessment of Member States' progress is based on benchmarks for land use activities, such as Forest Reference Levels[84] for sustainable forest management. Across all land categories, a Member State has to fulfil the 'no-debit' rule, i.e. the credits or debits generated in individual land categories must to sum up to at least zero. If the 'no-debit' rule is not met and a Member State has a net debit, it will be able to use a number of flexibilities to compensate the net debit (e.g. by purchasing credits from other Member States). If a net debit remains from the first

[82] Regulation (EU) 2018/841 of the European Parliament and of the Council of 30 May 2018 on the inclusion of GHG emissions and removals from land use, land use change and forestry in the 2030 climate and energy framework and amending Regulation (EU) No 525/2013 and Decision No 529/2013/EU (OJ L 156, 19.6.2018, p. 1).

[83] Regulation (EU) 2023/839 of the European Parliament and of the Council of 19 April 2023 amending Regulation (EU) 2018/841 as regards the scope, simplifying the reporting and compliance rules, and setting out the targets of the Member States for 2030, and Regulation (EU) 2018/1999 as regards improvement in monitoring, reporting, tracking of progress and review (OJ L 107, 21.4.2023, p. 1).

[84] Commission Delegated Regulation (EU) 2021/268 of 28 October 2020 amending Annex IV to Regulation (EU) 2018/841 of the European Parliament and of the Council as regards the forest reference levels to be applied by the Member States for the period 2021-2025.

compliance period, even after using all flexibilities, this net-debit will be moved to the ESR account of the Member State.

- From 2026 to 2030: each Member State must meet a binding national target in 2030 based on the sum of reported emissions and removals in all land categories. Benchmarks no longer apply for individual land categories. A 'net removal budget' will be created for the period 2026-2029 to check the performance of each Member State. Any debit in this period will be carried forward to the final compliance assessment for the 2030 target.

ASSESSMENT OF PROGRESS IN THE LULUCF SECTOR

In 2021, the EU's carbon sink achieved a net removal of -230 Mt CO_2-eq.[85] The trend seen in recent years persists, and the size of the carbon sink is continuing to decrease, even though, based on approximated data, the sink is estimated to have increased to -244 Mt CO_2-eq in 2022.

With current LULUCF accounting rules – with a limited scope – applicable to the period 2021 to 2025, the provisional 'accounted' balance for 2021 using the 2023 GHG inventory submission produced a slight accounted credit of -14 Mt CO_2-eq. As such, the EU as a whole meets the 'no-debit' rule of compliance for the first year of the compliance period 2021-2025. Based upon estimates using approximated data, 2022 would also produce a small accounted credit.

Even so, based upon a single year of the compliance period, and excluding the other flexibilities available to Member States at the end of the compliance period, nine Member States showed potential accounting debits,[86] with France, Finland and Czechia showing the biggest debit. 18 Member States had potential accounting credits[87] with Spain, Germany and Romania having the largest net credit in the EU.

Based on approximated data for 2022,[88] with accounting rules applied, 16 Member States had potential credits[89] and ten Member States showed potential debits.[90] Czechia and Finland show a decrease in debit while Latvia moves from having a credit to a debit. Italy and Romania show increase in credits. Five Member States submitted 2021 inventory data as approximated data for 2022.[91] (for more details see Chapter 9 of the staff working document – 'Technical information).

[85] 2023 Submission GHGI reported data on LULUCF, as reported for the entire sector scope.

[86] In decreasing order of magnitude: France, Finland, Czechia, Portugal, Estonia, Poland, Slovenia, Belgium and Cyprus show net LULUCF debits.

[87] In increasing order of magnitude: Malta, Luxembourg, Latvia, Netherlands, Croatia, Slovakia, Bulgaria, Greece, Ireland, Austria, Lithuania, Denmark, Hungary, Italy, Sweden, Spain, Germany, and Romania show net LULUCF credits.

[88] Reported approximated data by Member States for 2022, on LULUCF carries uncertainties and it is therefore important to exercise caution drawing conclusions from this data. Seven Member States report 2021 data as approximated data for 2022.

[89] Austria, Bulgaria, Croatia, Denmark, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Luxembourg, Netherlands, Romania, Slovakia, Spain, Sweden.

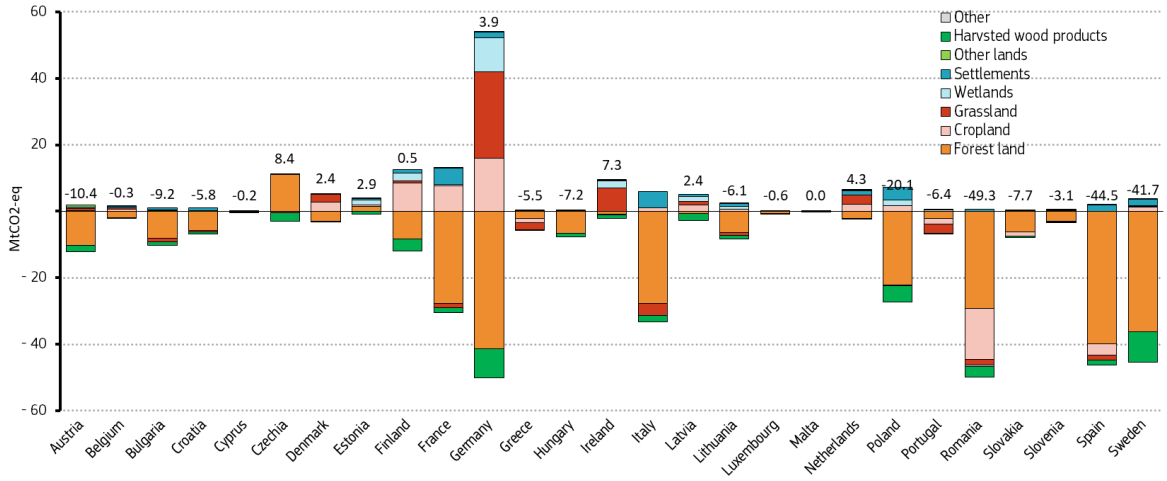
[90] Belgium, Cyprus, Czechia, Estonia, Finland, France, Latvia, Poland, Portugal, Slovenia.

[91] Austria, Belgium, Croatia, Cyprus, Denmark, Estonia submitted same data as reported under 2023 GHGI submission as 2022 approximated data for LULUCF.

In line with the reporting obligations, Member States reported their projected total LULUCF accounted credit or debit for the period 2021 to 2025.[92] From this, 16 Member States reported projections with existing measures[93] (WEM), and 10 Member States reported projections with additional measures[94] (WAM). After calculations[95], some Member States show debit accounted emissions per year for each year 2021-2025.[96] This raises reason for concern as there is limited time to develop policies and implement measures to reverse the trend.

Projections on reported emissions and removals, delivered by Member States in March 2023, have been assessed for LULUCF progress towards the 2030 targets. Projections with existing measures show EU total net removals of -239 Mt CO_2-eq for 2030 and -260 Mt CO_2-eq with additional measures, leaving a gap of around 50-70 Mt CO_2-eq to meet the 2030 target. This means that, according to projections, the EU is not on track to meet the 2030 net removal target of -310 Mt CO_2-eq.

Figure 18: Land sector emissions and removals in the EU, by main land use category[97]



In conclusion, based on the limited data and information currently available, Member States are encouraged in the context of the ongoing NECP update process to reflect further on how to increase ambition and action on their territory. Following submission of the final updated NECPs in 2024, the Commission will return to the assessment of whether Member States are making sufficient progress. Insufficient progress may trigger the need for a corrective action plan under Article 13(d) of the LULUCF Regulation.

[92] Total cumulative emissions/removals (kt CO_2-eq) for LULUCF by land category in the period 2021-2025, reported by Member States under Table 5b: Projections of accounted emissions and removals from the LULUCF sector in accordance with Regulation (EU) 2018/841

[93] Austria, Bulgaria, Czechia, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Malta, Netherlands, Poland, Portugal, Romania and Sweden.

[94] Belgium, Croatia, Estonia, Ireland, Latvia, Lithuania, Luxemburg, Slovakia, Slovenia and Spain.

[95] Total cumulative emissions and removals (kt CO_2 -eq) calculated average per year over the five-year period by using WAM per land category, if WAM not available, WEM is used. LULUCF managed forest land, including Harvested Wood Products assuming instantaneous oxidation where available

[96] Belgium, Cyprus, Czechia, Estonia, Finland, France, Malta, Portugal and Slovenia.

[97] The figure shows net reported removals by land use category for each Member State in 2021. Net removals are expressed as negative figures and net emissions as positive figures.

ACTION TO STEP UP LAND MONITORING

The **proposal for a directive on soil monitoring and resilience**[98] and the revised LULUCF Regulation[99] will be mutually reinforcing: healthy soils sequester more carbon and the LULUCF objectives promote the sustainable management of soils. The LULUCF regulation requires that all Member States set up systems to monitor, *inter alia*, soil carbon stocks[100].

Better land and soil monitoring will help target action on measures that unlock the highest climate benefits. Member States GHG inventories underpin climate action and are also continuously developing. Recalculations based on better data and methods are expected in response to new requirements on quality statistics in the revised LULUCF Regulation. Improved greenhouse gas inventories, based on harmonised and refined activity data and removal/emissions factors will be critical to facilitate action. Better, more timely and mapped data will help track national and collective EU progress towards climate objectives, and guide informed and accurate action and further measures. Over the past years, Member States made progress in their inventory reporting. For example, in their coverage of carbon pools and the quality of submitted data and methodological information. Advanced technologies, such as those available under EU programmes provide digital maps updated with high relevant satellite and ground observations. New steps are being undertaken to integrate data from the Copernicus satellite services and data sets such as those utilised for the Common Agricultural Policy (CAP).

RELATED INITIATIVES IN AGRICULTURE AND FORESTRY

Member States need to reflect on the role of the land use sector when updating their national energy and climate plans (NECPs) for the 2021-2030 period. This update is key to enable Member States to track progress against the targets and the EU to ensure increased ambition. Member States must also assess by 16 November 2023 whether their CAP strategic plans are in line with the new targets under the revised LULUCF Regulation and ESR and amend their plans as necessary.

Access to funding and incentives

Many funding mechanisms and incentives are available or being developed to encourage carbon removals, through public or private-sector sources. The EU provides funding under the CAP, other EU programmes such as LIFE, Horizon Europe (in particular the Soil Mission), and the Cohesion Policy funds. In 2023, the Commission adopted guidance on EU funding opportunities for healthy soils[101]. Member States can also support the uptake of sustainable management practices under State aid rules, which have been revised and allow for the provision of forest ecosystem services such as climate regulation and biodiversity restoration. The Commission guidance on payment schemes for forest ecosystem services[102] provides further information for actors. The CAP and State aid cover funding for investments and measures such as training, advice or cooperation, that help maximise effects. Private initiatives linked to voluntary carbon markets or a combination of different funding options can supplement and further promote large-scale deployment of carbon farming.

[98] Proposal for a Directive on Soil Monitoring and Resilience (europa.eu)

[99] Regulation (EU) 2023/839

[100] Through an amendment to Annex V Part 3 (e) of Regulation (EU) 2018/1999,

[101] SWD(2023) 423 final

[102] Guidance on the Development of Public and Private Payment Schemes for Forest Ecosystem Services (SWD(2023)285 final).

To ensure high-quality EU-certified carbon removals, the Commission has proposed a regulatory **EU framework for the certification of carbon removals**[103] providing Member States with a toolbox to increase carbon removals. The certification framework will help ensure the transparent identification, through standardised methodologies, of carbon farming and industrial solutions that remove CO_2 from the atmosphere and store it long-term. Carbon removal certificates can also help organisations back credible carbon removal claims and meet stakeholders' expectations that carbon removals should not be used for greenwashing, in line with the Corporate Sustainability Reporting directive[104] and the proposed directive on green claims.[105] To facilitate future work under this initiative, the Commission has set up an Expert Group on carbon removals.[106]

[103] Proposal for a Regulation establishing a Union certification framework for carbon removals.pdf (europa.eu)
[104] Corporate Social Responsibility Directive and the related Sustainability Reporting Standards
[105] Proposal for a Directive on green claims (europa.eu)
[106] Expert group on carbon removals (europa.eu)

5 RESILIENCE TO CLIMATE CHANGE

The losses from weather and climate related disasters are significant. The heatwaves of summer 2022 are estimated to have caused over 61000 excess deaths in Europe.[107] Extreme flash floods in summer 2021 caused EUR 46 billion of economic damage.[108] Climate risks will continue to intensify, with the IPCC assessing the window of opportunity to avert the worst consequences to be "brief and rapidly closing".[109]

The EU has an obligation under the European Climate Law to ensure continuous progress in building its capacity to adapt to the effects of climate change, boost its resilience and reduce vulnerability to climate change. The next section provides a high-level assessment of that progress at the level of EU policy. This is followed by an assessment of collective progress by all Member States. Further information is found in chapters 7 and 10 of the staff working document – 'Report on the implementation of the EU strategy on adaptation to climate change' accompanying this report. There is also a separate report on the implementation of the EU's adaptation strategy.

IMPLEMENTATION OF THE EU ADAPTATION STRATEGY

The EU updated its adaptation strategy in 2021.The strategy contains 49 actions to which the Commission has committed, spread across four objectives: **smarter, more systemic, faster, and international** adaptation to climate change. The actions were designed to cover large ground in terms of policies and often require a careful sequencing of measures.

To improve knowledge and manage uncertainty**,** the Commission, together with the EEA, has expanded the content and partners of the **European Climate and Health Observatory**[110] to help build resilience to climate change impacts on human health. It published new calls for projects under Horizon Europe to close knowledge gaps on climate impacts and resilience and is developing the **Risk Data Hub**.[111] The Commission is working to expand the content and impact of the Climate-ADAPT knowledge exchange platform.

The first ever **European Climate Risk Assessment** is due to be published in Spring 2024. The Climate Resilience Dialogues[112] have brought together policymakers, insurers, risk managers, consumers, city associations and other stakeholders to discuss and identify possible actions, on insurance and investment in adaptation to help narrow the climate protection gap.

The **European Drought Observatory** promotes the sustainable use of freshwater by providing knowledge. To address water scarcity, six times more water could be reused than current levels, facilitated by the **Water Re-use Regulation** that entered into force in 2023.[113]

The Commission has stepped up the systematic integration of adaptation action in sectoral strategies and plans, with updated guidelines on Member State adaptation strategies and plans and complementary support from the Commission's Technical Support Instrument, including under its 2023 flagship project on adaptation. In 2021, the Commission published **technical guidance on the climate proofing of infrastructure projects** and, in 2023, on **enhancing**

[107] Heat-related mortality in Europe during the summer of 2022 | Nature Medicine

[108] Economic losses from climate-related extremes in Europe (8th EAP) (europa.eu)

[109] Sixth Assessment Report — IPCC

[110] European Climate and Health Observatory (europa.eu)

[111] DRMKC Risk Data Hub (europa.eu)

[112] Climate Resilience Dialogue (europa.eu)

[113] Water Reuse (europa.eu)

the climate resilience of buildings. Climate proofing applies to infrastructure and buildings funded by the EU budget. The **European Climate Pact**,[114] a stakeholder platform launched by the Commission to empower citizen to act and advocate on climate matters, continues to run adaptation and mitigation activities. The **Policy Support Facility** under the **EU Covenant of Mayors** has involved over a thousand people over the past year and a half, including 350 municipalities, in national workshops, with eight cities developing peer-to-peer exchanges on climate action and 37 adaptation measures being implemented.

Good progress has been made in implementing the **EU Mission on Adaptation to Climate Change**,[115] designed to speed up innovative adaptation action at local and regional levels. Over 300 regions and communities, covering some 40% of the EU, have signed up to the Mission Charter and committed to work together to accelerate their transformation to climate resilience; the Adaptation Community of Practice is live, and the Mission technical support facility is operational.

Climate resilience as an issue is now far more visible across EU policies than a few years ago. There have been efforts to support adaptation objectives in legislative proposals where resilience to climate change (or risks interacting with climate impacts) were not the primary objectives. For example, the proposal to amend the Budgetary Framework Directive, in the context of the economic governance review, includes reporting requirements for Member States on macro-fiscal risks from climate change and on disaster and climate related contingent liabilities.

Similarly, the proposed revision of the Urban Wastewater Treatment Directive included measures to tackle the overflow of sewage systems caused by flash floods, likely to become more intense and frequent across Europe due to the changing climate. Implementation will need to continue, building on measures initiated under the adaptation strategy. The Commission also now requires a consistency check with adaptation objectives in its own impact assessments (see Chapter 1 for an assessment of the consistency check), which should be done in a systematic way, covering both emission reduction and adaptation objectives.

ASSESSMENT OF COLLECTIVE PROGRESS OF MEMBER STATES ON ADAPTATION

Article 6.1b of the European Climate Law requires the Commission to assess the collective progress made by all Member States on climate adaptation. For the first time, this section assesses the progress they reported and have made in enhancing adaptive capacity, strengthening resilience, and reducing vulnerability to climate change.

Member States report that currently the most observed acute **climate hazards** in Europe are heatwaves, droughts, floods, heavy rainfall, and wildfires. They cite the changing temperature, changing rainfall patterns, sea level rise and hydrological variability as the most frequent chronic climate hazards. They anticipate that future hazards will be the same as those currently observed, except for water scarcity, which seven countries anticipate being an additional future key hazard.

Health, agriculture, forestry, biodiversity, energy, and water management are the areas reported as the most affected by climate threats in Europe.

Almost all Member States have carried out **climate risk assessments**, 14 of these assessments have been updated recently, with the rest scheduled for updates soon.

[114] European Climate Pact (europa.eu)

[115] EU Mission: Adaptation to Climate Change (europa.eu)

All Member States have **national adaptation strategies** and/or **national adaptation plans** in place. A considerable part of these strategies and plans have recently been renewed or are under revision and will be renewed over the coming years. More national sectoral adaptation plans have been adopted. The policy landscape is varied. On the one hand there is continuity in long-term priorities, increasing alignment with European frameworks, evolving legislative instruments, and incremental shifts in policy focus. On the other hand, there are challenges, gaps, and barriers to the governance of adaptation action.

National and subnational **governance** structures and mechanisms for horizontal policy integration and multi-level (vertical) coordination have been developed and are mainly now in place. The mandates and operational features of these structures vary greatly. Eight Member States report having embedded elements of their adaptation policy systems in binding legal frameworks. However, most Member States use soft and collaboration-based forms of vertical and horizontal governance.

Progress on **international and transnational cooperation** on adaptation has been made in two-thirds of the Member States. Factoring in social justice and equity into adaptation measures is still at an early stage in many countries, highlighting a key area for future focus, to tackle the disproportionate impacts of climate change on vulnerable groups. Two-thirds of Member States made progress in adaptation policy-related stakeholder engagement.

Member States are also making progress on implementing adaptation **measures**, including mainstreaming adaptation in sectoral policies and plans. They have made significant progress on integrating climate change impacts into national disaster risk management frameworks and sectoral planning. Assessing the **costs** of adaptation remains a challenge for many Member States and is often only done partially. National adaptation plans and strategies often lack dedicated budgets or financing streams for their implementation, and most countries lack the budget needed to finance adaptation action.

Half the Member States reported an increase in **monitoring, reporting and evaluation** activities since 2021, at national, regional and local level.

6 ALIGNING INVESTMENTS WITH CLIMATE NEUTRALITY

INVESTMENT NEEDS AND TRENDS IN THE EU

Bridging the investment gap for the transition to climate neutrality by 2050 will require substantial amounts of finance. Commission analyses[116] estimate the *additional* private and public investment needs for the green transition at EUR 477 billion per year between 2021 and 2030[117], and delivering the REPowerEU objectives requires an estimated additional investment of up to EUR 35 billion per annum between 2022 and 2027.[118] Meanwhile, boosting EU manufacturing capacity for strategic net-zero technologies, as set out in the Net-Zero Industry Act (NZIA), will require investment amounting to around EUR 92 billion, cumulated over the period 2023-2030, compared to EUR 52 billion under a status quo scenario. Closing the investment gaps for other environmental objectives (circular economy, pollution, water, biodiversity) for the green transition will require an estimated EUR 110 billion per year between 2021-2030,[106] with climate action co-benefits (e.g. carbon removal, storage). While these figures should not be added up given their different scope, timeframe and estimation method, they convey the magnitude of the challenge.

Data show that in recent years, financial markets have begun to enable the transition too, an important development given the limits to public finance. This is driven by growing awareness of the financial impacts of climate change's physical and transition risks[119] and a fast-evolving sustainable finance policy framework with increasing investor demand for genuinely sustainable investments.

MONITORING FINANCE'S ALIGNMENT WITH THE TRANSITION TO CLIMATE NEUTRALITY

Monitoring investment trends in climate and other green finance is still challenging, especially due to data gaps and limited standardisation of data categories. Disclosures mandated under the EU's sustainable finance regulatory framework are expected to facilitate monitoring once implemented. A series of indicators can already be used to measure stocks and flows of finance conducive to reaching the EU's climate objectives.

Sufficiently robust data is available on **green bond markets**, which have soared in recent years. Cumulative issuances of bonds aligned with the International Capital Market Association's (ICMA) Green Bond Principles[120] will very likely pass the EUR 1 trillion mark in 2023 (see Figure 19).

[116] SWD(2023) 68 final. Values in EUR 2022.

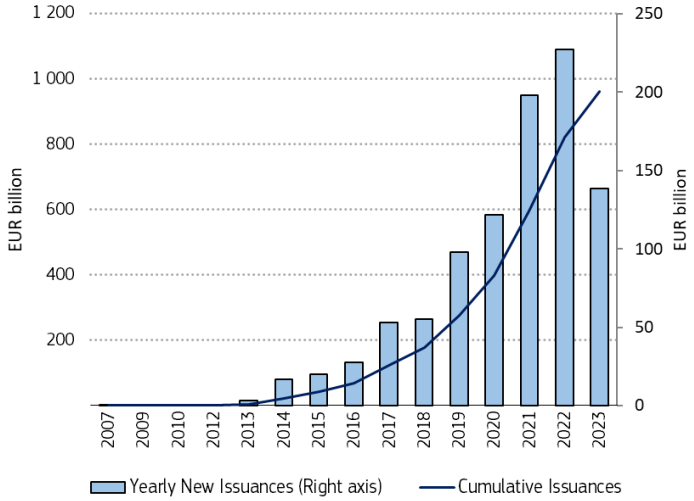
[117] Investments in the transport sector are included in this figure, albeit not road or railway infrastructure investments.

[118] COM(2022) 230 final, p. 12.

[119] Transition risks are defined as financially-material risks related to changes in regulatory environment, technological development or consumer behaviour. Physical risks are financially-material risks related to impacts of climate change on an undertaking.

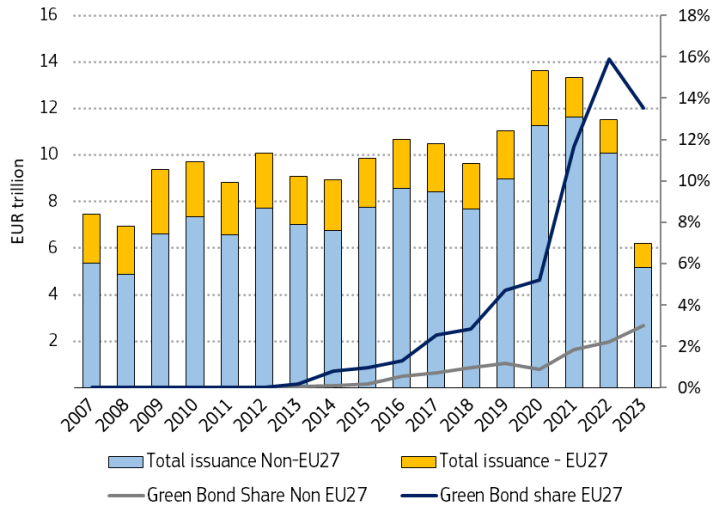
[120] https://www.icmagroup.org/sustainable-finance/the-principles-guidelines-and-handbooks/green-bond-principles-gbp/

Figure 19: Issuance of Green Bonds in the EU aligned with ICMA's green principles (volumes)[121]



This increase in absolute green bond issuances is reflected in **green bonds' share of the corresponding bond market** (see Figure 20). For EU and non-EU issuers, the share in the EU27 remained lower than 1% until 2013, but has significantly increased since, even more markedly from 2016, on the back of strong growth of the green segment. In 2022, green bonds accounted for 16% of all newly issued bonds in the EU27, but only 2% of overall issuance in non-EU markets, confirming Europe's leading role in the sustainable debt capital market.

Figure 20: Green Bond Share in Total New Issuance for EU and Non-EU (until 30 June 2023)[122]



[121] Source: Dealogic DCM and JRC calculations. Data as of 30 June 2023.

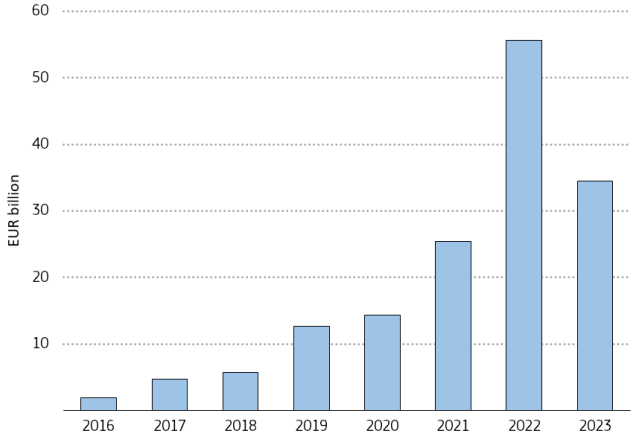
[122] Sources: Dealogic DCM, JRC calculation.

Sustainability-linked bonds emerged in 2019 as a new financial instrument, incentivising the transition with contractual sustainability targets. Their uptake is still limited compared to green bonds, having peaked in 2021 at EUR 51.8 billion, given the more recent development of this new type of assets.

However, the "green-ness" of green bonds and sustainability-linked bonds remains a cause for concern due to the risk of greenwashing despite the emergence of standards and principles that require third-party certification and adequate reporting. Political agreement was reached in early 2023 on the voluntary **EU Green Bond Standard**, which will rely on the EU Taxonomy and independent reviewers to provide guarantees with a high degree of confidence that financing raised compliant with this standard is genuinely 'green'.[123]

While bonds are traded publicly, in the loan market, lending normally takes place based on private information. The loan market has only recently seen the introduction of codified principles to facilitate and support environmentally sustainable economic activity. All loans that follow ICMA's Green loans principles are labelled as green.[124] Green loan volumes have been steadily increasing in the EU since 2016, reaching almost EUR 60 billion in 2022 (see Figure 21, below).

Figure 21: Yearly Issuance of Green Loans in the EU (until 30 June 2023)[125]



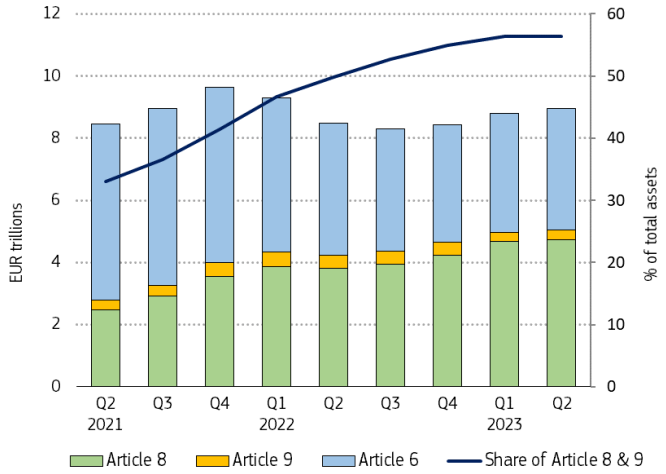
For **investment funds,** the entry into force of the Sustainable Finance Disclosures Regulation (SFDR) shed light on financiers' sustainability claims. Since 2022, financial market participants are required to disclose information on their financial products with purported Environmental, Social, Governance (ESG) benefits. Figure 22 below shows that total assets under management for products with *ESG characteristics* and products with *a sustainability objective* has for a time represented over half the market before stabilising at around 50% of all assets under management.

[123] European green bond standard (europa.eu)

[124] https://www.icmagroup.org/assets/documents/Regulatory/Green-Bonds/LMA_Green_Loan_Principles_Booklet-220318.pdf

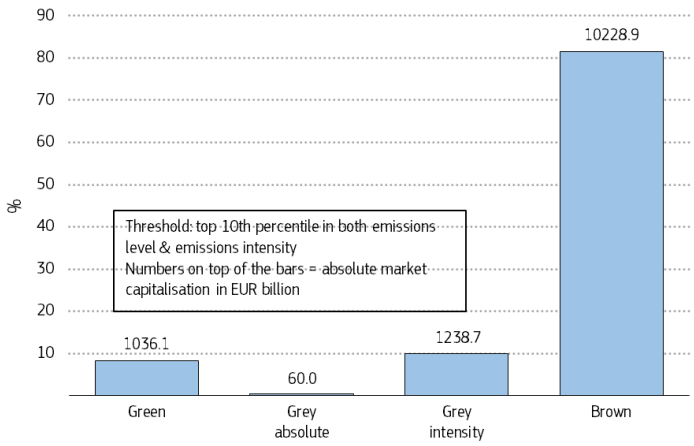
[125] The chart includes three types of loans: club deals, syndication transactions, bilateral transactions. Source: Refinitiv, JRC calculations.

Figure 22: Assets Under Management by SFDR Classification[126]



However, SFDR-based classifications have not always been a reliable measure of the sustainability of funds, as the Regulation gives market participants considerable leeway to define sustainability. For example, while funds tracking the EU **Paris-Aligned or Climate Transition Benchmarks,**[127] can be considered sustainable, other products still have considerable exposures to the fossil fuel sector.[128]

Figure 23: EU market capitalization by greenness, 2021[129]



[126] Article 6 = funds without a sustainability scope; Article 8 = funds that promote environmental or social characteristics; Article 9 = funds that have sustainable investment as their objective. Source: MorningStar, JRC Calculation

[127] EUR-Lex - 32019R2089 - EN - EUR-Lex (europa.eu)

[128] Commission Staff Working Document on Enhancing the Usability of the EU Taxonomy and the overall EU Sustainable Finance Framework https://impact-investor.com/article-9-funds-underreporting-exposure-to-fossil-fuels-research/

[129] Green = top 10% of companies, i.e. below the 10th percentile threshold in both absolute emissions & emissions intensity rankings; Brown = companies ranking above the specified threshold for both absolute emissions & emissions intensity rankings; Grey intensity = companies like green ones regarding absolute emissions, but like brown ones for emissions intensity; Grey absolute = companies like green ones regarding emissions intensity, but like brown ones for absolute emissions. Source: JRC calculation based on MSCI emissions data (ranking based on global MSCI dataset; totalled figures by category referring to EU-domiciled companies sub-set)

Green finance can also be measured through **green market capitalisation** (equity investments) of EU-domiciled companies, defining green firms as those in the lowest 10th percentile for both total GHG emissions (scope 1 and scope 2) levels and intensities. Green companies represent a very small share of overall market capitalisations (see Figure 23, for 2021).

The gold standard for defining green economic activities is the **EU Taxonomy**, a cornerstone of the EU's Sustainable Finance framework. The mandatory Taxonomy-alignment disclosures on Capex, OpEx and revenue for companies under the scope of the Corporate Sustainability Reporting Directive (CSRD) will allow reliable quantification of finance aligned with a net zero trajectory by 2050 (and other environmental objectives). With first reporting on taxonomy-alignment mandated for 2023, it will be possible to start aggregating these data from 2024 onwards.

INTEGRATING CLIMATE IN FINANCIAL MARKET POLICY

Green finance is increasing and the sustainable finance regulatory framework that the EU has put in place since 2018 has been instrumental in driving the reorientation of private capital flows, but green finance remains far from the levels needed to finance the transition to a climate neutral and climate resilient economy. Policy needs to re-focus financing for the transition of "brown" sectors towards "green", while avoiding lock-ins that undermine long-term goals. The 2023 Commission Recommendation on Transition Finance outlines how the EU's existing toolbox can already be used[130] and provides a starting point for the upcoming revisions of existing financial market policies, including identification of new policies to ensure a comprehensive framework to enable the EU to achieve its climate targets. The Commission's commitment in the Renewed Sustainable Finance Strategy of 2021 to report on its implementation by the end of 2023 will be an opportunity to assess needs to be addressed going forward.

FUNDING FROM THE EU EMISSION TRADING SYSTEM

The **Innovation Fund** is one of the key instruments at EU level to bring solutions to the market to decarbonise the European economy, supporting its transition to climate neutrality while fostering its competitiveness. It is Europe's key instrument to gear up the EU green industrial strategy while preserving cohesion objectives. Following the ETS Directive revision the Innovation Fund[131] will:

1) grow from 450 million to approximately 530 million ETS allowances;
2) Have a bigger scope in terms of sectors (maritime, aviation, buildings, road transport), size of grant (introducing a category of medium-scale projects, with total investment costs of EUR 20 million to EUR 100 million) and in terms of level of innovation, allowing support for upscaling innovative technologies;
3) be able to introduce new financing mechanisms, with projects selected through auctions (competitive bidding) and supported through fixed premium contracts, contracts for difference or carbon contracts for difference.

[130] EUR-Lex - 32023H1425 - EN - EUR-Lex (europa.eu)

[131] See delegated regulation on the Innovation Fund (Regulation (EU) 2019/856)

The Innovation Fund portfolio has continued to increase. A total of 23 large-scale projects (total investment costs above EUR 7.5 million) and 46 small-scale projects (total investments costs below EUR 7.5 million) are under implementation, with a total EU contribution amounting to EUR 3.1 billion. The investment mobilised by these grant contributions amounts to more than EUR 13 billion (estimated aggregate capital costs for the 69 projects). Following the publication of results from the third call for large-scale projects, another 41 projects with total grants amounting to EUR 3.6 bn are currently preparing their grant agreements with CINEA. In parallel, a total of 43 projects were awarded project development assistance by mid-2023. The third call for small scale projects closed in September 2023; 72 applications were received, asking for EUR 289 million, 2.9 times more than the call budget of EUR 100 million. The launch of a new call for proposals is planned by end 2023, with a total budget of EUR 4 billion, covering small, medium and large-scale projects.

In addition, following the introduction of the competitive bidding mechanism in the revised ETS Directive, the first auction organised at EU level under the Innovation Fund, on renewable hydrogen, is planned to be launched by the end of the year, with a budget of EUR 800 million, to respond to the priorities put forward in the Hydrogen Bank Communication,[132] the Green Deal Industrial Plan[133] and the Net-Zero Industry Act.[134]

The **Modernisation Fund** supports lower-income Member States with financial assistance, generated through the ETS, to modernise their energy systems and improve energy efficiency. Up to 2030, over 750 million allowances will be auctioned to support these Member States, an increase by 110 million allowances (representing around EUR 60 billion), thanks to the revision of the ETS Directive. In the latest disbursement cycle, the EU allocated EUR 2.4 billion to 31 projects across seven beneficiary countries. Additional investments were made in Romania (EUR 1.1 billion), Czechia (EUR 1 billion), Bulgaria (EUR 197 million), Poland (EUR 47 million), Croatia (EUR 88 million), Latvia (EUR 5 million), and Lithuania (EUR 1 million). The Modernisation Fund has now distributed a total of around EUR 7.5 billion since January 2021, benefiting ten eligible Member States. Under the revised EU ETS, Greece, Portugal and Slovenia will also become beneficiaries of the Modernisation Fund.

MAINSTREAMING CLIMATE POLICIES IN THE EU BUDGET

The EU budget 2021-2027 – both the 'multiannual financial framework' and the *NextGenerationEU* instrument – is an important enabler of the green transition. It is currently projected that in the period up to 2027 it will contribute EUR 578 billion to climate action. This represents 32.6% of the EU's total budget[135] and exceeds its 30% climate spending target. This target is underpinned by programme-specific spending targets, for instance in the European Regional Development Fund (30%), the Neighbourhood, Development and International Cooperation Instrument (30%), Horizon Europe (35%), the Cohesion Fund (37%), the Common Agricultural Policy (40%), the Connecting Europe Facility (60%), and the LIFE programme (61%).

The EU's **Recovery and Resilience Facility** – the centrepiece of *NextGenerationEU*, the EU's recovery instrument – has a value of up to EUR 723.8 billion and enables Member States to significantly increase climate investments. To qualify for the Facility's grants (EUR

[132] COM/2023/156

[133] COM/2023/62

[134] COM/2023/161

[135] European Commission's 'statement of estimates' published in preparation of the draft budget 2024. The projected amount reflects loans currently requested in the RRF and excludes the Innovation and Modernisation Funds.

338 billion) and loans (EUR 385.8 billion), Member States have prepared recovery and resilience plans setting out investments and policy reforms that contribute to the Facility's six policy objectives including the green transition. Each national plan must spend a minimum of 37% of its total allocation on measures contributing to climate objectives (such as initiatives promote energy efficiency, sustainable mobility and renewable energy). Every measure must also comply with the 'do-no-significant-harm' principle. All 27 Member State plans exceed the 37% benchmark, with some Member States spending well over half of their allocation to fund climate policy. Collectively Member States dedicate 40% of their allocations to climate objectives (EUR 203 billion)[136].

In addition, during 2023, Member States were (or still are) complementing their recovery and resilience plans with new chapters on *REPowerEU* , a joint response to the energy crisis caused by Russia's invasion of Ukraine. New or scaled-up reforms and investments in Members States to help phase out the EU's dependence on Russian fossil fuels and accelerate the clean energy transition will be supported by additional financial firepower (EUR 20 billion of new grants, transfers from other funds and use of remaining NGEU loans).

At the same time, the EU budget is enhancing its focus on the *results* of the measures that it finances. By way of example, by 2022:

- 459 362 households had improved their energy classification through the regional funds;
- Annual energy consumption had been reduced by nearly 14.2 terawatt thanks to the Recovery and Resilience Facility;
- 3 640 gigawatts of additional renewable energy had been financed by the regional funds.

InvestEU

At least 30% of the InvestEU programme's target of EUR 372 billion for mobilising additional investment over the period 2021-27 should contribute to meet the EU climate objectives. Under the Sustainable Infrastructure Window, 60% of the funding must be spent on climate and environment. Investments above EUR 10 million are subject to sustainability proofing (identify, assess and mitigate climate, environment or social risks). All InvestEU supported investment will be climate and environmentally tracked against the methodology issued by the Commission. Besides the EIB, 18 institutions have been selected to start negotiating Guarantee Agreements for them to become Implementing Partners, with Guarantee Agreements signed with the European Bank for Reconstruction and Development (EBRD), Council of Europe Development Bank (CEB), Nordic Investment Bank (NIB), CDP Equity (CDPE), Caisse des Dépôts (CDC) in 2022. Financial products foreseen will help address market failures in providing access to finance projects in a broad area of policy priorities from transport, smart mobility, clean energy, digital connectivity, as well as energy efficiency, decarbonisation of industry, renewable energy, circular economy and other fields.

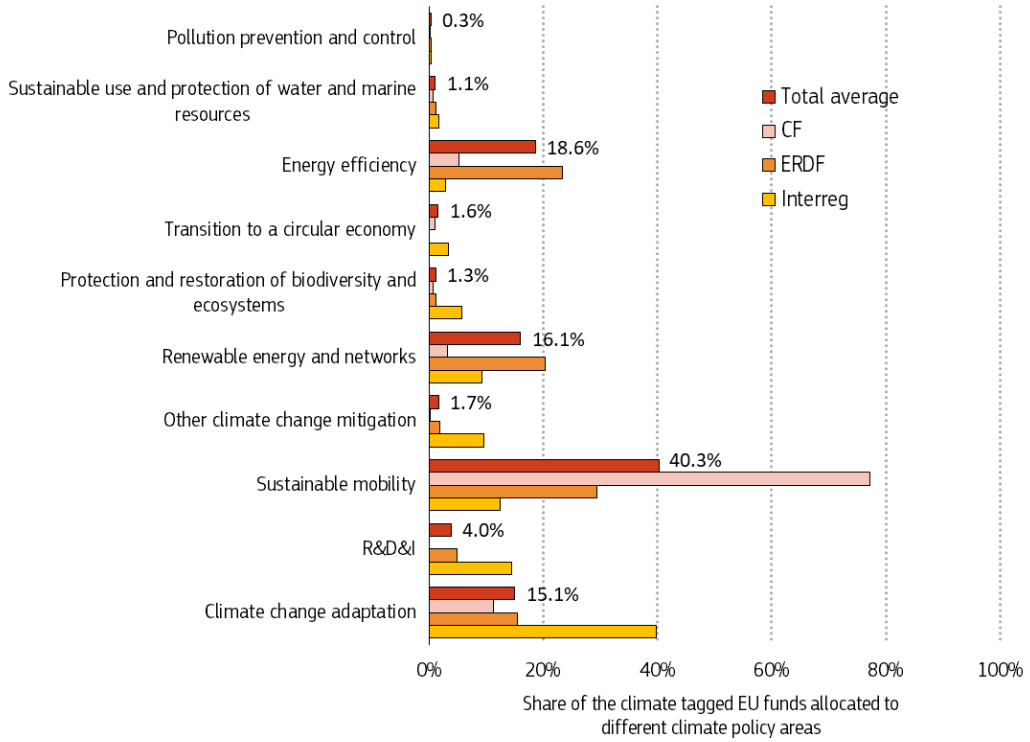
European Regional Development Fund and Cohesion Fund

Member States' planned allocations under Cohesion policy programmes for the period 2021-2027 exceed the climate expenditure targets of both the European Regional Development Fund (ERDF) (30.0%) and the Cohesion Fund (CF) (37.0%). EUR 92 billion (36.3%) of the EUR 253.3 billion of ERDF and CF funds financed by the EU under the current multiannual financial framework are expected to fund climate change mitigation and adaptation measures.

[136] Recovery and Resilience Scoreboard (europa.eu)

In addition, about 24.9% of the EUR 10.2 billion of Interreg funds financed by the EU are expected to fund climate relevant measures. Figure 24 shows the funding allocated to climate relevant policy areas as a share of total ERDF, CF, and Interreg climate expenditure.

Figure 24: ERDF, CF and Interreg EU climate amounts by policy area[137]



Research and Innovation Framework Programmes (Horizon Europe and Horizon 2020)

Investments in research and innovation are essential for generating knowledge and solutions for the transition towards climate neutrality and resilience. Overall, Horizon Europe will contribute at least 35% of its EUR 95.5 billion budget to climate objectives. By end of 2022, over EUR 8.5 billion have already been earmarked to R&I supporting climate action.[138] A broad portfolio of ambitious European private-public partnerships is mobilising resources and developing solutions necessary to deliver on the EU's climate agenda across key economic sectors such as steel, process industries, hydrogen, batteries, bioeconomy, aviation, road and waterborne transport, buildings, water and more.

[137] Totals may not add up due to rounding. The data shown were taken on 25/09/2023 from the Open Data Portal for the European Structural Investment Funds - European Commission | Data | European Structural and Investment Funds (europa.eu), which contains more detailed information including climate spending by programme. Data shown are from the latest adopted versions of programmes. These figures are subject to change as Member States may amend their programmes during the programming period. The methodology for climate tracking under the Recovery and Resilience Facility (RRF) has been used as a basis for categorizing climate expenditure by policy category.

[138] Preliminary figures

Just Transition Fund

The Just Transition Fund (JTF) -related cohesion policy programmes adopted make EUR 18.5 billion of EU investments available to help the people and places that suffer the most from the transition to climate neutrality. In addition to JTF, the other 2 pillars of the Just Transition Mechanism will mobilise EUR 28 billion from public and private investments to address the social and economic effects of the transition. The Commission has approved 67 Territorial Just Transition Plans, covering a total of 93 territories, including coal regions and carbon intensive regions. Almost half of JTF investments will support diversification of the local economy, so that they don't depend on a single polluting sector, and help people acquire new skills. The first JTF projects are being selected in Estonia and Netherlands.

European Social Fund (ESF+)

For the period 2021-2027, Member States programmed almost 6 billion or 6% of total ESF+ allocations[139] for green skills and green jobs, considerably more than in the previous programming period. Finland, Italy, Belgium, Luxembourg, and Denmark allocated the highest shares to green jobs and skills (between 12% and 31%) while in several individual programmes from Belgium, Denmark, Italy, France, Germany, Portugal and Spanish programmes this share is 20% and above. In terms of actual investments, three individual programmes from Italy, Portugal and Greece alone contribute to some 30% of total EU climate expenditure for green jobs and skills. Overall, a third of climate expenditure has been allocated to access to employment and activation measures.

Technical Support Instrument

This year the Technical Support Instrument is financing several projects on adaptation, do-no-significant-harm, faster permitting, industrial eco-systems and skills, building renovation but also capacity building. A Flagship on preparation of the Social Climate Fund and the new ETS has been developed to help Member States implement the "Fit For 55" package.

LIFE programme

LIFE is the EU's funding instrument for the environment and climate action. In 2022, more than EUR 600 million were awarded to 200 projects supporting the Green Deal, including projects developing innovative solutions and sharing best practice to reduce GHG emissions, increase resilience to climate change and contribute to clean energy transition. In 2023, over EUR 600 million will be awarded to projects supporting environment, climate action and the clean energy transition, including contributing to the objectives of REPowerEU and the Green Industrial Plan. In the last year Moldova and North Macedonia joined Iceland and Ukraine in the list of third countries participating in LIFE.

[139] EU's main tool for investing in skills and for supporting labour market transitions with a total budget of almost EUR 99.3 billion for the period 2021-2027.

7 INTERNATIONAL CLIMATE ACTION

OVERVIEW AND DEVELOPMENTS

The past year has seen productive international exchanges including the Ministerial on Climate Action, the Major Economies Forum, the Petersberg Climate Dialogue, the Africa Climate Summit, the Cartagena Dialogue and the 27th Conference of the Parties in Sharm el Sheik, Egypt.

The EU is pushing for an ambitious Mitigation Work Programme, and focusing on delivering concrete solutions to close the ambition and implementation gap and to create incentives to set a high level of ambition.

The EU is seeking an ambitious outcome on the **first Global Stocktake** to set the course to achieve the Paris Agreement goals and to get on track to limit warming to 1.5 degrees Celsius, and concrete recommendations for enhanced, immediate and ambitious mitigation action pre- and post-2030. The EU is also wants action on climate adaptation and means of implementation and support, including aligning global finance flows with these goals.

On **Loss and Damage** discussed at COP27 in Sharm el-Sheikh, a fund to assist developing countries that are particularly vulnerable to the adverse effects of climate change will be set up, and the EU is engaging in the work of the Transitional Committee to develop recommendations for the operationalisation of the new funding arrangements.

The EU has been active in scaling up international finance for **adaptation**. The EU and its Member States are the largest donors of funding for adaptation, contributing more than EUR 12 billion per year to climate adaptation or actions that combine adaptation and mitigation. At COP27, and in the follow-up intersessional Conference 58 in Bonn, the Parties agreed on the possible structural aspects of a Global Goal on Adaptation Framework for consideration and adoption at COP28.

The EU has also joined and/or further developed initiatives such as Adaptation Without Borders, the Africa Adaptation and Innovation Initiative, the International Coral Reef Initiative, and the All-Atlantic Ocean Research Alliance.

The EU is helping to advance **plurilateral initiatives**, including the announcement of a global pledge for doubling energy efficiency and tripling renewable energy by 2030. The 2021 Global Methane Pledge, co-led with the United States of America, now has over 150 participants and a dedicated secretariat. The EU has provided EUR 10 million to support the work and is preparing development finance for implementation projects. The EU is also launching the MARS initiative (Methane Alert and Response System) to support ongoing work in this area.

MULTILATERAL AND BILATERAL ENGAGEMENT

Significant progress was made with multilateral and bilateral partners to convince and support other countries, in particular major emitters, to increase their climate ambition. The EU strengthened its green deal diplomacy efforts by increasing engagement with third countries and regions.

Following the adoption of the **Green Alliance** with **Japan** in 2021, the EU launched further green alliances and partnerships with **Morocco** (October 2022), **Norway** (April 2023) and **the Republic of Korea** (May 2023), bilateral frameworks for closer dialogue and cooperation on climate action, environmental protection and the clean energy transition.

Regular exchanges took place with the **United States**, including under the High-Level Climate Action Group set-up by the 2021 EU-US Summit. The EU also engaged in **high level dialogues** with **China** and **Canada** underlining that cooperation on climate for large emitters is central to building global consensus for increasing climate ambition aligned with the 1.5 °C degree temperature limit, and to ensuring that existing commitments are implemented.

The EU together with other members of the International Partners Group set up a **Just Energy Transition Investment Partnership** worth over USD 8.5 billion with South Africa in 2021 and signed three more since with Indonesia (2022), Vietnam (2022) and Senegal (2023) providing USD 20 billion, USD 15.5 billion and EUR 2.5 billion respectively in new public and private financing. The partnerships are a model of how the international community can work with partner countries to commit to sustainable development and jointly implement a clean and just energy transition.

The Political Declaration signed with **Indonesia** includes an accelerated path to reducing power sector emissions to net zero by 2050 and a strategy based on the expansion of renewables so that renewable energy comprises at least 34% of all power generation by 2030, the phase down of on- and off-grid coal-fired electricity generation, and further commitments to regulatory reforms and energy efficiency.

The Partnership with **Vietnam,** led by the EU and UK as co-leads of the International Partners Group, also sets ambitious new targets such as advancing the projected date for all GHG emissions to peak from 2035 to 2030, limiting Vietnam's peak coal capacity to 30.2 GWT (down from the current 37 GWT) and accelerating the adoption of renewables to reach at least 47% of electricity generation by 2030.

The Partnership with **Senegal** seeks to strengthen the development of renewable energy and infrastructure and technologies to accelerate deployment and use. Senegal aims to reach a share of 40% renewable energy in its installed generation capacity by 2030.

Through the **Global Gateway strategy**, the European Commission and the EU High Representative have set out to boost smart, clean and secure links in digital, energy and transport sectors and to strengthen health, education and research systems across the world. Between 2021 and 2027, the EU institutions and EU Member States jointly will mobilise up to EUR 300 billion of investment for sustainable, high-quality projects, considering the needs of partner countries and ensuring lasting benefits for local communities.

The EU also worked with the **Contracting Parties of the Energy Community**[123] to adopt the 2030 energy and climate targets to reduce primary and final energy consumption, accelerate the uptake of renewables and reduce GHG emissions to achieve climate neutrality by 2050. They also agreed to adopt monitoring and reporting of GHG emissions and associated legal acts.

CLIMATE FINANCE AND INTERNATIONAL COOPERATION

International public climate finance plays an important role in helping developing countries to implement the Paris Agreement, together with climate finance from private sources.

The Commission continues to support partner countries through its financing instruments. Under the Neighbourhood, Development and International Cooperation Instrument (NDICI) – Global Europe, with at least 30% to be dedicated to climate action.

The Instrument for Pre-Accession Assistance (IPA III) also sets a climate change spending target of 18%, rising to 20% by 2027. The principle of 'do not harm' is enshrined in both regulations. The Commission has committed an additional EUR 4 billion for climate finance by 2027 on top of these climate change spending targets, which equates to a 35% climate finance target. This is an unprecedented investment by the EU in reducing emissions and in helping developing countries build resilience to the effects of climate change.

The EU, its Member States and financial institutions, collectively known as Team Europe, are the leading contributor of development assistance and the world's biggest climate finance contributor, accounting for about a third of the global public climate finance. In 2021, the European Union and its 27 Member States committed over EUR 23 billion in climate finance from public funds to support developing countries in reducing their GHG emissions and in adapting to the impacts of climate change.

Over 54% of overall Team Europe finance was allocated to either climate adaptation or to actions involving both mitigation and adaptation. Almost half of the total funding was committed in the form of grants.

Efforts are underway to **promote the involvement of the private sector** in climate action through the European Fund for Sustainable Development Plus (EFSD+) guarantees and blending.

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Brussels, 24.10.2023
SWD(2023) 339 final

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 2023

{COM(2023) 653 final} - {SWD(2023) 338 final}

CONTENTS

1 OVERVIEW OF EU CLIMATE TARGETS

Table 1: Overview of new climate targets as adopted under the Fit for 55 package

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<tr><td>Target year of period</td><td>Second commitment period (2013-2020)</td><td>Already in force – covers the period post 2020</td><td colspan="2">2013-2020</td><td colspan="4">2021 - 2030</td><td>2050</td></tr>
<tr><td>Overall emission reduction target</td><td>-20%</td><td>at least -55% net emissions in 2030</td><td colspan="2">-20% GHG emissions reduction vs 1990</td><td colspan="4">at least -55% net domestic reduction vs 1990</td><td rowspan="2">climate neutrality (Balance between emissions and removals)</td></tr>
<tr><td>Emission reduction target</td><td></td><td></td><td>-21% in 2020 compared to 2005</td><td>-10% in 2020 compared to 2005</td><td>-62% in 2030 compared to 2005 for</td><td>-42% in 2030 compared to 2005 for ETS 2 emissions</td><td>-40% in 2030 compared to 2005 for ESR</td><td>First phase 2021-2025 'no-debit' commitment</td></tr>
</table>

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

			for ETS emissions	for non-ETS emissions Annual binding targets by MS ranging from +20% to -20%.	EU ETS emissions		emissions (non-ETS1 emissions) Annual binding targets by MS ranging from -10% to -50%.	to maintain current carbon sink levels. In a second phase 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

[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.

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 sectors, aviation	Transport (except aviation), buildings, non-ETS industry, agriculture and waste	Electricity & heat generation, energy-intensive industry, aviation[4], maritime[5]	Buildings, road transport and small-emitting sectors (i.e. emissions from fuel combustion in these sectors)	Domestic transport (except aviation), buildings, non-ETS industry, agriculture and waste	Land use, land use change and forestry	Economy-wide
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]

[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.
[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 OVERVIEW OF RECENTLY ADOPTED LEGISLATION CONTRIBUTING TO THE CLIMATE-NEUTRALITY OBJECTIVE

2.1 FIT-FOR-55 PACKAGE

The European Climate Law lays down a binding EU target to reduce net greenhouse gas emissions by at least 55% by 2030 compared to 1990 levels and to achieve climate neutrality at the latest by 2050. In July 2021, the Commission proposed the **Fit-for-55 package**, containing the legislative proposals needed to reach those targets, including revision of existing legislation and new measures. In September 2023, nearly all proposals under this package were adopted (or close to adoption) by co-legislators, with several measures already in force.[9] Key elements of those proposals are summarised below.

EU Emissions Trading System

- Revision of the EU Emissions Trading System (ETS)[10] to increase the system's **ambition to 62%** emissions reductions by 2030, compared to 2005 levels.
- Extension of ETS to **maritime transport,** covering carbon dioxide (from 2024), methane and nitrous oxide emissions (from 2026) from ships above 5 000 gross tonnage in respect of all emissions from voyages within the EU and emissions from ships within EU ports and of 50% of emissions from international voyages starting or ending in the EU. The obligations for shipping companies to surrender allowances is introduced gradually: 40% of emissions reported for 2024, 70% for 2025 and 100% for 2026.
- Increasing the **aviation** sector's contribution to emission reductions through a strengthening of the EU ETS for aviation and implementing the global market-based measure CORSIA (Carbon Offset and Reduction Scheme for International Aviation)[11]**.**
- The **Market Stability Reserve**, which stabilises the carbon market by removing surplus allowances, is strengthened.

[9] Nearly all acts under the Fit-for-55 package were adopted by the Parliament and the Council, with the exception of the Renewable Energy Directive, the ReFuel EU Aviation Regulation (both provisionally agreed, pending final vote) and the Energy Taxation Directive (negotiations still ongoing).

[10] Directive (EU) 2023/959 of the European Parliament and of the Council of 10 May 2023 amending Directive 2003/87/EC establishing a system for greenhouse gas emission allowance trading within the Union and Decision (EU) 2015/1814 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading system.

[11] Decision (EU) 2023/136 of the European Parliament and of the Council of 18 January 2023 amending Directive 2003/87/EC as regards the notification of offsetting in respect of a global market-based measure for aircraft operators based in the Union.

- Free emission allowances to certain industry sectors gradually phased out as a new **Carbon Border Adjustment Mechanism (CBAM)**[12] will be phased in between 2026 and 2034. CBAM puts a carbon price on imports of products in the covered sectors to avoid 'carbon leakage'.
- The size of the **Innovation Fund** and the **Modernisation Fund** funded from revenues of the EU ETS, is increased. Additional resources of the Modernisation Fund are supporting three more Member States with their transition. The Innovation Fund, which funds the demonstration of innovative low-carbon technologies, is expanded to new sectors, including maritime transport.
- A **new separate emissions trading system for buildings, road transport and small emitting sectors (ETS2) is established, with compliance starting in 2027**. It is complementing Member States' emission reduction targets under the Effort Sharing Regulation. The ETS 2 is contributing to 42% emission reductions compared to 2005 in the sectors covered.
- **The new Social Climate Fund**[13] is introduced together with the ETS 2 to mitigate any social effects of carbon pricing in the covered sectors. It will pool revenues from the new system to provide dedicated financial support to Member States to help vulnerable citizens and micro-enterprises with investments in energy efficiency (such as home insulation, heat pumps, solar panels), and low- and zero-emissions mobility. Member States will also be able to provide direct income support to households up to 37.5% of the total cost of their Social Climate Plans. The Fund will be launched in 2026, a year before ETS 2. In 2026-32, it is expected to mobilise EUR 86.7 billion – directly from ETS 2 revenues and co-financing by Member States. As a result, energy costs for vulnerable households, micro-enterprises and transport users will be reduced.

Effort Sharing Regulation

- Increased ambition of the EU's Effort Sharing Regulation[14] to a **-40%** reduction of emissions in domestic transport, buildings, agriculture, waste and small industrial installations by 2030 compared to 2005 levels (from -29% for EU-27 in 2018). The updated emission reduction targets for Member States range from –10% to -50%.

Land use, land use change and forestry

- Introduction of an EU target for **net greenhouse gas removals** by natural sinks of 310 million tonnes of CO_2 equivalent by 2030 and setting ambitious and fair targets for each

[12] Regulation (EU) 2023/956 of the European Parliament and of the Council of 10 May 2023 establishing a carbon border adjustment mechanism.
[13] Regulation (EU) 2023/955 of the European Parliament and of the Council of 10 May 2023 establishing a Social Climate Fund and amending Regulation (EU) 2021/1060.
[14] Regulation (EU) 2023/857 of the European Parliament and of the Council of 19 April 2023 amending Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement, and Regulation (EU) 2018/1999.

Member State to reverse the decreasing trend of the EU's carbon sink[15]. For the period from 2026-2030, each Member State will have a binding national target for 2030, which together will deliver the collective EU target of 310 Mt. In addition, the Regulation sets a commitment for each Member State to achieve a sum of net greenhouse gas emissions and removals for the period from 2026 to 2029 ('the budget 2026-2029').

Standards for new cars and vans

- More ambitious targets for reducing CO_2 emissions of new cars and vans with the adoption of the **regulation on emission performance standards for new cars and vans[16]**, to reduce 55% of CO_2 emissions for new cars and 50% for new vans from 2030 until 2034, and for 100% CO_2 emissions reductions from 2035 for new cars and vans.

Other acts under the Fit-for-55 package

- Ambitious **targets for improving energy efficiency[17] and for increasing renewables[18]** in the EU energy mix have been agreed. In line with the European Commission's plan to make Europe independent from Russian fossil fuels well before 2030 (RePowerEU), the EU has agreed to increase ambition on energy savings through an enhanced target to **reduce final energy consumption at EU level by 11,7% in 2030,** compared to projections made in 2020, and a new target for **increasing renewable energy in final energy consumption of at least 42,5% by 2030**, with an additional 2,5% indicative top up that would allow to reach 45%.
- The **ReFuelEU Aviation Regulation[19]** will increase the uptake of sustainable fuels, such as advanced biofuels or hydrogen, in the aviation sector. It obliges EU airports and fuel suppliers to ensure that, starting from 2025, at least 2% of aviation fuels will be green, with this share increasing every five years and reaching 70% in 2050.
- The **FuelEU Maritime Regulation[20]** will ensure that the greenhouse gas intensity of fuels used by the shipping sector gradually decreases over time, by 2% in 2025 and 6% in 2030 to as much as 80% by 2050. It promotes sustainable alternative fuels in shipping and at

[15] Regulation (EU) 2023/839 of the European Parliament and of the Council of 19 April 2023 amending Regulation (EU) 2018/841 as regards the scope, simplifying the reporting and compliance rules, and setting out the targets of the Member States for 2030, and Regulation (EU) 2018/1999 as regards improvement in monitoring, reporting, tracking of progress and review.

[16] Regulation (EU) 2023/851 of the European Parliament and of the Council of 19 April 2023 amending Regulation (EU) 2019/631 as regards strengthening the CO_2 emission performance standards for new passenger cars and new light commercial vehicles in line with the Union's increased climate ambition.

[17] Directive (EU) 2023/1791 of the European Parliament and of the Council of 13 September 2023 on energy efficiency and amending Regulation (EU) 2023/955.

[18] Proposal for an amendment to the Renewable Energy Directive to implement the ambition of the new 2030 climate target (COM/2021/557).

[19] Proposal for a Regulation of the European Parliament and of the Council on ensuring a level playing field for sustainable air transport (COM/2021/561 final).

[20] Regulation (EU) 2023/1805 of the European Parliament and of the Council of 13 September 2023 on the use of renewable and low-carbon fuels in maritime transport, and amending Directive 2009/16/EC.

European ports by limiting the greenhouse gas intensity of the energy used on-board large ships and by mandating the use of onshore power supply for certain ship types.

- With the new Regulation for the deployment of an **alternative fuels infrastructure (AFIR)**[21]**,** more **recharging and refuelling stations** for alternative fuels will be deployed in the coming years across Europe. It will ensure minimum infrastructure to support the required uptake of alternative fuel vehicles across all transport modes and in all EU Member States, ensure full interoperability of the infrastructure and comprehensive user information and adequate payment options at alternative fuels infrastructure. It sets mandatory national targets for the deployment of alternative fuels infrastructure in the EU, for road vehicles, vessels and stationary aircraft.
- The proposal for a revised **Energy Taxation Directive**[22] aims to align the taxation of energy products with EU energy and climate policies, promote clean technologies and remove outdated exemptions and reduced rates that currently encourage the use of fossil fuels (*legislative procedure ongoing)*

2.2 ADDITIONAL POLICY CONTRIBUTING TOWARDS THE ACHIEVEMENT OF THE EU'S CLIMATE TARGETS

The proposals to revise the **fluorinated greenhouse gases (F-gases) Regulation**[23] and the **Ozone Regulation**[24] will further reduce emissions from those highly potent, human-made greenhouse gases which are often several thousand times stronger than carbon dioxide (CO_2). In particular, the current HFCs phase-down, which is gradually reducing the volume of hydrofluorocarbons placed on the EU market, will become steeper. The Commission also proposed more ambitious emission-reduction targets for **heavy-duty vehicles**[25] to ensure that this segment of the road transport sector contributes to the EU's climate and zero pollution objectives. The proposed revision of the TEN-T Regulation[26] and the Greening freight package[27] will further support the decarbonisation of the transport sector. These saved emissions will support Member States' efforts to reach their target

[21] Regulation (EU) 2023/1804 of the European Parliament and of the Council of 13 September 2023 on the deployment of alternative fuels infrastructure, and repealing Directive 2014/94/EU.
[22] Proposal for a Council Directive restructuring the Union framework for the taxation of energy products and electricity (COM/2021/563 final).
[23] Proposal for a Regulation of the European Parliament and of the Council on fluorinated greenhouse gases, amending Directive (EU) 2019/1937 and repealing Regulation (EU) No 517/2014, (COM/2022/150 final).
[24] Proposal for a Regulation of the European Parliament and of the Council on substances that deplete the ozone layer and repealing Regulation (EC) No 1005/2009, (COM/2022/151 final).
[25] Proposal for a Regulation of the European Parliament and of the Council amending Regulation (EU) 2019/1242 as regards strengthening the CO_2 emission performance standards for new heavy-duty vehicles and integrating reporting obligations, and repealing Regulation (EU) 2018/956, (COM/2023/88 final).
[26] Proposal for a Regulation of the European Parliament and of the Council on Union guidelines for the development of the trans-European transport network, amending Regulation (EU) 2021/1153 and Regulation (EU) No 913/2010 and repealing Regulation (EU) 1315/2013, (COM(2021)812 final).
[27] Proposal for a Regulation on the use of railway infrastructure capacity in the single European railway area (COM(2023)443), Proposal for a Revision of the Weights and Dimensions Directive (COM(2023)445), Proposal for a Regulation on the accounting of greenhouse gas emissions of transport services (COM(2023)441).

under the Effort Sharing Regulation. The **hydrogen and gas markets decarbonisation package**[28] will decarbonise the EU gas market by facilitating the uptake of renewable and low carbon gases, including hydrogen and will ensure energy security for all citizens in Europe. New rules on **methane emissions**[29] in the energy sector will increase understanding of where methane emissions come from and will contribute to reduce those emissions. The revised **Energy performance of buildings Directive**[30] will contribute to achieving a zero-emission and largely decarbonised building stock by 2050. The proposed EU-wide voluntary framework to reliably **certify high-quality carbon removals**[31] will boost innovative carbon removal technologies and carbon farming solutions.

Tackling climate change and ensuring healthy and biodiverse ecosystems are intrinsically linked. **Natural carbon sinks** are of crucial importance to sequester carbon. The new proposals to conserve and restore ecosystems such as wetlands and forests. The **Nature Restoration Law**[32], **Soil Monitoring Law**[33] and the upcoming framework for **resilient European forests**[34] will also make a significant contribution to maintaining, managing and enhancing natural carbon sinks and to increasing biodiversity while fighting climate change.

By promoting energy and material efficiency, and reducing the amount of waste produced, circularity has the potential to cut global emissions. The Commission adopted the **Ecodesign for Sustainable Products Regulation**[35] to ensure products are built to be sustainable and recyclable and to extend their lifetime. The initiative on the **Right to Repair**[36] makes repair easier and more attractive for consumers. The Commission proposed several measures to reduce waste such as a targeted revision of the **Waste Framework Directive (WFD)**[37] or the EU rules on **Packaging and Packaging Waste**[38]. Consumers in the EU indicated lacking reliable information about the sustainability of products and facing misleading commercial practices, such as greenwashing and early obsolescence practices. To address this, the Commission proposed a **Directive on**

[28] Proposal for a Directive of the European Parliament and of the Council on common rules for the internal markets in renewable and natural gases and in hydrogen (COM(2021)803 final) and proposal for a Regulation of the European Parliament and of the Council on the internal markets for renewable and natural gases and for hydrogen (COM(2021)804 final).
[29] Proposal for a Regulation of the European Parliament and of the Council on methane emissions reduction in the energy sector and amending Regulation (EU) 2019/942 (COM(2021)805 final)
[30] Proposal for a Directive of the European Parliament and of the Council on the energy performance of buildings, (COM/2021/802 final).
[31] Proposal for a Regulation of the European Parliament and of the Council establishing a Union certification framework for carbon removals, (COM(2022) 672 final).
[32] Proposal for a Regulation of the European Parliament and of the Council on nature restoration, (COM/2022/304 final).
[33] Proposal for a Directive of the European Parliament and of the Council on Soil Monitoring and Resilience (Soil Monitoring Law), (COM(2023) 416 final).
[34] Under preparation, see EU forests – new EU Framework for Forest Monitoring and Strategic Plans (europa.eu)
[35] Proposal for a Regulation of the European Parliament and of the Council establishing a framework for setting ecodesign requirements for sustainable products and repealing Directive 2009/125/EC, (COM/2022/142 final).
[36] Proposal for a Directive of the European Parliament and of the Council on common rules promoting the repair of goods and amending Regulation (EU) 2017/2394, Directives (EU) 2019/771 and (EU) 2020/1828, COM/2023/155 final.
[37] Proposal for a Directive of the European Parliament and of the Council amending Directive 2008/98/EC on waste, (COM/2023/420 final).
[38] Proposal for a Regulation of the European Parliament and of the Council on packaging and packaging waste, amending Regulation (EU) 2019/1020 and Directive (EU) 2019/904, and repealing Directive 94/62/EC, (COM/2022/677 final).

Empowering Consumers for the Green Transition[39] to ensure better information is provided to consumers on durability and reparability, and to strengthen the fight against misleading practices linked to sustainability. The Commission also proposed an **EU Green Claims Directive**[40] under which companies will be required to substantiate the claims they make.

In February 2023, the Commission adopted "**a Green Deal Industrial plan for the net zero age**[41]" to enhance the competitiveness of the EU's net zero industry and leading globally the transition to climate neutrality. The plan aims at creating a predictable and simplified regulatory environment, enabling faster access to sufficient funding, turning skills into quality jobs, and supporting open trade for resilient supply. As part of this, the Commission has proposed the **net-zero industrial act (NZIA)**[42], the **critical raw material act**[43], and a **reform of the electricity market**[44]. The NZIA aims to scale up net zero technology manufacturing in the EU to provide at least 40% of the EU's annual deployment needs by 2030 and sets a union level objective of 50 million tonnes of annual CO_2 storage capacity by 2030. A key element in the strategy is the promotion of renewable hydrogen as a substitute to fossil fuels, for which the Commission has set the target of 20 million tonnes of supply by 2030. To facilitate its deployment, in 2023 the Commission created the European hydrogen bank, which will support amongst other things the creation of a domestic market with funds from the ETS innovation fund, starting with a public auction by the end of 2023.

The availability of **relevant skills** is a precondition for a successful transition towards climate neutrality. With the necessary skills in place, significant jobs creation on the 2030 time horizon will take place not only within the clean energy sector, but also in manufacture, construction transportation, and services linked to boosted manufacturing and deployment of these technologies. Under the Net Zero Industry Act, the Commission will support the setting up of specialised **European Net-Zero Industry Academies**, each focusing on a net-zero technology to provide up-skilling and re-skilling programmes. With the Council Recommendation on **ensuring a fair transition** towards climate neutrality[45], Member States have committed to devise and implement measures to address the employment and social aspects of the transition, including in the energy sector. It specifically asks Member States to consider the guidance provided in the

[39] Proposal for a Directive of the European Parliament and of the Council amending Directives 2005/29/EC and 2011/83/EU as regards empowering consumers for the green transition through better protection against unfair practices and better information, (COM/2022/143 final).
[40] Proposal for a Directive of the European Parliament and of the Council on substantiation and communication of explicit environmental claims (Green Claims Directive), (COM/2023/166 final).
[41] Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions, A Green Deal Industrial Plan for the Net-Zero Age, (COM/2023/62 final).
[42] Proposal for a regulation of the European Parliament and of the Council on establishing a framework of measures for strengthening Europe's net-zero technology products manufacturing ecosystem (Net Zero Industry Act), (COM(2023)161).
[43] Proposal for a regulation of the European Parliament and of the Council establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) 168/2013, (EU) 2018/858, 2018/1724 and (EU) 2019/102, (COM(2023)160).
[44] Proposal for a Regulation of the European Parliament and of the Council amending Regulations (EU) 2019/943 and (EU) 2019/942 as well as Directives (EU) 2018/2001 and (EU) 2019/944 to improve the Union's electricity market design, (COM/2023/148 final).
[45] Proposal for a Council recommendation on ensuring a fair transition towards climate neutrality, (COM(2021) 801 final).

Recommendation as part of their assessments during the update of the National Energy and Climate Plans (NECPs).

Future EU spending will also be directed **to action on the green and just transition**. To meet the need to boost investment in critical technologies in Europe, the Commission proposed the **Strategic Technologies for Europe Platform**[46]. It will supplement and leverage existing EU instruments to swiftly channel financial support to clean technologies, deep and digital technologies, and biotechnologies. In addition, the proposal for a revised **Financial Regulation**[47] includes the do-no-significant-harm principle to ensure that the EU budget is implemented without doing significant harm to the environmental objectives, including climate change mitigation and adaptation.

The Joint Communication on the **Climate and Security** Nexus[48] mainstreams climate and environmental considerations into EU external action and takes steps to make Member States' security and defence actors more climate-proof. This will enhance their contribution to the EU climate, energy and environmental objectives and policies, while respecting its specificities and preserving their operational effectiveness in rapidly changing strategic context.

[46] Proposal for a Regulation of the European Parliament and of the Council establishing the Strategic Technologies for Europe Platform ('STEP') and amending Directive 2003/87/EC, Regulations (EU) 2021/1058, (EU) 2021/1056, (EU) 2021/1057, (EU) No 1303/2013, (EU) No 223/2014, (EU) 2021/1060, (EU) 2021/523, (EU) 2021/695, (EU) 2021/697 and (EU) 2021/241, (COM(2023) 335 final).

[47] Proposal for a Regulation of the European Parliament and of the Council on the financial rules applicable to the general budget of the Union, (COM(2022) 223 final).

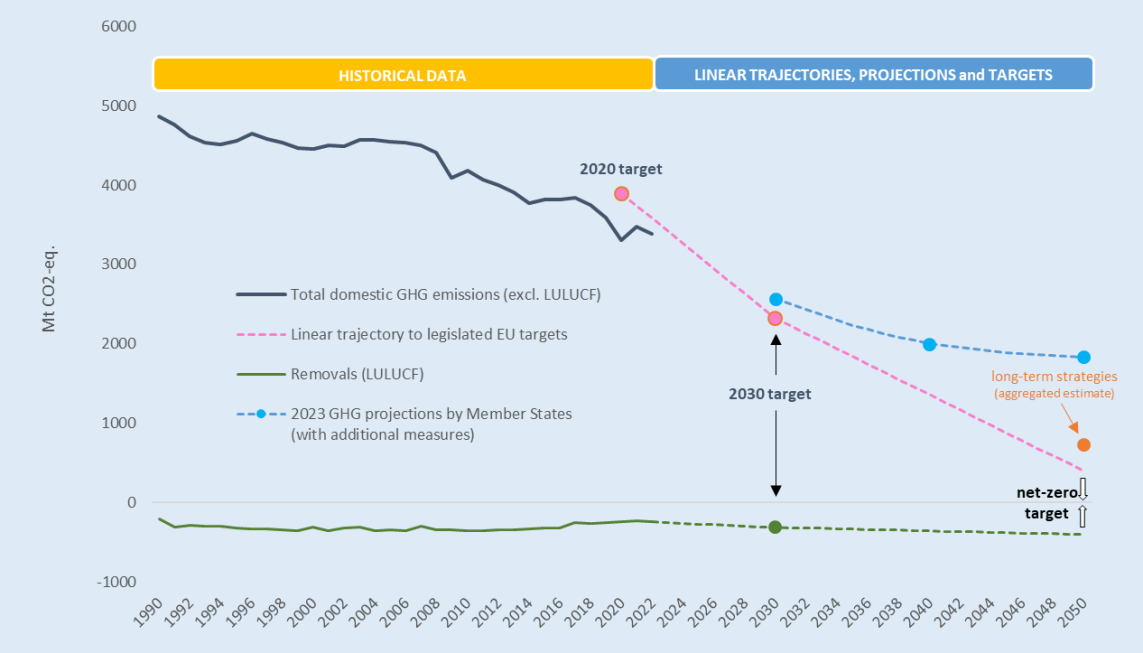
[48] Joint Communication to the European Parliament and the Council, A new outlook on the climate and security nexus: Addressing the impact of climate change and environmental degradation on peace, security and defence (JOIN(2023) 19 final).

3 EU's GREENHOUSE GAS EMISSIONS: TRENDS AND PROJECTIONS

3.1 EU GREENHOUSE GAS EMISSIONS AND REMOVALS: RECENT DEVELOPMENTS

After the 2021 strong rebound in greenhouse gas (GHG) emissions following the unprecedented fall in 2020 due to the COVID-19 pandemic, EU emissions in 2022 are expected to bounce back to the 30-years descending trend (**Figure 1**). According to provisional data, total EU domestic GHG emissions (i.e. excluding LULUCF and international aviation) decreased by 2.4% in 2022 compared to 2021, whilst EU GDP grew by 3.5% in the same year. This translates into a reduction in GHG emissions of 30.4% compared to the 1990 base year (or 29% when international aviation is included). Over the same period, there is an approximated increase in reported GHG net removals from land use, land use change, and forestry (LULUCF) of 14 million tonnes of CO_2 equivalent compared to 2021.[49] As a result, net GHG emissions for 2022 (i.e. including LULUCF) are expected to be 32.5% below the 1990 level (or 31.1% when international aviation is included).

__Figure 1__: Total EU GHG emissions (excluding international aviation) and removals (1990-2022), linear trajectories to EU targets, and Member States' latest GHG emissions projections (2022–2050).[50]

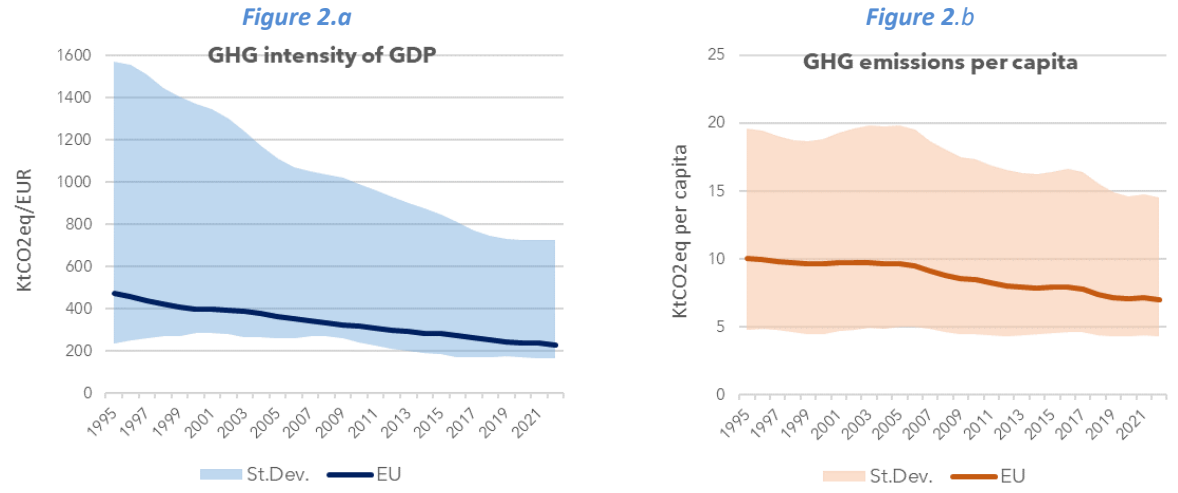


[49] Approximated 2022 data could suggest a break to the declining trend in the LULUCF sink observed in recent years. However, the assessment takes into consideration the large uncertainty of these data and as it will possibly be subject to larger revisions.

[50] Notes: (1) Historical GHG emissions and removals (1990-2022) are based on European Environment Agency's 2023 GHG Inventory and Approximated emissions and removals. (2) Linear trajectories for GHG emissions and removals (2022-2050) 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 $MtCO_2eq$.

This is also evidenced by the continued relative decoupling between emissions and economic growth with the GHG emission intensity of the economy, defined as the ratio between emissions and GDP, falling to 229 gCO_2-eq/EUR in 2022, less than half the 1990 level. As shown in Figure 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, although the decline seems have plateaued in the most recent years (**Figure 2.b**).

Figure 2: GHG emission intensity of GDP and GHG emissions per capita (1995-2022)[51]



However, more effort is needed in the next years and decades to reach the EU's long-term climate targets. The annual average reduction in domestic GHG net emissions observed over the last decade (i.e. around 53 $MtCO_2$-eq or 1 ½ percentage point) has almost to triple in order to achieve the 2030 target of -55% and keep up the pace beyond 2030 to reach climate neutrality by 2050 (see **Table 2**).[52]

In terms of sectors, emission reductions in the last three decades were significant in the energy industry (e.g. electricity and heat production, -42%), in the fuel combustion in the manufacturing industry and construction (e.g. iron and steel production, -48%) and in the industrial processes and product use industries (e.g. chemical industry, -65%; metal industry, -44%). Conversely, emissions in the transport sector have increased, especially in road transportation (+16%) although they have been slightly decreasing in the last ten years. Emission reduction in the agriculture sector (excluding fuel combustion) has somewhat halted at the half-way, showing even a moderate increase since 2010.[53] Finally, the traditional role of natural sink of CO_2 of the LULUCF sector, declined at a worrying speed in the last decade.

[51] Sources: EU greenhouse gas inventory 1990-2021. Real GDP in 2015 prices, data from AMECO database (European Commission, DG ECFIN). For GHG intensity of GDP, first available data are: BG and LT 1997; EE and SK 1993; HR 1995; LV 1992; HU, SI, MT 1991; and RO 1999.

[52] These figures assume a quite significant improvement of LULUCF in absorbing the remaining emissions, therefore clear actions are expected for the sector to revert recent trends.

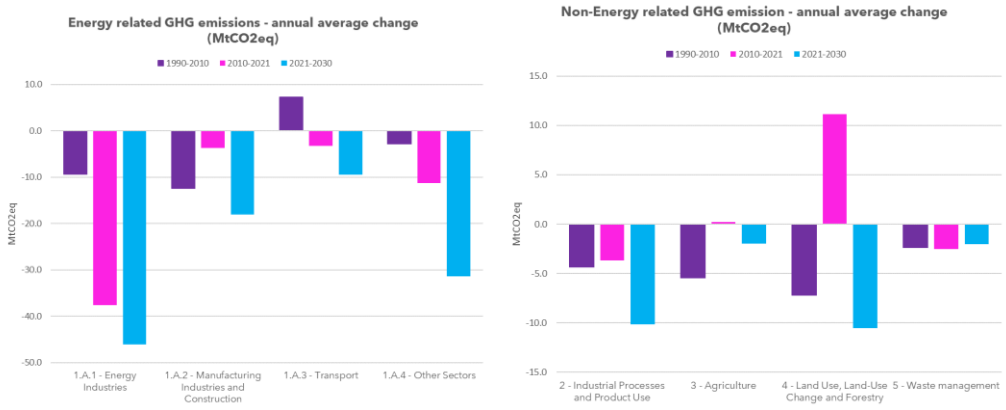
[53] https://www.eea.europa.eu/ims/greenhouse-gas-emissions-from-agriculture

***Table 2**: Change in EU's GHG emissions over 1990-2021 and expected change by 2030: a sectoral perspective.*[54]

EU-27	1990	2010			2021					2030	
			compared to 1990			compared to 1990		compared to 2010		compared to 2021	
	MtCO2eq	MtCO2eq	%Δ	annual μΔ MtCO2eq	MtCO2eq	%Δ	annual μΔ MtCO2eq	%Δ	annual μΔ MtCO2eq	%Δ	annual μΔ MtCO2eq
1 - Energy	**3747**	**3305**	**-12%**	**-22.1**	**2663**	**-29%**	**-35.0**	**-19%**	**-58.4**	**-41%**	**-122.4**
1.A.1 - Energy Industries of which:	**1442**	**1254**	**-13%**	**-9.4**	**840**	**-42%**	**-19.4**	**-33%**	**-37.6**	**-42%**	**-39.0**
1.A.1.a - Public Electricity and Heat Production	1233	1083	-12%	-7.5	717	-42%	-16.6	-34%	-33.3		
1.A.2 - Manufacturing Industries and Construction of which:	**729**	**481**	**-34%**	**-12.4**	**440**	**-40%**	**-9.3**	**-9%**	**-3.7**	**-46%**	**-22.4**
1.A.2.a - Iron and Steel	152	93	-39%	-2.9	80	-48%	-2.3	-15%	-1.2		
1.A.2.c - Chemicals	102	76	-25%	-1.3	72	-30%	-1.0	-6%	-0.4		
1.A.2.f - Non-metallic minerals	129	100	-22%	-1.4	84	-34%	-1.4	-16%	-1.4		
1.A.3 - Transport of which:	**672**	**818**	**22%**	**7.3**	**782**	**16%**	**3.5**	**-4%**	**-3.2**	**-25%**	**-22.1**
1.A.3.b - Road Transportation	620	771	24%	7.6	748	21%	4.1	-3%	-2.1		
1.A.4 - Other Sectors	**713**	**656**	**-8%**	**-2.8**	**533**	**-25%**	**-5.8**	**-19%**	**-11.2**	**-53%**	**-31.4**
1.A.4.a - Commercial/Institutional	172	163	-5%	-0.4	130	-25%	-1.4	-20%	-3.0		
1.A.4.b - Residential	450	413	-8%	-1.8	325	-28%	-4.0	-21%	-8.0		
1.A.4.c - Agriculture/Forestry/Fishing	91	80	-12%	-0.5	78	-14%	-0.4	-2%	-0.2		
2 - Industrial Processes and Product Use	**445**	**358**	**-19%**	**-4.3**	**318**	**-29%**	**-4.1**	**-11%**	**-3.7**	**-19%**	**-6.6**
2.A - Mineral Industry	**134**	**110**	**-18%**	**-1.2**	**104**	**-22%**	**-1.0**	**-6%**	**-0.6**		
2.B - Chemical Industry	**154**	**68**	**-56%**	**-4.3**	**52**	**-66%**	**-3.3**	**-24%**	**-1.5**		
2.C - Metal Industry	**134**	**78**	**-42%**	**-2.8**	**75**	**-44%**	**-1.9**	**-4%**	**-0.3**		
2.D,E,F,G,H - Other production	**22**	**102**	**358%**	**4.0**	**87**	**292%**	**2.1**	**-14%**	**-1.3**		
3 - Agriculture	**485**	**376**	**-22%**	**-5.4**	**378**	**-22%**	**-3.4**	**1%**	**0.2**	**-5%**	**-2.0**
of which:											
3.1 - Livestock	317	249	-21%	-3.4	245	-23%	-2.3	-1%	-0.3		
4 - Land Use, Land-Use Change and Forestry	**-209**	**-353**	**69%**	**-7.2**	**-230**	**10%**	**-0.7**	**-35%**	**11.1**	**35%**	**-8.9**
5 - Waste management	**184**	**137**	**-26%**	**-2.4**	**109**	**-41%**	**-2.4**	**-20%**	**-2.5**	**-17%**	**-2.0**
Total emissions (UNFCCC)	**4867**	**4181**	**-14%**	**-34.3**	**3472**	**-29%**	**-45.0**	**-17%**	**-64.5**	**-35%**	**-134.4**
Total emissions with international aviation (EU 2020)	**4921**	**4281**	**-13%**	**-32.0**	**3541**	**-28%**	**-44.5**	**-17%**	**-67.2**	**-33%**	**-129.5**
Total net emissions (UNFCCC)	**4658**	**3828**	**-18%**	**-41.5**	**3242**	**-30%**	**-45.7**	**-15%**	**-53.3**	**-40%**	**-143.3**
Total net emissions with international aviation (EU NDC)	**4712**	**3929**	**-17%**	**-39.2**	**3311**	**-30%**	**-45.2**	**-16%**	**-56.1**	**-38%**	**-138.4**

Looking forward (**Figure 3**), based on the analysis supporting the "Delivering the European Green Deal", the speed of reduction needs to significantly accelerate almost in all sectors, particularly in transport (i.e. from an average reduction of 3 to 22 $MtCO_2eq$), manufacturing (i.e. from 4 to 22 $MtCO_2eq$), and residential emissions (from 11 to 31 $MtCO_2eq$), while agriculture and LULUCF need to reverse the last decade's trend in order to meet the EU -55% reduction target by 2030.

***Figure 3**: Annual average change (1990-2010, 2010-2021, 2021-2030) in EU GHG emissions ($MtCO_2eq$)*



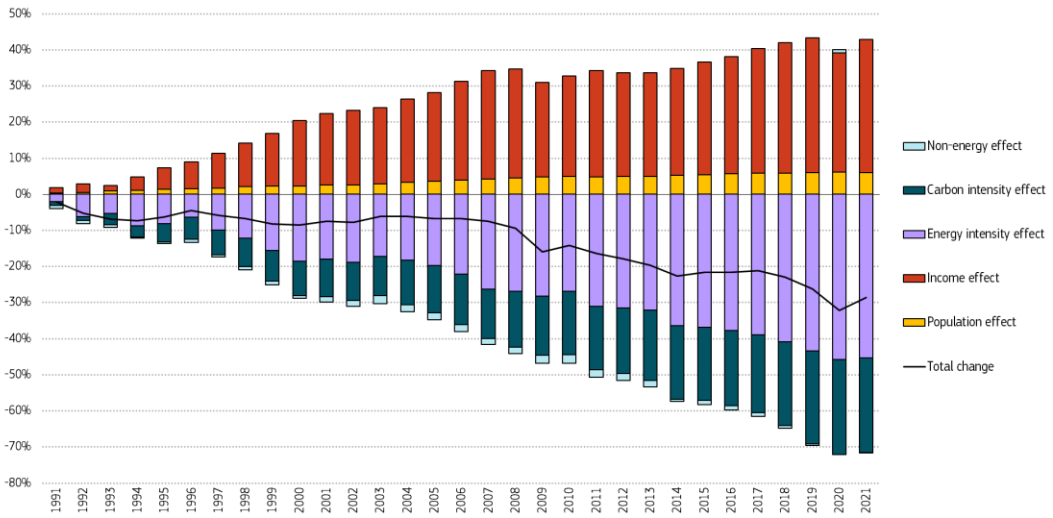
[54] Based on the 2023 GHG inventory data submitted by Member States. Ending values for 2030 based on the model results under the MIX policy scenarios for delivering the European Green Deal https://energy.ec.europa.eu/data-and-analysis/energy-modelling/policy-scenarios-delivering-european-green-deal_en

3.2 DRIVERS OF GREENHOUSE GAS EMISSION REDUCTION SINCE 1990

A combination of factors has helped the EU to reduce total greenhouse gas emissions (excluding the LULUCF sector) by about 29% over the past three decades. Figure 4 shows an annual breakdown of this trend into factors using a decomposition analysis with an extended Kaya identity. The underlying methodology follows that of earlier studies, e.g. by the European Environment Agency.[55] 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 and population would have led to a substantial increase in GHG emissions (income and population effect). However, just the emission reduction from the decrease in primary energy use per unit of output generated (energy intensity effect) more than compensated this. Compared to 1990, 41% less energy was needed to produce a unit of GDP in 2021. Better energy transformation processes, for example through electrification, as well as a general shift to the less energy-hungry service sector can be identified as the main reasons behind this efficiency gain.

Figure 4: Drivers of total GHG emissions cumulated over 1990-2021 [56]



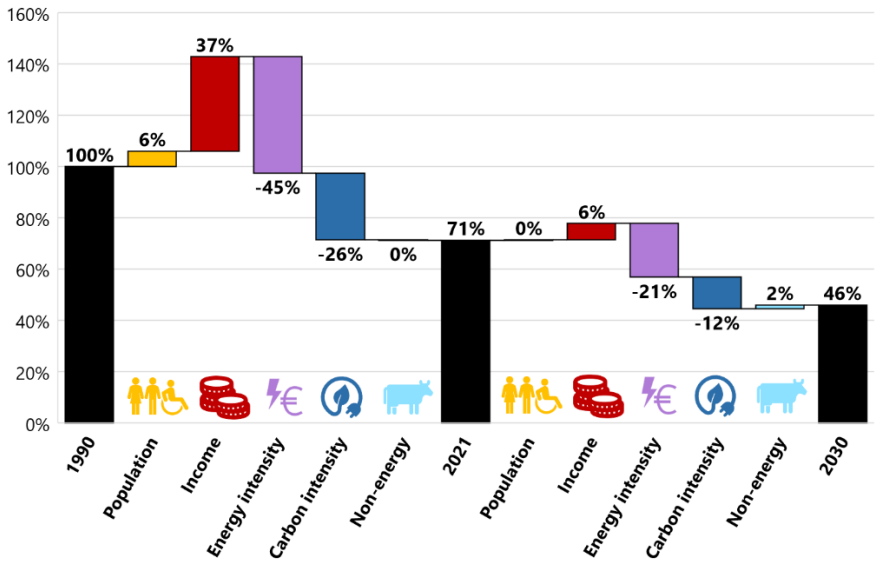
In addition to using less energy to produce the same value of output, this energy also got cleaner over the years, which further reduced emissions. Energy-related emissions per Terajoule of primary energy were 26% lower in 2021 than three decades before. In the 1990s and early 2000s this drop was mainly caused by a switch from coal to gas which emits substantially less carbon dioxide to deliver the same amount of energy. Thus, the carbon intensity of all fossil fuels sank by 12% in the time period. Since the beginning of the millenium also renewable energy sources have

[55] 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.
[56] Data sources: EU inventories to the UNFCC, AMECO, Eurostat energy balances.

been picking up speed. This decreased the share of fossil fuels in primary energy consumption by 15% and brought down emissions further.

Energy-related emissions made up about three quarters of total GHG emissions excluding the LULUCF sector in 1990. The remaining quarter came from other sources, such as industrial processes, agriculture or waste management. Over the past three decades this share has not changed much and remained at a ratio of 3:1. Thus, the non-energy effect expressing this relationship (total vs. energy-related emissions) is zero as non-energy emissions have been mitigated at the same pace as energy-related ones.

Figure 5: Effects on total GHG emissions between 1990-2021 and 2021-2030 based on the modelling for the 2030 target (in % of 1990 emissions) [57]



To set these achievements into perspective, **Figure 5** 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,[58] a faster pace is needed in this decade to achieve the EU 2030 target. To reach it, emissions have to fall by roughly 134 $MtCO_2eq$ or 2.8% of 1990 emissions annually until 2030 compared to the historical annual mitigation of 45 $MtCO_2eq$ or 0.9% of 1990 emissions in 1990-2021, i.e. the pace of reduction has to more than triple. As in the last three decades the modelling suggests the largest emission reductions coming from a substantially lower energy intensity (-30% versus 2021) and a less carbon-intense primary energy consumption (-19%). Overall, energy-related emissions are expected to decrease at a faster pace than those from other sources as implied by the slightly positive non-energy effect.

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

[58] https://energy.ec.europa.eu/data-and-analysis/energy-modelling/policy-scenarios-delivering-european-green-deal_en

4 GREENHOUSE GAS EMISSIONS COVERED BY THE UNFCCC, THE KYOTO PROTOCOL AND THE CLIMATE AND ENERGY PACKAGE

Under the **UNFCCC**, the EU and its Member States committed to achieving a joint quantified economy wide greenhouse gas emission reduction target of 20 % below the 1990 level by 2020 ('the **Cancun pledge**'). The United Kingdom remains part of this joint EU 2020 target under the Convention along with the 27 Member States. The scope of GHG emissions excludes LULUCF and includes international aviation.

The EU has implemented its UNFCCC target through EU legislation in the **2020 Climate and Energy Package** that was adopted in 2009. The package stipulates that the target will be met jointly by the EU and its Member States through a 21% reduction below the 2005 level in GHG emissions from installations under the EU Emissions Trading System, and a 10% reduction below the 2005 level of emissions from sectors covered under the Effort Sharing Decision.

The EU's greenhouse gas inventory report for EU-27 + UK submitted under the Convention in 2022 together with its submission of the fifth Biennial Report later the same year were the basis for assessing the EU target achievement of the Cancun pledge. This target has been overachieved. Total emissions in 2020 were 34 % lower than 1990 emissions for EU-27 and the United Kingdom (**Table 3**).[59]

Table 3: Emissions covered by the Cancun pledge under the UNFCCC and the EU Climate and Energy Package in 1990 and 2020 (Mt CO_2-eq. and % change from base year emissions)

UNFCCC, Climate and energy package:	Base year emissions (Mt CO_2-eq.)	1990 emissions (Mt CO_2-eq.)	2020 emissions (Mt CO_2-eq.)	2020 emissions (% change from base year)	2020 targets (Mt CO_2-eq.)	2020 target (% change from base year)
Total GHG Emissions, including international aviation (EU-27 + UK, Convention scope)	5 711	5 711	3 772	-34%	4 569	-20%

Under the **Kyoto Protocol's** second commitment period in 2013-2020 (KP2), the EU, its Member States, the UK and Iceland committed jointly to reducing greenhouse gas emissions by 20% on average in comparison to 1990, the base year.[60] Under this framework, the EU, its Member States, the UK and Iceland were given a joint emission budget, a so-called **joint assigned amount**, for the second commitment period, equal to 80 per cent of their emissions in the base year times 8.

[59] For the EU-27, GHG emissions in 2020 were 32 % below 1990 emissions.

[60] Base year refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH4 and N2O for all Member States except Bulgaria (1988), Hungary (1985–1987), Poland (1988), Romania (1989) and Slovenia (1986), and 1995 for HFCs, PFCs and SF6 for all Member States except Austria, Croatia, France, Italy, Malta and Slovakia (1990), Romania (1989), and Iceland (1990), and 1995 for NF3 for all Member States except Austria, Croatia, Greece, Poland, Portugal, Romania and Slovakia (2000).

This amount corresponds to 37 604 million tonnes of CO_2 equivalent for the whole commitment period (**Table 4**).

The geographical scope of KP2 includes the EU, Iceland, the UK and certain of its overseas regions not included in the Climate and Energy Package. Emissions from international aviation are excluded under KP2.

Under KP2, Member States had to account for emissions and removals from certain activities of land use, land use change and forestry (LULUCF) by applying the accounting rules of the Kyoto Protocol. For the EU, the LULUCF sector was an accounted net sink in 2013-2020, thereby contributing to achieving the EU's joint commitment.

The EU's greenhouse gas inventory report submitted in 2022 (for EU-27 + UK and Iceland)[61] and reviewed by the UNFCCC in December 2022 is the basis for assessing whether the EU, its Member States, the UK and Iceland comply with their joint commitment under KP2. The inventory report shows that the EU, its Member States, the UK and Iceland overachieved their joint KP2 reduction target by reducing emissions by 28% (**Table 4**).

The UNFCCC will also review the EU's so-called true-up period report to check that the EU and the other parties to the joint fulfilment agreement (Member States, UK and Iceland) have retired sufficient assigned amount units and any other Kyoto units in their Kyoto retirement accounts. This final step of KP compliance is expected to be concluded in 2024, after the review of the true-up period reports have been finalised.

Table 4: Emissions covered by the Kyoto Protocol's second commitment period (Mt CO_2-eq. and % change from base year emissions)

Kyoto Protocol:	**Base year emissions** (Mt CO_2-eq.)	**2013 - 2020 emission reduction target** (% change from base year)	**Joint Assigned Amount in Mt CO_2-eq.** (2013-2020)	**Emissions in Mt CO_2-eq.** (2013 - 2020)	**Over (+) / Under (-) achievement in Mt CO_2-eq.** (2013 - 2020)	**2013 - 2020 emission reduction** (% change from base year)
Total GHG emissions, excluding international aviation (EU-27+UK+**IS**, KP scope)	5 876	-20%	37 604	33 731	3 873	-28%

[61] As part of the yearly official EU GHG inventory submission to UNFCCC, the EU prepared and submitted two sets of inventory tables corresponding to the EU's geographical scopes under the Convention and under the second Kyoto Protocol (KP2), respectively. The scope under the Convention is consistent with the European Union territorial boundaries, which, in addition to the 27 Member States, included the EU-territory of the United Kingdom until 2020 (England, Scotland, Wales, Northern Ireland and Gibraltar). The scope of the EU's submission under KP2 included the EU-27 Member States, Iceland, and the EU-territory of the United Kingdom together with its Crown Dependencies and Overseas Territories that ratified the Kyoto Protocol. The final emissions and removals of the European Union were confirmed in the last UNFCCC inventory review under the Kyoto Protocol that took place in December 2022.

5 PROGRESS TOWARDS CLIMATE NEUTRALITY: ADDITIONAL INDICATORS

In this decisive decade for climate action, a thorough understanding of progress is needed to ensure that we are on track to achieve our common climate objectives, including of reaching net-zero emissions by 2050. The transition to climate neutrality is an unprecedented and far-reaching socio-economic project, which implies transformation across all sectors. Therefore, different source of data and indicators are needed to carry out a comprehensive analysis. Table 5 provides an overview of past and more recent GHG emission trends, across countries and sectors, while Table 6 looks at emission projections and the climate targets in the years ahead.

5.1 GREENHOUSE GAS EMISSIONS: RECENT DEVELOPMENTS IN EU MEMBER STATES

Historical data show that for some EU Member States, i.e. Finland, Latvia, Lithuania, and, to a lesser extent, Cyprus, Poland, Malta, Estonia, and Ireland, GHG net emissions have been rising in recent years (i.e. between 2015 and 2022). Drivers varied among these countries. In the case of Finland, Latvia and Estonia, the upward trend was mainly related to the strong declining of removals by the land use, land use change and forestry sector (LULUCF, cf. Chapter 4 of the Climate Action Progress Report), while for Lithuania, transport and building also contribute to the increase in GHG emissions. Transport emissions increased in Hungary, Malta and Poland, while in Ireland emissions in agriculture continued to grow. For Latvia and Finland, the increased emissions, due to a decrease of net removals in the LULUCF sector, had an impact on both the GHG intensity of GDP and on GHG emissions per capita, which increased between 2015 and 2022 (see **Table 5**).

Reductions in GHG emissions were achieved, but were at a slow pace (i.e. below the EU average) for another group of countries, namely Czechia, Italy, Hungary, Croatia, France, and Denmark. In the case of Italy, approximated GHG net emissions in 2022 are expected to be 2% higher than the pre-pandemic level. Overall, the slow progress in these countries appears to be related to a lack of significant emission cuts in the energy production (Italy, France), increased emissions in transport (Hungary, Czechia), in LULUCF (Denmark), or even a change from net removals to net emissions in LULUCF (i.e. Czechia).

5.2 GREENHOUSE GAS EMISSIONS PROJECTIONS: EXPECTED TRENDS IN EU MEMBER STATES

Table 6 looks at the challenges ahead. By 2030, based on the GHG projections submitted by EU Member States in March 2023, six countries (i.e. Poland, Ireland, Estonia, Czechia, Luxembourg, Latvia) expect emissions per capita to be significantly higher than 5 tonnes of CO_2-eq, which represents the EU average GHG net emissions per capita by 2030 broadly consistent with the EU -55% target.[62] Projected emission reductions in the years to 2030 are, in certain cases (i.e. Finland,

[62] Five tonnes of CO_2-eq GHG emissions are roughly equivalent to 27.000 km with a medium-sized petrol car, or 20 round-trip flights Brussels to Rome in economy class, or again 2 beef-based meals per day in a year, of course without any other human activity generating direct or indirect GHG emissions. The net GHG emissions consistent with the EU 2030 target are around 2100 $MtCO_2eq$ (including the contribution of 225 $MtCO_2eq$ of net removals from LULUCF). Divided by the latest Eurostat population projections for the EU-27 by 2030 (around 550 million EU residents), is equal to 4.7 tonnes of CO_2eq per capita.

Estonia, Latvia, Denmark, Ireland, Czechia, Lithuania, and Germany) significantly higher (i.e. more than 25 ppt.) than the emission reductions shown between 2015-2022. Most of the contribution to emission savings is expected from the power sector, with shares ranging between 20 and 30 percent, while transport is expected to contribute significantly to the decarbonisation in Lithuania.

Table 5: *GHG emission dashboard indicators (historical data)*[63]

	Historic data (1)														
	Total net GHG emissions (% change)				Sector performance (2022-2015, contribution to change)							GHG intensity and GDP per capita (3)			
	2022-1990	2022-2021	2022-2019	2022-2015	Power	Industry	Transport	Buildings (2)	Agriculture	Waste	LULUCF	GHG intensity of GDP (2022)	GHG intensity of GDP (2022-2015, % change)	GHG emissions per capita (2022)	GHG emissions per capita (2022-2015, % change)
Austria	-7%	-7%	-24%	-14%	-3%	-1%	-3%	-1%	0%	-1%	-5%	162	-23%	6.9	-18%
Belgium	-26%	-4%	-8%	-10%	-2%	-4%	-2%	-2%	0%	0%	0%	229	-19%	9.1	-13%
Bulgaria	-43%	6%	6%	-10%	-7%	0%	2%	0%	0%	-1%	-3%	857	-26%	6.9	-5%
Croatia	-30%	-5%	-7%	-7%	-6%	1%	0%	1%	-1%	0%	-1%	308	-26%	4.6	2%
Cyprus	54%	-1%	-2%	4%	1%	1%	2%	-1%	1%	0%	1%	349	-23%	9.4	-2%
Czechia	-37%	-5%	-8%	-1%	-10%	0%	2%	-1%	0%	0%	10%	561	-22%	11.5	-1%
Denmark	-42%	-1%	-5%	-9%	-10%	0%	-1%	-2%	0%	0%	3%	143	-23%	7.8	-13%
Estonia	-53%	11%	10%	0%	-19%	-2%	0%	0%	1%	0%	21%	671	-19%	12.9	-1%
Finland	-1%	-7%	-3%	17%	-11%	-6%	-2%	-3%	0%	-2%	41%	190	5%	8.1	15%
France	-26%	-3%	-6%	-7%	-1%	-4%	-2%	-4%	-1%	0%	5%	162	-15%	5.7	-9%
Germany	-42%	-3%	-6%	-16%	-10%	-2%	-2%	-1%	-1%	0%	1%	228	-22%	8.9	-18%
Greece	-30%	0%	-11%	-22%	-18%	-4%	2%	-1%	0%	1%	-1%	373	-28%	6.9	-19%
Hungary	-42%	-7%	-11%	-6%	-6%	-2%	5%	-1%	-1%	0%	-2%	472	-6%	5.5	-4%
Ireland	10%	-2%	0%	0%	-3%	0%	0%	-1%	3%	0%	2%	151	-42%	13.5	-7%
Italy	-25%	-1%	2%	-4%	-3%	-2%	1%	-2%	0%	0%	3%	222	-9%	6.5	-1%
Latvia	4%	8%	61%	30%	-7%	0%	0%	1%	1%	-1%	37%	491	10%	7.6	38%
Lithuania	-69%	-7%	-9%	7%	-5%	-7%	8%	2%	-1%	-2%	15%	280	-14%	4.7	12%
Luxembourg	-41%	-15%	-28%	-25%	-3%	-3%	-14%	-2%	0%	0%	-4%	118	-36%	11.6	-35%
Malta	-17%	2%	1%	2%	-3%	-1%	3%	0%	-1%	3%	0%	153	-28%	4.2	-14%
Netherlands	-31%	-8%	-15%	-21%	-12%	-2%	-2%	-4%	-1%	-1%	-1%	199	-31%	9.0	-24%
Poland	-18%	-4%	-1%	3%	-3%	0%	6%	-1%	0%	0%	2%	720	-13%	9.7	4%
Portugal	-24%	1%	-15%	-21%	-16%	-2%	1%	-1%	0%	-1%	-4%	246	-32%	4.9	-21%
Romania	-75%	-14%	-16%	-15%	-16%	-1%	4%	1%	-2%	0%	0%	301	-28%	3.0	-11%
Slovakia	-54%	-11%	-13%	-15%	-4%	-5%	1%	0%	0%	0%	-6%	323	-26%	5.5	-15%
Slovenia	-8%	2%	-4%	-25%	-7%	0%	4%	-2%	-1%	-1%	-20%	268	-41%	6.3	-27%
Spain	-2%	2%	-6%	-14%	-10%	-3%	2%	-1%	0%	-1%	0%	212	-21%	5.3	-16%
Sweden	-86%	-42%	-71%	-51%	-12%	-18%	-68%	-7%	-1%	-8%	66%	8	-51%	0.3	-54%
EU27	-32%	-3%	-6%	-10%	-7%	-2%	0%	-2%	0%	0%	2%	229	-20%	7.0	-11%

An assessment of EU Member States' progress towards the respective targets set in the Effort Sharing (ESR) and LULUCF regulations has been provided in Chapter 3 and 4 of the main report,

[63] 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. (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.

showing that more efforts are needed to reach the EU targets. Table 6 only provides an indication of the projected emissions compared to the targets in 2030 based on estimated emission allocations under the ESR and estimated GHG net removals target under the LULUCF regulation but does not reflect Member States' progress towards their 2030 targets. For example, the table does not take into account the flexibilities that are available for Member States under these legislations which are part of Member States progress to their ESR and LULUCF targets. Based on Member States' projections, also shown by Table 12 of the main report, five countries (i.e. Malta, Cyprus, Austria, Romania and Italy) expect significantly higher emissions compared to their ESR 2030 target (above 15 ppt.).[64] Five Member States are expected to fall significantly behind their LULUCF targeted values (i.e. Poland, Estonia, Croatia, Ireland and Latvia) relative to the available lands (agriculture plus forest areas).[65]

When it comes to the climate neutrality target, ten Member States (i.e. Poland, Latvia, Austria, Belgium, Czechia, Greece, Hungary, Ireland, Netherlands and Malta) project net GHG emissions in 2050 higher than the EU-average projections of 3.6 tonnes of CO_2 equivalent per capita, obtained by aggregating Member States' projections. Of notice, the EU aggregated value falls short of the EU collective objective of climate neutrality (i.e. zero net emissions).

Trajectories are also relevant. Table 6 provides two similar metrics, which compare for each Member States the cumulative projected emissions between 2022 and 2050 with a linear trajectory and, alternatively, with an indicative benchmark trajectory, built as the median pathway of the seven climate neutrality scenarios that were proposed by the European Scientific Advisory Board[66] (cf. Chapter 1 of the main report). Malta, Romania, Croatia, Austria, Hungary, Poland, Italy, and Greece are among the top ten overshoots according to both metrics. Moreover, as of today, Ireland, Poland and Romania have still to officially submit to the Commission their national long-term strategies, due by January 2020, and some other countries (Bulgaria, Croatia, Cyprus, Czechia and Malta) have not yet reported a clear (e.g. legally binding) climate neutrality objective.

Overall, based on the available information, progress by Member States towards the EU climate neutrality objective appear insufficient for Poland, Ireland, Latvia, Malta and Croatia, and, to a lesser extent, for Austria, Estonia, Czechia, Cyprus, Italy and Romania. Lack of significant progress in the most recent years is not consistent with the effort required in the next decades to meet both the medium- and the long-term climate targets. Latest GHG projections submitted by those Member States show significant gaps to specific sector targets by 2030 and to the EU climate neutrality objective by 2050. Without additional efforts from all Member States, the EU will miss the collective climate objectives.

[64] While the NECP process is ongoing and pending the use of flexibilities the Commission will come back to the assessment of progress towards the ESR targets.

[65] LULUCF projections compared to the estimated LULUCF targeted values in relation to the available lands (agriculture plus forest areas). A significant gap to the LULUCF targets by 2030 is assumed here if higher than 50 tonnes of CO_2 equivalent per square kilometre of available land (agriculture plus forest land. Source: Eurostat "land use overview by NUTS 2 regions" dataset).

[66] Scientific advice for the determination of an EU-wide 2040 climate target and a greenhouse gas budget for 2030–2050 (europa.eu). The EU-level emissions of this median pathway were 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.

Table 6: *GHG emission dashboard indicators (projected data)*[67]

	GHG emission projections and future challenges[4]														
	2030 target			Projected contributions by sector (2030 vs. 2022)							Climate Neutrality[5]				
	MS projected net GHG 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)	**Total emissions** (excl. LULUCF) (% change)	Power	Industry	Transport	Buildings	Agriculture	Waste	MS projected net GHG by 2050 (tonnes of CO2 eq. per capita)	Overshoot vs. linear trajectory net GHG emissions 2022-2050	Overshoot vs. Benchmark Total GHG emissions 2022-2050	Target year for climate neutrality (NECPR; nLTS or other sources)	Legal Status of long term target (based on https://zerotracker.net/)
Austria	6.8	-21	6	-7%	-3%	1%	-2%	-2%	-1%	0%	5.6	79%	61%	2050	In law
Belgium	7.0	-4	-4	-22%	-1%	-5%	-8%	-5%	-2%	0%	5.2	49%	21%	2050	In policy document
Bulgaria	6.0	-12	-3	-15%	-16%	2%	-1%	-1%	1%	-1%	3.7	40%	60%	2050	Proposed / in discussion
Croatia	5.0	0	-92	-8%	-2%	-1%	0%	-2%	-1%	-2%	3.4	83%	64%	2050	In policy document
Cyprus	6.7	-23	41	-20%	-14%	0%	-5%	1%	1%	-3%	3.5	33%	51%	2050	In policy document
Czechia	7.6	-6	-32	-31%	-20%	-1%	-8%	0%	0%	-1%	4.4	10%	29%	2050	Proposed / in discussion
Denmark	4.9	-10	39	-43%	-20%	-7%	-5%	-6%	-4%	-1%	3.7	26%	3%	2050	In law
Estonia	8.1	-13	-108	-36%	-33%	0%	-3%	1%	0%	0%	3.6	15%	30%	2050	Declaration / pledge
Finland	0.9	-4	13	-44%	-25%	-4%	-8%	-4%	-2%	-1%	-2.4	-98%	-10%	2035	In law
France	4.7	-14	-25	-14%	-3%	-3%	-6%	-2%	1%	0%	3.7	56%	57%	2050	In law
Germany	5.0	-10	-35	-41%	-24%	-6%	-5%	-6%	-1%	0%	1.7	-9%	-1%	2045	In law
Greece	5.4	13	5	-21%	-18%	0%	-2%	-2%	1%	-1%	5.3	58%	63%	2050	In law
Hungary	5.4	-6	-27	-7%	-6%	9%	-6%	-3%	1%	-1%	4.4	74%	59%	2050	In law
Ireland	9.0	-13	-70	-30%	-10%	-1%	-7%	-5%	-7%	0%	6.0	44%	32%	2050	In law
Italy	5.3	-15	-4	-16%	-8%	-2%	-4%	-1%	0%	-1%	4.6	60%	76%	2050	In policy document
Latvia	7.1	-9	-61	-5%	3%	-2%	0%	-2%	-2%	-1%	7.9	74%	26%	2050	In policy document
Lithuania	3.4	0	36	-20%	-1%	-1%	-12%	-1%	-4%	-2%	3.5	29%	32%	2050	In policy document
Luxembourg	7.3	8	12	-33%	-1%	0%	-24%	-6%	-2%	0%	1.3	-12%	-2%	2050	In law
Malta	4.3	-65	-46	17%	12%	3%	-1%	0%	0%	3%	4.4	155%	100%	2050	In policy document
Netherlands	6.9	-9	37	-22%	-18%	-2%	-1%	-1%	0%	-1%	4.9	43%	34%	2050	In law
Poland	9.2	-11	-118	-10%	-5%	-3%	-1%	-3%	1%	1%	8.1	68%	71%	-	-
Portugal	2.9	13	139	-31%	-9%	-7%	-11%	0%	-1%	-2%	0.3	-13%	20%	2050	In law
Romania	3.4	-17	62	-7%	-12%	0%	5%	1%	3%	-4%	3.7	95%	69%	2050	In policy document
Slovakia	5.2	-11	-42	-12%	-8%	-2%	2%	-2%	0%	-2%	3.8	63%	56%	2050	In policy document
Slovenia	5.2	-1	117	-17%	-3%	-3%	-7%	-4%	0%	-1%	0.0	21%	9%	2050	In policy document
Spain	3.2	7	-15	-34%	-13%	-4%	-10%	-4%	-1%	-1%	2.9	34%	42%	2050	In law
Sweden	-1.1	12	-15	-32%	-2%	-9%	-17%	-3%	-1%	0%	-2.0	-582%	13%	2045	In law
EU27 (MS aggr. proj.)	5.1	-8	-16	-24%	-12%	-3%	-5%	-3%	0%	0%	3.6	34%	40%		In law

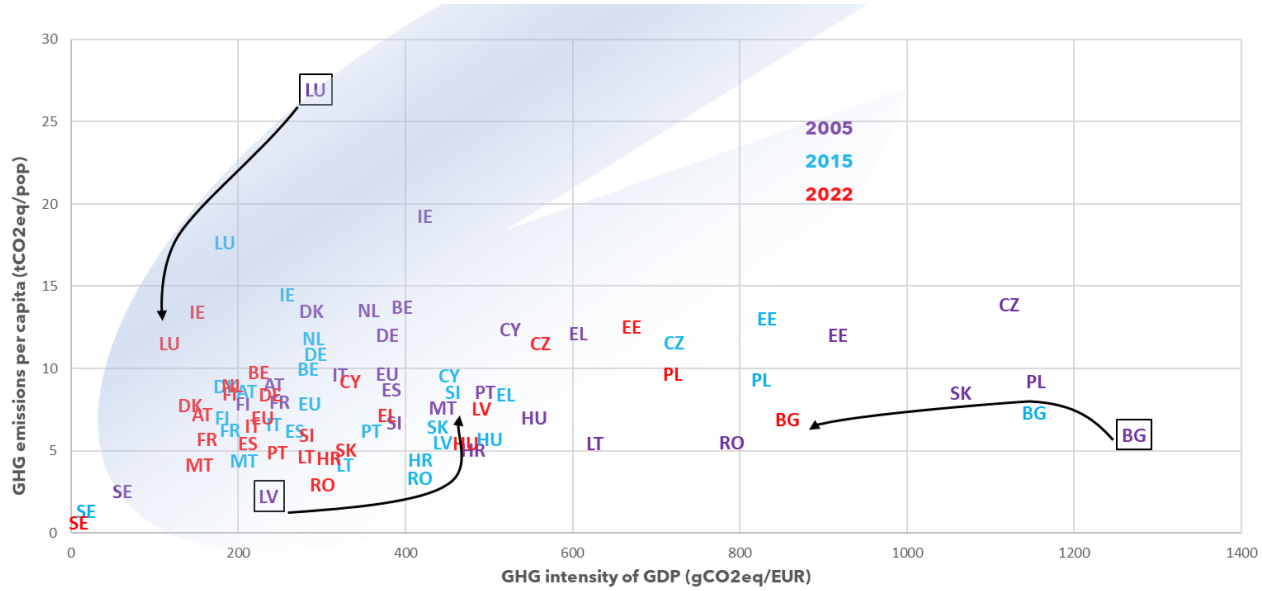
[67] Note to table: (4) GHG emission projections submitted in 2023 by Member States under Art. 18 of the Governance Regulation considering additional measures (WAM). EU Population in 2050 is based on the latest Eurostat population projections. Agriculture and forest land are based on the Eurostat land 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 2021 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 NECP progress reports or, in grey, from other unofficial sources (Net Zero Tracker).

5.3 ADDITIONAL GREENHOUSE GASES INDICATORS

Since 2005, there has been a clear downward trend in net GHG emissions per capita and GHG intensity of GDP for all EU Member States, except Latvia (Figure 6).[68]

More rapid progress by countries with higher emission ratios (i.e. Bulgaria, Romania, Slovakia, Czechia, Luxembourg and Ireland) led to significant convergence towards the EU average. However, between 2015 and 2022, the downward converging trend seems to have halted for most Member States. In 2022, Latvia and Finland exceeded the 2015 levels for both indicators,[69] while GHG emissions per capita in Lithuania, Poland and Croatia were above the respective 2015 levels. Nonetheless, in 2022, Estonia, Cyprus, Czechia, and Poland ranked among the top five for the two indicators, while Bulgaria showed the highest GHG intensity of GDP (above 850 tonnes of CO_2 equivalent per Euro of GDP), and Ireland was the highest per capita emitter among the EU Member States (above 13 tonnes per capita).

Figure 6: Greenhouse gas emissions intensity (i.e. the ratio between GHG emissions and GDP, g CO_2-eq./ EUR2015) and greenhouse gas emissions per capita in the EU and its Member States 1990, 2005 and 2022.[70]

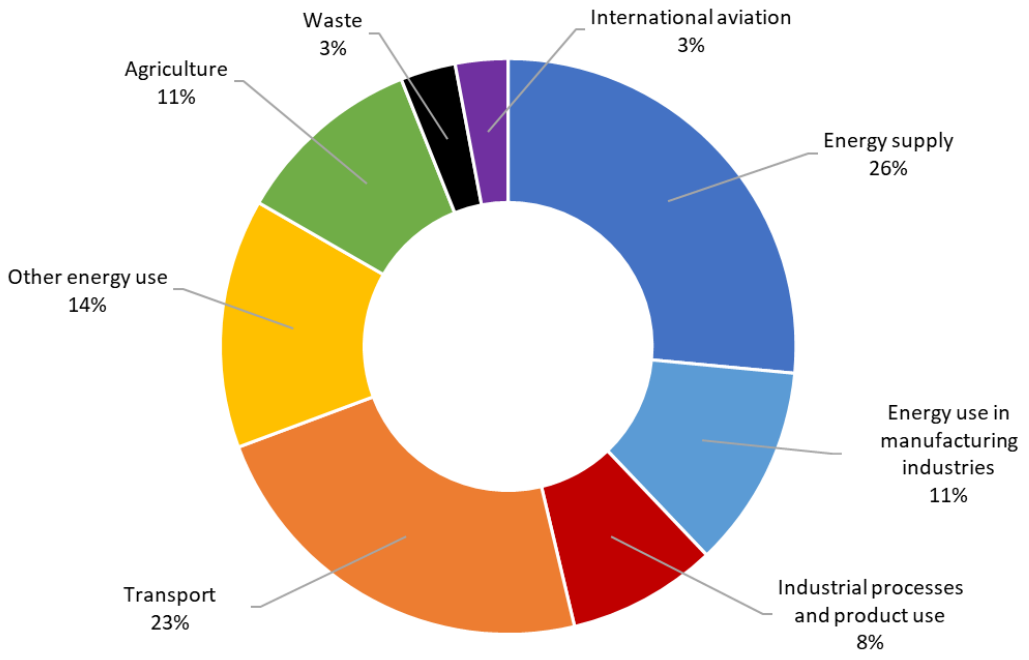


In terms of GHG emissions by sector, in 2022, energy supply was still the largest contributor to GHG emissions (26%), closely followed by the transport sector (23%) (Figure 7). With 11% and 14%, respectively, energy use in manufacturing industries and other energy use were also important contributors.

[68] Figures use net GHG emissions, including LULUCF and excluding international transport emissions.
[69] Due to a declining LULUCF sink.
[70] Sources: EU greenhouse gas inventory 1990-2021, EU approximated greenhouse gas inventory 2022 (EEA). Real GDP in 2015-prices, data from AMECO database (European Commission, DG ECFIN).

Among all the EU Member States, in 2021, GHG emissions from the power sector were highest in Estonia (56%), followed with some distance by Poland (43%) and Bulgaria (42%) (Figure 8). Emissions from industry were relatively high in Slovakia (41%) and Austria (36%). 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 (37% and 28%, respectively), followed by Lithuania (22%) and Latvia (21%). For Sweden, and with some distance also for Romania, the LULUCF sink was significant in relation to the countries' respective GHG emissions.

Figure 7: *EU-27 greenhouse gas emissions by sector 2022 (in % of total emissions, excluding LULUCF)*[71]



[71] The sectors used correspond to the following IPCC sectors: Energy supply: 1.A.1, 1.B and 1.C; Energy use in manufacturing industries: 1.A.2: Industrial processes and product use: 2; Transport (includes domestic aviation): 1.A.3; Other energy use: 1.A.4, 1.A.5 and 6, Agriculture: 3, Waste: 5, International aviation: 1.D.1.A.

Figure 8: *EU Member States greenhouse gas emissions by sector 2021 (in % of total emissions, excluding LULUCF)*[72]

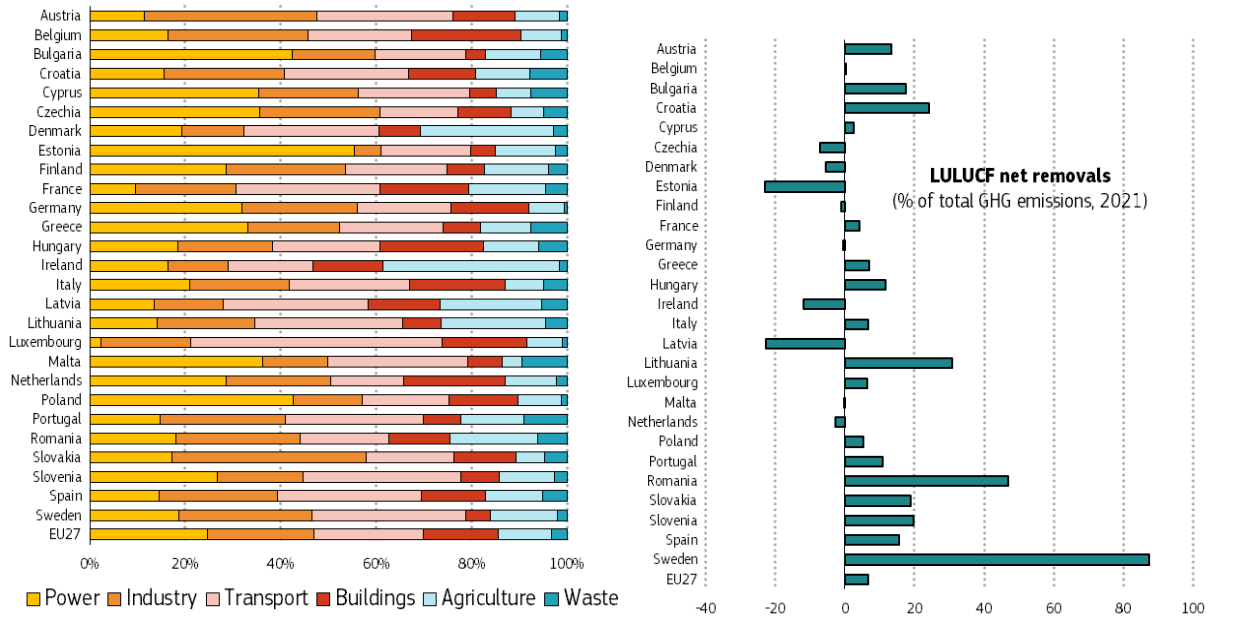


Table 7: *Total GHG emission per Member States (including and excluding LULUCF and international aviation)*

	Total GHG emissions, excl. LULUCF, excl. international aviation					Total net GHG emissions, incl. LULUCF, excl. international aviation					Total net GHG emissions, incl. LULUCF, incl. international aviation				
	1990	2005	2015	2022	2022-1990	1990	2005	2015	2022	2022-1990	1990	2005	2015	2022	2022-1990
Belgium	146	145	119	106	-27%	143	144	118	106	-26%	146	147	123	111	-24%
Bulgaria	99	62	60	57	-43%	83	46	53	47	-43%	83	47	53	48	-42%
Czechia	201	150	129	116	-42%	192	142	122	121	-37%	193	143	123	122	-37%
Denmark	72	68	50	43	-39%	78	73	51	46	-42%	80	76	53	48	-40%
Germany	1251	985	897	746	-40%	1287	993	885	744	-42%	1299	1016	910	771	-41%
Estonia	40	19	18	14	-64%	37	16	17	17	-53%	37	17	17	17	-53%
Ireland	56	72	62	61	9%	62	79	68	68	10%	63	82	71	71	13%
Greece	104	137	96	77	-26%	102	133	92	72	-30%	104	136	95	75	-28%
Spain	288	439	334	294	2%	254	394	289	249	-2%	259	406	304	264	2%
France	539	550	454	404	-25%	522	500	417	387	-26%	531	516	435	399	-25%
Croatia	31	30	25	23	-25%	25	22	19	18	-30%	26	22	19	18	-30%
Italy	521	594	446	418	-20%	518	559	402	387	-25%	522	567	411	396	-24%
Cyprus	6	9	8	9	54%	5	9	8	8	54%	6	10	9	9	45%
Latvia	26	11	11	10	-61%	14	5	11	14	4%	14	5	11	15	6%
Lithuania	48	22	20	19	-60%	43	18	12	13	-69%	43	18	12	13	-69%
Luxembourg	13	13	10	8	-35%	13	12	10	7	-41%	13	14	11	9	-28%
Hungary	95	77	62	60	-37%	92	71	57	53	-42%	92	72	57	54	-41%
Malta	3	3	2	2	-17%	3	3	2	2	-17%	3	3	2	3	-9%
Netherlands	223	215	194	154	-31%	229	221	200	158	-31%	234	232	211	168	-28%
Austria	79	93	79	73	-8%	67	74	72	62	-7%	68	76	74	63	-6%
Poland	475	401	384	385	-19%	446	353	355	365	-18%	447	354	357	366	-18%
Portugal	60	87	68	57	-4%	67	90	65	51	-24%	68	92	68	55	-20%
Romania	257	151	117	107	-58%	229	118	67	57	-75%	229	118	68	57	-75%
Slovenia	19	21	17	16	-15%	14	13	18	13	-8%	14	13	18	13	-8%
Slovakia	74	51	41	38	-49%	64	46	35	30	-54%	65	46	35	30	-53%
Finland	71	70	55	46	-36%	45	41	38	45	-1%	46	43	40	46	0%
Sweden	71	67	54	45	-37%	25	23	7	4	-86%	26	25	9	5	-80%
EU-27	**4867**	**4542**	**3812**	**3389**	**-30%**	**4658**	**4200**	**3490**	**3145**	**-32%**	**4712**	**4296**	**3599**	**3247**	**-31%**

[72] 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.

6 EU ETS EMISSIONS

Table 8: EU ETS verified emissions from power and industry installations and from aircraft operators since 2019.

	2019	2020	2021	2022
Verified emissions from power and industry installations[73]	**1 530**	**1 356**	**1 337**	**1 313**
Change year-on- year	**-9.1%**	**-11.4%**	**6.6%**	**-1.8%**
Verified emissions from electricity and heat generation[74]	822	696	708	725
Change year-on- year	-14.7%	-15.3%	8.4%	2.4%
Verified emissions from industrial production[75]	708	660	629	588
Change year-on- year	-1.6%	-6.9%	4.6%	-6.5%
Verified emissions from aircraft operators (million tonnes CO_2eq)	**68.2**	**25.2**	**27.9**	**49.1**
Change year-on- year[76]	**1%**	**-63%**	**30%**	**75%**

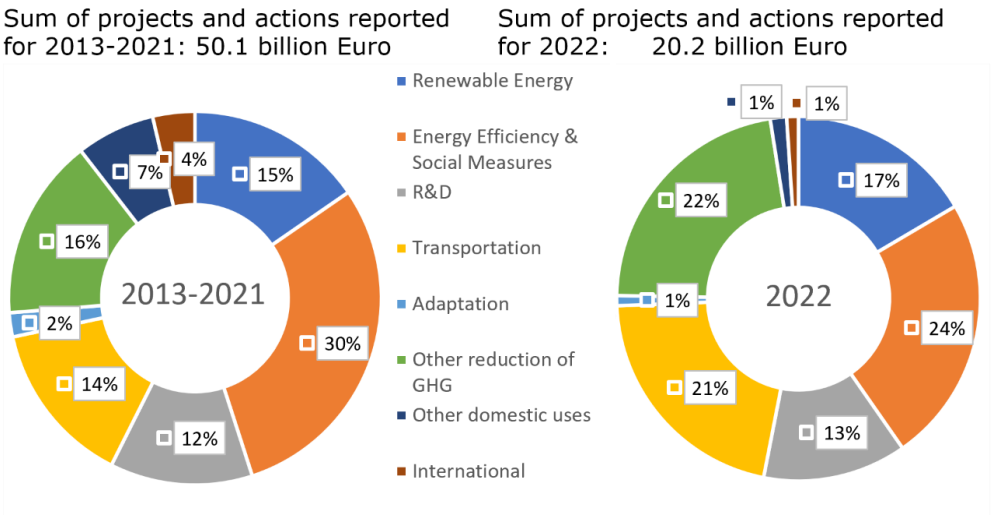
[73] From 2021, the EU ETS no longer includes emissions from the UK, only emissions from electricity generators in Northern Ireland are included. 2021 emissions are compared with an adjusted value of 2020 emissions – without the UK data, only Northern Ireland from electricity generation.
[74] From 2021, the EU ETS no longer includes emissions from the UK, only emissions from electricity generators in Northern Ireland are included. 2021 emissions are compared with an adjusted value of 2020 emissions – without the UK data, only Northern Ireland from electricity generation.
[75] From 2021, the EU ETS no longer includes emissions from the UK. 2021 emissions are compared with an adjusted value of 2020 emissions – without the UK data.
[76] Considering the updated EU ETS aviation scope (without the flights incoming from the UK). Switzerland is included in 2020, 2021 and 2022 data only.

7 USE OF REVENUES FROM AUCTIONING OF ETS ALLOWANCES

The vast majority of revenue from auctioning ETS allowances accrue to Member States, who should spend at least 50% on climate and energy purposes.

Figure 9 shows the primary[77] type of purpose reported for spending of 2013-2021 and 2022 auction revenues and indicates that renewables support, decarbonisation of transport and other GHG reduction were the areas where most of the revenues were spent. Compared to previous years, the increasing share of "other" spending appears partly linked to new national measures using ETS revenues to compensate for rising energy prices and mitigate their social impacts.[78]

Figure 9: *Reported spending of auction revenues, categorised, 2013-2021 and 2022, EU-27*



Auctions of EU ETS emission allowances for both stationary installations and aircraft operators have provided the EU-27 countries with revenues listed in the Table 9.[79] Member States report annually on the use of auctioning revenues for climate change and energy purposes.[80] It should be noted that annual reporting does not necessarily cover how the revenues of that year are spent, but the spending of revenues during that year, i.e. it can include revenues from earlier years. Member States only report on spending for the purposes of addressing climate change and energy, but this does not mean that the amount not covered in the report is necessarily spent for other purposes: it is also possible that revenues are spent later, or used to fund many projects/purpopses of which

[77] In their reports, Member States can indicate multiple types, in such case the first category is used for this figure.
[78] For instance, between late-2021 and mid-2022, Spain, Italy, Greece, Germany and Estonia announced the direct or indirect use of ETS revenues for such purposes.
[79] The table lists annual total revenues of the auctioned allowances on the EEX platform.
[80] Article 5 of Implementing Regulation (EU) No 2020/1208.

only parts are linked to climate change and energy, or that a certain amount has been set aside for climate and energy purposes but not all of it has yet been formally attributed to specific projects.

In the latter case, and when Member States have reported having a national minimum set aside for climate and energy, this has been reflected in the *% spent on climate and energy* row.[81] Additionally, several Member States do not earmark their auction revenues for a specific purpose, but instead attribute part or all of their revenues to a broad budget such as the general budget, that is funded by more than just auctioning revenues, and can be spent on both climate change and energy and many other purposes. Often, in such cases example projects funded by the broad budget are reported, but a direct link to auctioning revenues cannot be made. Such country specific contexts are described below. Reported spending can also be higher than the revenues of that year, if either it includes spending of previous years' revenues or if the reported projects were co-funded with other funds.[82]

Table 9: *Member States' revenues from auctioning of ETS allowances (EUR million), amounts spent on climate and energy purposes (EUR million) and share of the revenues spent on climate and energy purposes (%), 2013-2022.*[83]

Austria	**2013-2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Revenues from auctioning	247.5	79.4	210.4	183.8	184.2	311.0	381.7
Reported as spent on climate etc.	231.4	79.2	0	0	986.4	311.0	381.7
% spent on climate and energy	>100%	>100%	>100%	>100%	>100%	>100%	>100%
Revenues are not earmarked. National spending on climate and energy purposes is >100% of auctioning revenues. In several years, climate and energy projects financed from the national budget were reported, even though their funding cannot be directly linked to the auctioning revenues.							
Belgium	**2013-2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Revenues from auctioning	461.6	144.3	381.5	356.8	356.1	533.2	657.7
Reported as spent on climate etc.	37.5	133.1	213.7	357.8	162.6	76.1	103.0
% spent on climate and energy	8%	92%	56%	99%	46%	14%	16%
The policy is that 100% of auction revenues are spent on energy and climate purposes and on the compensation of indirect carbon costs. For 2021 onwards the direct spending of auction revenues is on hold pending a legal decision on the regions and federal shares, revenues are carried over to future years. The amount reported as							

[81] Where relevant, the amount resulting from the *% spent on climate and energy* row that is not covered in the row *Reported as spent on climate etc.* has been included in Figure 9 of the Climate Action Progress Report as *Used for climate change and energy, (unspecified)*.

[82] For the purposes of Figure 9 of the Climate Action Progress Report and the estimated shares spent on climate and energy, the annual shares have been capped at 100% in order to avoid distortion of the figures.

[83] 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. In 2020-2022 the harmonisation, methodology and analysis were conducted by SQ Consult in a study for the European Commission. Proposed modifications have been discussed with the Member States as part of the quality checks. Notes: "N/A" = Not available, "*" = Member States that do not earmark auction revenues, "(*)" = Member States that partially earmark auction revenues.

spent in 2022 cover only direct revenue spent, Belgium also mentioned from the general budget to support climate- and energy-related actions in 2022.							
Bulgaria	**2013-2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Revenues from auctioning	296.1	130.4	368.2	440.3	448.6	832.9	1094.2
Reported as spent on climate etc.	285.1	138.2	368.2	440.3	448.6	832.9	1094.2
% spent on climate and energy	96%	>100%	100%	100%	100%	100%	100%
All auction revenues are earmarked for climate and energy purposes. Unspent revenues are carried over to later years, therefore in some years spending is higher than the revenues.							
Croatia	**2013-2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Revenues from auctioning	107.2	27.2	71.5	72.7	72.2	112.2	143.4
Reported as spent on climate etc.	123.6	18.9	29	13.4	44	12.3	193.9
% spent on climate and energy	>100%	100%	100%	100%	100%	100%	100%
According to the law, 100% of the auctioning revenues are spent on climate and energy purposes. This table lists the amount spent during the same year as the revenue earnt. The remainder is carried over to the next years.							
Cyprus(*)	**2013-2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Revenues from auctioning	2.8	6.6	26	26.1	40.1	78.4	102.9
Reported as spent on climate etc.	5.7	0.8	6.4	57.5	57.6	75.3	160.1
% spent on climate and energy	>100%	100%	100%	>100%	>100%	>100%	>100%
The auctioning revenues go to a fund, which different ministries can use for climate and energy purposes. This fund also receives money from the general budget, so in practice a higher amount than 100% of revenues is spent on climate and energy overall.							
Czechia *	**2013-2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Revenues from auctioning	365.9	199.8	584.4	630.4	719.4	604.0	673.6
Reported as spent on climate etc.	329.6	199.8	367.3	408.4	309.7	208.6	181.9
% spent on climate and energy	90%	100%	63%	65%	43%	35%	27%
Revenues are not earmarked. Reported spending represents the amounts committed for climate change and energy purposes in the general state budget of each year. The remaining revenues go to the general budget.							
Denmark *	**2013-2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Revenues from auctioning	229.2	71.7	189.8	166.1	166.5	292.9	362.2

Reported as spent on climate etc.	229.1	71.7	189.8	166.1	166.5	292.9	362.2
% spent on climate and energy	100%	100%	100%	100%	100%	100%	100%
Revenues are not earmarked, example projects have been reported up to 100% of revenues each year.							
Estonia (*)	**2013-2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Revenues from auctioning	70.4	39.4	140	142.8	142.4	248.6	334.0
Reported as spent on climate etc.	34.3	15.9	53.3	64.5	30	43.6	307.7
% spent on climate and energy	49%	40%	38%	45%	≥50%	≥50%	≥50%
50% of the auctioning revenues are earmarked and directed through the four-year State Budget Strategy and spent on climate and energy purposes, which may take multiple years. Unspent revenues are carried over to later years and always used for climate and energy projects. The remaining 50% goes to the general budget, which, among others, covers climate and energy investment (not included here).							
Finland *	**2013-2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Revenues from auctioning	295.5	95.3	251.8	219.9	220.6	409.0	511.1
Reported as spent on climate etc.	198.1	9.5	251.8	219.9	220.6	409.0	511.1
% spent on climate and energy	67%	10%	100%	100%	100%	100%	100%
Revenues are not earmarked. National spending on climate and energy is >100% of auctioning revenues. Only a part of actual spending has been reported, in some years covering specific projects, in other years up to 100% of revenues, even though this funding cannot be directly linked to the auctioning revenues.							
France (*)	**2013-2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Revenues from auctioning	981.3	313.4	829.6	726.5	728.1	1469.1	1868.3
Reported as spent on climate etc.	981.3	313.4	550	420	728.1	1469.1	1854.1
% spent on climate and energy	100%	100%	100%	100%	100%	100%	99%
The auctioning revenues co-fund energy efficiency improvements of low-income housing, up to a ceiling of EUR 420 million per year. The remainder is not earmarked but goes to the general budget, which, among others, covers climate and energy investments.							
Germany	**2013-2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Revenues from auctioning	3501.9	1146.8	2581.7	3164	2662.4	5306.2	6812.6
Reported as spent on climate etc.	3496.7	1130.8	2563	3147.2	2662.4	5306.2	6812.6
% spent on climate and energy	100%	99%	99%	99%	100%	100%	100%

100% of revenues is spent on energy and climate projects. All revenues go to a fund for climate and energy projects, which is additionally co-funded from the general budget.							
Greece	**2013-2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Revenues from auctioning	622	198	523.5	509.5	506.7	1014.6	1329.5
Reported as spent on climate etc.	622	198	523.5	509.5	506.7	1014.6	1329.5
% spent on climate and energy	100%	100%	100%	100%	100%	100%	100%
Revenues are earmarked and fully spent on domestic climate change and energy purposes.							
Hungary (*)	**2013-2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Revenues from auctioning	238.1	85.2	225.4	228	226.3	288.2	464.9
Reported as spent on climate etc.	81.7	68.7	65.9	74	71.8	232.9	233.5
% spent on climate and energy	34%	81%	50%	50%	50%	81%	50%
50% of the revenues are spent on climate and energy (any revenues not spent are carried over to future years) and the remainder goes to the national general budget. Amounts included in the latter can be spent on climate change and energy are not covered here.							
Ireland *	**2013-2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Revenues from auctioning	171.3	53.6	142.1	124.3	124.5	149.2	215.7
Reported as spent on climate etc.	171.3	53.6	142.1	124.3	124.5	149.2	215.7
% spent on climate and energy	100%	100%	100%	100%	100%	100%	100%
While ETS auction revenues are not earmarked for specific purposes, amounts spent are equivalent to 100% of these revenue (less ETS administration costs for the Environmental Protection Agency) and are attributed to emission reduction activities in line with the purposes specified in the ETS Directive.							
Italy (*)	**2013-2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Revenues from auctioning	1706.1	549.7	1453.3	1289	1290.5	2520.9	3202.7
Reported as spent on climate etc.	548.6	383.7	148.4	148.1	506.6	1260.5	1601.3
% spent on climate and energy	32%	70%	50%	50%	50%	50%	50%
Italian law guarantees that 50% of the revenues are used for climate and energy purposes but only after the year has ended, which can cause underreported spending. The remaining 50% was initially used to compensate for the depleted phase 2 of the New Entrants Reserve, and later it was allocated to the general budget, which funds, among others, climate and energy projects (not included here).							
Latvia	**2013-2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**

Revenues from auctioning	47.8	15.4	40.7	42.6	42.3	62.4	84.2
Reported as spent on climate etc.	7.6	3.8	12.3	11.4	5.8	62.4	84.2
% spent on climate and energy	100%	100%	100%	100%	100%	100%	100%
100% of revenues go to the EAAI, a national green investment scheme aimed at tackling global climate change. Reported spending shows actually disbursed amounts per year, all leftovers are carried over to future years.							
Lithuania	**2013-2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Revenues from auctioning	86.5	31.5	80.4	84	86.6	86.2	103.7
Reported as spent on climate etc.	86.5	31.5	80.4	83.7	86.6	86.2	110.0
% spent on climate and energy	100%	100%	100%	100%	100%	100%	>100%
Revenues are put in a Climate Change fund that is only funded by auctioning revenues, and spent on climate and energy purposes.							
Luxembourg *	**2013-2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Revenues from auctioning	22.1	6.9	18.3	17.1	17	8.1	30.7
Reported as spent on climate etc.	11.5	3.5	9.2	17.1	17	8.1	5.7
% spent on climate and energy	52%	50%	51%	100%	100%	100%	19%
Revenues are not earmarked, example projects have been reported up to 100% of revenues each year.							
Malta *	**2013-2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Revenues from auctioning	19.1	6	15.7	15.9	15.8	30.7	40.1
Reported as spent on climate etc.	30.3	6.9	4.9	9.1	47.2	30.7	40.1
% spent on climate and energy	>100%	>100%	100%	100%	>100%	100%	100%
All revenues go to a fund for climate and energy projects, which is additionally co-funded from the general budget.							
Netherlands *	**2013-2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Revenues from auctioning	595.2	190.7	504.2	440.1	441.4	894.0	1135.9
Reported as spent on climate etc.	595.2	190.7	504.2	440.1	441.4	0.0	0.0
% spent on climate and energy	>100%	>100%	>100%	>100%	>100%	>100%	>100%

Auctioning revenues go to the national general budget which is used to, among others, finance climate and energy purposes. Amounts spent are higher than 100% of revenues, but it is not possible to link auctioning revenues to specific projects funded.							
Poland*	**2013-2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Revenues from auctioning	590.9	506	1211.6	2548.8	3157.6	5593.6	4976.0
Reported as spent on climate etc.	304.3	290.4	609.9	1274.4	1564	2768.3	2550.2
% spent on climate and energy	51%	57%	50%	50%	50%	49%	51%
Revenues are not earmarked, example projects have been reported for around 50% of revenues each year.							
Portugal	**2013-2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Revenues from auctioning	314.2	100.3	265.6	257.1	255.8	513.9	673.2
Reported as spent on climate etc.	292.7	95.1	201.2	235.3	251.3	513.9	673.2
% spent on climate and energy	93%	95%	76%	92%	98%	100%	100%
All revenues from auctioning are channelled to the Environment Fund (alongside other revenues) which is financing environmental projects that may or may not be directly related to climate objectives. The amounts reported as spent represent climate change and energy projects paid by the Environmental Fund.							
Romania (*)	**2013-2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Revenues from auctioning	609.8	260.8	719.1	749.8	803.1	483.9	488.0
Reported as spent on climate etc.	578.3	0	160	42.7	165.9	226.6	277.7
% spent on climate and energy	95%	0%	22%	6%	17%	47%	57%
50% of revenues is earmarked for climate change and energy purposes and an additional 6% is earmarked for GHG reduction projects (and 15% goes to indirect carbon cost compensation and 29% to the general budget). Part of unspent revenues are carried over to later years.							
Slovakia	**2013-2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Revenues from auctioning	268.8	87.1	229.9	244.7	242.1	276.2	342.9
Reported as spent on climate etc.	80.8	40.9	55.6	44.6	27.4	50.9	54.5
% spent on climate and energy	30%	47%	24%	18%	11%	18%	16%
All auctioning revenues are earmarked and go to the Environmental Fund, which also receives money from other sources. The values reported as spent represent the funding of climate change and energy projects known at the time of reporting. Part of unspent revenues are carried over to later years.							
Slovenia	**2013-2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**

Revenues from auctioning	77.4	25.1	66.3	65.3	65.0	130.1	170.8
Reported as spent on climate etc.	46.4	5.4	14.2	40.8	40.4	79.9	182.3
% spent on climate and energy	100%	100%	100%	100%	100%	100%	100%
100% of the auctioning revenues are used for climate and energy projects. Some projects receive funding later than in the year in which the auctioning revenues were generated. About EUR 174 million in already received auction revenues will still be spent on climate and energy.							
Spain (*)	**2013-2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Revenues from auctioning	1535.2	493.6	1306	1245.2	1240.3	2482.9	3231.2
Reported as spent on climate etc.	1494.9	445.5	788.6	1054.1	1081.5	2035.0	2019.7
% spent on climate and energy	97%	90%	60%	85%	87%	82%	63%
Estimated revenues are earmarked for energy and climate purposes ahead of each year, so actual revenues may differ from the allocated estimate. All estimated revenues that don't go to indirect cost compensation (maximum of 25%, 5.6% in 2022, not included as spent here) are used for climate and energy purposes. Current legislation includes a minimum 450 M€ for renewable energy production support plus a maximum of 30% for energy transition. Revenues higher than estimated go to the general budget, without a predefined purpose.							
Sweden *	**2013-2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Revenues from auctioning	161.1	51.5	136.3	128.5	127.9	222.2	283.1
Reported as spent on climate etc.	128.7	28.8	76.5	73.9	65	222.2	283.1
% spent on climate and energy	80%	56%	56%	58%	51%	100%	100%
Revenues are not earmarked, example projects have been reported for at least the minimum required spending on energy and climate purposes.							

8 EMISSIONS COVERED BY THE EFFORT SHARING LEGISLATION

By 30 June 2023, Member States had to report their draft updated integrated National Energy and Climate Plans (NECPs) to the Commission.[84] The draft NECPs should contain the policies and measures that a Member State envisages to meet their climate and energy targets. The draft NECPs are currently being assessed by the Commission, which will address recommendations to the Member States by the end of the year. Member States are encouraged to take these recommendations into account in their final updated NECPs which are to be submitted by 30 June 2024. The Commission already notes that some Member States have planned higher ambition for their ESR emissions in their draft NECPs. Therefore, a more complete overview will be available in the Commissions assessment of draft NECPs due by the end of this year. After the submission of the final updated NECPs by Member States, the Commission will come back to the assessment of whether Member States are making sufficient progress.

Table 10: *Member States targets, historical and projected emissions under the effort-sharing legislation and distance to targets in percentage change from 2005 base year emissions.* [85]

Member State	2021	2022	2030 (projections WEM)	2030 (projections WAM)
Austria				
Target	-14%	-17%	-48%	-48%
Emissions	-14%	-19%	-27%	-27%
Distance to target (percentage point)	0%	3%	-21%	-21%
Belgium				
Target	-13%	-15%	-47%	-47%
Emissions	-15%	-18%	-22%	-43%
Distance to target (pp)	2%	3%	-25%	-4%
Bulgaria				

[84] By 6 October 2023, 16 Member States have submitted their draft updated NECPs. 6 Member States foresee a higher ambition in their draft NECPs compared to their reported projections in Table 10, i.e. Croatia reports a WAM projection of -17.1%, Cyprus reports a WAM projection of -23.1%, Hungary reports an improved WEM of -15.1% and WAM of -23.8%, Italy reports a WAM projection in the range of -35.3% to -37.1%, Slovakia reports a WAM projection of -20%, Slovenia reports a WAM projection of -28.8%.

[85] 2021 emissions are based on the final inventory reports, 2022 emissions are based on approximated inventory reports and EEA's calculation of ESR emissions. This includes ETS emissions taken from EEA's EU Emissions Trading System (ETS) data viewer — European Environment Agency (europa.eu) to ensure consistency between Member States. The approximated emissions can therefore deviate from Member States' reported emissions. ESR base year emissions and targets are in GWP AR5. Positive values indicate projected overachievement while negative values indicate projected underachievement. WEM = with existing measures, WAM = with additional measures. Targets for 2030 are based on Member States' estimated AEAs for 2030. Any apparent miscalculations for percentage point distance to targets is due to rounding of the percentage targets and emissions (e.g. distance to target (pp) for CY an CZ).

Target	21%	13%	-10%	-10%
Emissions	12%	2%	4%	2%
Distance to target (pp)	9%	11%	-14%	-12%
Croatia				
Target	-2%	-8%	-17%	-17%
Emissions	-3%	-6%	-11%	-17%
Distance to target (pp)	1%	-2%	-6%	0%
Cyprus				
Target	-5%	-7%	-32%	-32%
Emissions	4%	2%	-9%	-9%
Distance to target (pp)	-8%	-9%	-23%	-23%
Czechia				
Target	2%	-6%	-26%	-26%
Emissions	-6%	-9%	-16%	-20%
Distance to target (pp)	7%	3%	-10%	-6%
Denmark				
Target	-20%	-22%	-50%	-50%
Emissions	-20%	-21%	-40%	-40%
Distance to target (pp)	0%	-2%	-10%	-10%
Estonia				
Target	0%	-3%	-24%	-24%
Emissions	-7%	-4%	-10%	-11%
Distance to target (pp)	7%	1%	-14%	-13%
Finland				
Target	-16%	-19%	-50%	-50%
Emissions	-20%	-23%	-44%	-46%
Distance to target (pp)	4%	4%	-6%	-4%
France				
Target	-16%	-19%	-47%	-47%
Emissions	-19%	-22%	-34%	-34%
Distance to target (pp)	3%	3%	-14%	-14%
Germany				
Target	-12%	-15%	-50%	-50%
Emissions	-17%	-19%	-35%	-40%
Distance to target (pp)	5%	5%	-15%	-10%
Greece				

Target	-27%	-25%	-23%	-23%
Emissions	-30%	-29%	-36%	-36%
Distance to target (pp)	4%	3%	13%	13%
Hungary				
Target	4%	-9%	-19%	-19%
Emissions	-3%	-8%	-12%	-12%
Distance to target (pp)	7%	-2%	-6%	-6%
Ireland				
Target	-9%	-11%	-42%	-42%
Emissions	-2%	-3%	-10%	-29%
Distance to target (pp)	-7%	-8%	-32%	-13%
Italy				
Target	-20%	-22%	-43%	-43%
Emissions	-17%	-18%	-28%	-28%
Distance to target (pp)	-3%	-3%	-15%	-15%
Latvia				
Target	24%	3%	-17%	-17%
Emissions	1%	-3%	-7%	-8%
Distance to target (pp)	23%	6%	-10%	-9%
Lithuania				
Target	23%	5%	-21%	-21%
Emissions	10%	9%	-15%	-21%
Distance to target (pp)	14%	-4%	-6%	0%
Luxembourg				
Target	-17%	-19%	-50%	-50%
Emissions	-20%	-30%	-35%	-58%
Distance to target (pp)	3%	11%	-15%	8%
Malta				
Target	102%	21%	-19%	-19%
Emissions	33%	35%	46%	46%
Distance to target (pp)	69%	-14%	-65%	-65%
Netherlands				
Target	-23%	-25%	-48%	-48%
Emissions	-27%	-33%	-38%	-39%
Distance to target (pp)	4%	9%	-10%	-9%
Poland				

Target	12%	6%	-18%	-18%
Emissions	8%	4%	4%	-7%
Distance to target (pp)	4%	2%	-22%	-11%
Portugal				
Target	-13%	-16%	-29%	-29%
Emissions	-17%	-17%	-39%	-42%
Distance to target (pp)	5%	1%	10%	13%
Romania				
Target	12%	-2%	-13%	-13%
Emissions	6%	1%	7%	4%
Distance to target (pp)	6%	-3%	-20%	-17%
Slovakia				
Target	1%	-9%	-23%	-23%
Emissions	-12%	-12%	-1%	-12%
Distance to target (pp)	13%	4%	-21%	-11%
Slovenia				
Target	-4%	-6%	-26%	-26%
Emissions	-12%	-6%	-9%	-26%
Distance to target (pp)	8%	0%	-17%	-1%
Spain				
Target	-17%	-18%	-37%	-37%
Emissions	-19%	-20%	-29%	-45%
Distance to target (pp)	2%	2%	-8%	7%
Sweden				
Target	-28%	-29%	-50%	-50%
Emissions	-33%	-36%	-62%	-62%
Distance to target (pp)	5%	8%	12%	12%
EU 27				
Target	-12%	-15%	-40%	-40%
Emissions	-14%	-17%	-27%	-32%
Distance to target (pp)	3%	2%	-13%	-8%
Iceland				
Target	-7%	-10%	-29%	-29%
Emissions	-10%	-10%	-24%	-26%
Distance to target (pp)	3%	0%	-4%	-3%
Norway				

Target	-13%	-16%	-40%	-40%
Emissions	-13%	-12%	-32%	-32%
Distance to target (pp)	0%	-4%	-8%	-8%

Table 11: *Annual emissions allocations, historical and projected emissions, and distance to targets under the Effort Sharing Regulation (Mt. CO_2-eq.) covering the period 2021 - 2030. Positive values indicate overachievement, negative values indicate underachievement.*[86]

Member State	ETS and LULUCF flexibility	2005 base year emissions	2021 (final inventory)	2022 (approximated)	2023	2024	2025	2026	2027	2028	2029	2030
Austria												
Estimated AEAs			48,8	47,4	45,2	43,0	40,7	40,9	38,1	35,3	32,5	29,6
Emissions		57,0	48,8	45,9	47,2	46,8	46,0	45,3	44,5	43,5	42,6	41,7
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			0,0	1,5	-2,0	-3,8	-5,2	-4,4	-6,4	-8,2	-10,1	-12,0
Cumulative balance of AEAs			0,0	1,5	-0,6	-4,4	-9,6	-14,0	-20,4	-28,6	-38,7	-50,8
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	58,8	54,9	51,0	47,1	43,3
Emissions		81,6	69,5	66,8	66,1	64,4	62,7	59,6	56,4	53,2	50,0	46,8

[86] 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 emissions are based on the final inventory reports, 2022 emissions are based on approximated inventory reports and EEA's calculation of ESR emissions. This includes ETS emissions taken from EEA's EU Emissions Trading System (ETS) data viewer — European Environment Agency (europa.eu) to ensure consistency between Member States. 2023 – 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.

Member State	ETS and LULUCF flexibility	2005 base year emissions	2021 (final inventory)	2022 (approximated)	2023	2024	2025	2026	2027	2028	2029	2030
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	2,4	-0,2	-1,8	-3,3	-0,8	-1,5	-2,2	-2,9	-3,6
Cumulative balance of AEAs			1,6	4,0	3,7	1,9	-1,4	-2,2	-3,7	-5,8	-8,7	-12,3
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	22,5	21,9	21,3	20,7	20,1
Emissions		22,3	25,0	22,7	23,6	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			2,1	2,4	1,0	0,3	-0,3	-1,0	-1,4	-1,8	-2,3	-2,7
Cumulative balance of AEAs			2,1	4,5	5,4	5,8	5,5	4,5	3,1	1,3	-1,0	-3,7
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	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	16,2	15,9	15,6	15,3	15,0
Emissions		18,1	17,4	17,0	16,2	16,1	15,9	15,8	15,6	15,4	15,2	15,0

Member State	ETS and LULUCF flexibility	2005 base year emissions	2021 (final inventory)	2022 (approximated)	2023	2024	2025	2026	2027	2028	2029	2030
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			0,2	-0,4	0,2	0,1	0,0	0,4	0,3	0,2	0,1	0,0
Cumulative balance of AEAs			0,2	-0,2	0,0	0,1	0,1	0,6	0,9	1,1	1,3	1,3
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	3,8	3,6	3,4	3,1	2,9
Emissions		4,3	4,4	4,4	4,3	4,3	4,3	4,3	4,2	4,1	4,0	3,9
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			-0,4	-0,4	-0,5	-0,6	-0,7	-0,5	-0,6	-0,8	-0,9	-1,0
Cumulative balance of AEAs			-0,4	-0,7	-1,2	-1,8	-2,6	-3,0	-3,7	-4,4	-5,3	-6,3
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	0,6	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	55,1	53,3	51,6	49,8	48,1
Emissions		65,0	61,2	59,2	56,7	56,7	56,6	55,7	54,7	53,8	52,8	51,9

Member State	ETS and LULUCF flexibility	2005 base year emissions	2021 (final inventory)	2022 (approximated)	2023	2024	2025	2026	2027	2028	2029	2030
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			4,8	1,7	2,6	1,0	-0,5	-0,6	-1,4	-2,2	-3,0	-3,8
Cumulative balance of AEAs			4,8	6,5	9,1	10,2	9,6	9,0	7,6	5,4	2,4	-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	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	27,5	25,7	23,8	22,0	20,2
Emissions		40,4	32,1	32,0	30,8	29,7	28,8	28,1	27,1	26,2	25,3	24,4
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			0,0	-0,7	-0,9	-1,2	-1,6	-0,6	-1,4	-2,3	-3,3	-4,2
Cumulative balance of AEAs			0,0	-0,7	-1,6	-2,7	-4,4	-4,9	-6,4	-8,7	-12,0	-16,2
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	5,3	5,1	4,9	4,7
Emissions		6,2	5,8	6,0	5,8	5,8	5,8	5,8	5,7	5,7	5,6	5,5

Member State	ETS and LULUCF flexibility	2005 base year emissions	2021 (final inventory)	2022 (approximated)	2023	2024	2025	2026	2027	2028	2029	2030
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	0,0	0,0	-0,2	-0,3	-0,3	-0,5	-0,6	-0,7	-0,8
Cumulative balance of AEAs			0,5	0,5	0,5	0,4	0,1	-0,3	-0,8	-1,4	-2,1	-2,9
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	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	23,2	21,7	20,2	18,7	17,2
Emissions		34,4	27,5	26,7	25,5	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			1,4	1,3	1,2	2,2	1,7	1,6	0,9	0,2	-0,6	-1,2
Cumulative balance of AEAs			1,4	2,7	3,8	6,0	7,8	9,4	10,2	10,4	9,9	8,6
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	276,4	259,9	243,5	227,1	210,6
Emissions		401,1	323,4	314,6	302,1	299,6	297,1	291,0	285,0	278,9	272,8	266,7

Member State	ETS and LULUCF flexibility	2005 base year emissions	2021 (final inventory)	2022 (approximated)	2023	2024	2025	2026	2027	2028	2029	2030
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			12,3	12,0	9,9	-2,1	-14,1	-14,7	-25,0	-35,4	-45,7	-56,1
Cumulative balance of AEAs			12,3	24,3	34,1	32,0	18,0	3,3	-21,7	-57,1	-102,8	-158,9
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	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	340,3	315,8	291,3	266,9	242,4
Emissions		484,7	404,5	390,5	391,0	384,2	369,8	357,4	343,3	326,4	309,5	290,5
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			22,8	22,7	0,9	-13,7	-20,7	-17,1	-27,5	-35,1	-42,6	-48,1
Cumulative balance of AEAs			22,8	45,5	46,3	32,6	11,9	-5,2	-32,6	-67,7	-110,3	-158,5
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	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	45,7	46,4	47,2	47,9	48,7
Emissions		63,0	43,9	45,0	43,1	43,1	43,0	42,5	42,0	41,6	41,1	40,6

Member State	ETS and LULUCF flexibility	2005 base year emissions	2021 (final inventory)	2022 (approximated)	2023	2024	2025	2026	2027	2028	2029	2030
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	2,0	4,1	4,3	4,6	3,2	4,4	5,6	6,8	8,1
Cumulative balance of AEAs			2,3	4,3	8,4	12,7	17,4	20,5	25,0	30,6	37,4	45,5
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	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	42,7	41,7	40,8	39,8	38,9
Emissions		47,8	46,6	44,2	43,5	43,5	43,4	43,1	42,8	42,5	42,2	41,9
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			3,3	-0,9	-0,7	-1,2	-1,8	-0,5	-1,1	-1,7	-2,4	-3,0
Cumulative balance of AEAs			3,3	2,4	1,7	0,5	-1,3	-1,8	-2,9	-4,6	-7,0	-10,0
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	39,1	36,2	33,4	30,5	27,7
Emissions		47,7	46,8	46,1	43,8	43,2	42,1	40,8	39,3	37,8	36,1	33,9

Member State	ETS and LULUCF flexibility	2005 base year emissions	2021 (final inventory)	2022 (approximated)	2023	2024	2025	2026	2027	2028	2029	2030
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			-3,3	-3,7	-3,3	-4,5	-5,3	-1,7	-3,1	-4,4	-5,6	-6,2
Cumulative balance of AEAs			-3,3	-7,0	-10,3	-14,8	-20,0	-21,7	-24,8	-29,2	-34,7	-40,9
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	248,2	234,6	221,0	207,5	193,9
Emissions		343,1	284,4	279,6	272,3	266,2	260,1	257,3	254,4	251,6	248,8	246,0
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			-10,9	-10,9	-12,8	-16,1	-19,4	-9,1	-19,8	-30,6	-41,3	-52,1
Cumulative balance of AEAs			-10,9	-21,8	-34,6	-50,7	-70,1	-79,2	-99,0	-129,6	-170,9	-223,0
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	7,4	7,1
Emissions		8,6	8,7	8,4	8,6	8,6	8,4	8,4	8,3	8,3	8,1	7,9

Member State	ETS and LULUCF flexibility	2005 base year emissions	2021 (final inventory)	2022 (approximated)	2023	2024	2025	2026	2027	2028	2029	2030
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	0,5	0,0	-0,2	-0,2	-0,3	-0,5	-0,7	-0,8	-0,7
Cumulative balance of AEAs			2,0	2,5	2,5	2,3	2,1	1,8	1,3	0,6	-0,2	-0,9
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	12,9	12,2	11,6	11,0	10,3
Emissions		13,1	14,3	14,2	14,4	13,9	13,4	12,8	12,1	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			1,8	-0,5	-1,1	-1,0	-0,9	0,1	0,2	0,1	0,0	0,0
Cumulative balance of AEAs			1,8	1,3	0,2	-0,9	-1,8	-1,7	-1,5	-1,4	-1,4	-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	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	6,6	6,2	5,8	5,5	5,1
Emissions		10,1	8,1	7,1	7,4	7,2	6,8	6,3	5,7	5,2	4,7	4,3

Member State	ETS and LULUCF flexibility	2005 base year emissions	2021 (final inventory)	2022 (approximated)	2023	2024	2025	2026	2027	2028	2029	2030
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	0,3	0,2	0,2	0,4	0,6	0,7	0,7	0,8
Cumulative balance of AEAs			0,3	1,4	1,7	1,9	2,1	2,5	3,0	3,7	4,4	5,2
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	1,4	1,4	1,5	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	-0,1	-0,3	-0,3	-0,4	-0,3	-0,4	-0,5	-0,6	-0,7
Cumulative balance of AEAs			0,7	0,6	0,3	0,0	-0,4	-0,7	-1,0	-1,5	-2,1	-2,7
ETS flexibility	0,2	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	81,2	77,5	73,9	70,3	66,6
Emissions		128,1	93,5	85,5	89,1	88,3	87,6	85,8	84,0	82,2	80,4	78,6

Member State	ETS and LULUCF flexibility	2005 base year emissions	2021 (final inventory)	2022 (approximated)	2023	2024	2025	2026	2027	2028	2029	2030
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	11,2	3,8	0,8	-2,2	-4,6	-6,4	-8,3	-10,1	-12,0
Cumulative balance of AEAs			5,0	16,2	20,0	20,9	18,7	14,1	7,7	-0,6	-10,8	-22,7
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	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	172,2	165,3	158,4
Emissions		192,5	207,9	200,6	195,7	191,9	188,2	186,3	184,4	182,5	180,6	178,7
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			7,2	3,8	2,9	1,0	-1,0	-0,4	-5,3	-10,3	-15,3	-20,3
Cumulative balance of AEAs			7,2	10,9	13,9	14,9	13,8	13,5	8,1	-2,2	-17,5	-37,8
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	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	37,6	36,9	36,2	35,4	34,7
Emissions		48,6	40,1	40,5	37,1	36,9	36,6	34,9	33,3	31,6	29,9	28,2

Member State	ETS and LULUCF flexibility	2005 base year emissions	2021 (final inventory)	2022 (approximated)	2023	2024	2025	2026	2027	2028	2029	2030
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	0,3	2,9	2,4	1,9	2,7	3,6	4,6	5,6	6,5
Cumulative balance of AEAs			2,4	2,7	5,7	8,1	10,0	12,7	16,3	20,9	26,5	33,0
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	76,2	74,3	72,3	70,3	68,3
Emissions		78,2	83,0	79,0	80,2	80,4	80,7	80,9	81,1	81,3	81,5	81,7
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			4,9	-2,1	-4,3	-5,7	-7,0	-4,6	-6,8	-9,0	-11,2	-13,4
Cumulative balance of AEAs			4,9	2,8	-1,5	-7,1	-14,1	-18,8	-25,6	-34,6	-45,8	-59,2
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	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	19,6	19,1	18,7	18,3	17,9
Emissions		23,1	20,4	20,3	20,8	20,7	20,2	20,4	20,5	20,6	20,4	20,5

Member State	ETS and LULUCF flexibility	2005 base year emissions	2021 (final inventory)	2022 (approximated)	2023	2024	2025	2026	2027	2028	2029	2030
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			3,0	0,8	-0,1	-0,4	-0,3	-0,8	-1,3	-1,8	-2,1	-2,6
Cumulative balance of AEAs			3,0	3,9	3,8	3,4	3,2	2,3	1,0	-0,8	-3,0	-5,5
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	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	9,9	9,6	9,3	9,0	8,7
Emissions		11,8	10,4	11,1	10,4	10,2	10,1	9,9	9,6	9,4	9,1	8,8
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			1,0	0,0	0,4	0,3	0,1	0,1	0,0	0,0	-0,1	-0,1
Cumulative balance of AEAs			1,0	1,0	1,4	1,7	1,8	1,9	1,9	1,8	1,8	1,7
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	1,3	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	176,2	170,1	163,9	157,7	151,5
Emissions		242,0	195,0	194,4	181,3	175,9	171,0	163,6	156,2	148,7	141,2	133,8

Member State	ETS and LULUCF flexibility	2005 base year emissions	2021 (final inventory)	2022 (approximated)	2023	2024	2025	2026	2027	2028	2029	2030
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			6,0	4,3	11,5	11,0	10,0	12,6	13,9	15,1	16,4	17,7
Cumulative balance of AEAs			6,0	10,3	21,8	32,7	42,7	55,4	69,3	84,4	100,9	118,6
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	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	25,3	24,4	23,5	22,5	21,6
Emissions		43,2	29,2	27,5	25,6	24,4	23,2	21,8	20,5	19,1	17,8	16,5
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			2,2	3,3	4,0	4,1	4,2	3,5	3,9	4,3	4,7	5,2
Cumulative balance of AEAs			2,2	5,4	9,4	13,5	17,6	21,1	25,1	29,4	34,1	39,3
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	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.										

Table 12: Annual emissions allocations, historical emissions, and distance to targets under the Effort Sharing Decision (Mt. CO_2-eq.) covering the period 2013 - 2020.[87]

Member State	2005 base year emissions	2013	2014	2015	2016	2017	2018	2019	2020
Austria									
AEA		52.6	52.1	51.5	51.0	49.5	48.9	48.3	47.8
Emissions	56.8	50.1	48.2	49.3	50.6	51.7	50.3	50.2	46.5
Distance to target		2.5	3.9	2.2	0.4	-2.1	-1.4	-1.9	1.2
Cumulative surplus of AEAs		2.5	6.4	8.7	9.0	6.9	5.5	3.6	4.8
Belgium									
AEA		78.4	76.9	75.3	73.8	72.5	71.1	69.7	68.2
Emissions	80.3	74.3	70.1	72.7	74.1	70.8	74.3	72.0	64.9
Distance to target		4.1	6.8	2.6	-0.3	1.7	-3.2	-2.4	1.7
Cumulative surplus of AEAs		4.1	10.9	13.5	13.2	14.9	11.7	9.4	11.1
Bulgaria									
AEA		26.9	27.2	27.5	27.7	25.9	26.1	26.3	26.5
Emissions	22.1	22.2	22.9	25.4	25.6	26.5	26.3	25.8	25.7
Distance to target		4.7	4.3	2.1	2.1	-0.6	-0.2	0.5	0.8
Cumulative surplus of AEAs		4.7	9.0	11.1	13.3	12.6	12.4	12.9	13.7
Croatia									
AEA		19.6	19.8	20.0	20.2	18.7	18.9	19.1	19.3
Emissions	17.4	15.1	14.7	15.6	16.0	16.7	16.2	16.1	16.5
Distance to target		4.5	5.1	4.4	4.2	2.0	2.7	3.0	2.8
Cumulative surplus of AEAs		4.5	9.6	14.1	18.2	20.3	22.9	26.0	28.8
Cyprus									

[87] Positive values indicate overachievement, negative values indicate underachievement. AEAs for the years 2017-2020 were revised in 2017 for all Member States to reflect updates in methodologies for reporting of GHG inventories. This recalculation ensures maintaining the originally intended effort of each Member State (in % of 2005 emissions). The values of 'cumulative surplus of AEAs' are the cumulative annual distances to target and do not take into account cancellations and transfers. 2020 ESD emissions are based on the 'Final Review Reports' from the 2022 annual ESD review. The UK's 2020 Final Review Report was corrected in 2023. For compliance in 2019, Germany used the flexibility to carry forward part of the AEAs allocated for 2020. As a result, Germany's AEAs available for compliance in 2020 are below the allocation set by the legislation.

AEA		5.9	5.9	5.9	5.9	4.2	4.1	4.0	4.0
Emissions	4.2	3.9	3.9	4.1	4.1	4.3	4.2	4.4	4.2
Distance to target		2.0	2.0	1.9	1.8	-0.1	0.0	-0.3	-0.3
Cumulative surplus of AEAs		2.0	4.0	5.8	7.7	7.6	7.5	7.2	7.0
Czechia									
AEA		62.5	63.2	64.0	64.7	65.2	65.9	66.5	67.2
Emissions	61.7	61.5	57.6	61.3	62.8	62.4	60.6	60.5	58.7
Distance to target		1.0	5.6	2.7	1.9	2.8	5.3	6.0	8.6
Cumulative surplus of AEAs		1.0	6.6	9.3	11.2	14.0	19.2	25.2	33.8
Denmark									
AEA		36.8	35.9	35.0	34.1	34.8	33.9	33.0	32.1
Emissions	40.1	33.7	32.6	32.5	33.1	32.7	33.1	32.1	30.8
Distance to target		3.1	3.3	2.5	1.0	2.1	0.7	0.9	1.2
Cumulative surplus of AEAs		3.1	6.4	8.9	9.9	12.0	12.7	13.6	14.9
Estonia									
AEA		6.3	6.3	6.3	6.4	5.9	6.0	6.0	6.0
Emissions	5.4	5.8	6.1	6.1	6.2	6.2	6.1	6.2	5.9
Distance to target		0.5	0.2	0.2	0.2	-0.3	-0.2	-0.2	0.1
Cumulative surplus of AEAs		0.5	0.8	1.0	1.1	0.9	0.7	0.5	0.6
Finland									
AEA		31.8	31.3	30.8	30.3	30.2	29.6	29.1	28.5
Emissions	33.9	31.6	30.1	29.9	31.4	30.1	29.9	29.6	28.1
Distance to target		0.2	1.1	0.9	-1.0	0.1	-0.3	-0.6	0.4
Cumulative surplus of AEAs		0.2	1.3	2.2	1.2	1.3	1.0	0.4	0.8
France									
AEA		394.1	389.5	384.4	379.4	358.2	352.9	347.7	342.5
Emissions	398.2	366.1	353.5	353.0	351.9	352.8	342.2	336.4	307.8
Distance to target		28.0	35.9	31.4	27.5	5.4	10.7	11.4	34.7

Cumulative surplus of AEAs		28.0	63.9	95.3	122.8	128.2	138.9	150.3	185.0
Germany									
AEA		472.5	465.8	459.1	452.4	432.3	425.2	432.9	396.0
Emissions	477.8	460.2	436.8	444.1	454.2	466.9	434.0	444.3	407.4
Distance to target		12.3	29.0	15.1	-1.7	-34.5	-8.8	-11.3	-11.4
Cumulative surplus of AEAs		12.3	41.4	56.4	54.7	20.2	11.3	0.0	-11.4
Greece									
AEA		59.0	59.3	59.6	59.9	59.1	59.4	59.7	60.0
Emissions	62.6	44.2	44.4	45.4	44.9	45.4	44.7	44.7	42.9
Distance to target		14.8	14.9	14.2	15.0	13.7	14.7	15.0	17.2
Cumulative surplus of AEAs		14.8	29.6	43.8	58.8	72.5	87.3	102.3	119.4
Hungary									
AEA		50.4	51.5	52.6	53.8	50.1	51.0	51.9	52.8
Emissions	48	38.4	38.4	41.4	42.1	43.1	43.2	44.9	43.9
Distance to target		12.0	13.1	11.2	11.7	6.9	7.7	7.0	8.9
Cumulative surplus of AEAs		12.0	25.1	36.3	47.9	54.9	62.6	69.6	78.5
Ireland									
AEA		46.9	45.8	44.6	43.5	40.9	39.8	38.7	37.7
Emissions	47.1	42.2	41.7	43.0	43.8	43.8	45.4	45.6	44.7
Distance to target		4.7	4.1	1.6	-0.3	-2.9	-5.6	-6.9	-7.1
Cumulative surplus of AEAs		4.7	8.8	10.4	10.1	7.1	1.6	-5.3	-12.4
Italy									
AEA		308.2	306.2	304.2	302.3	298.3	295.8	293.4	291.0
Emissions	334.5	273.3	265.3	273.3	270.7	270.1	278.7	274.9	254.0
Distance to target		34.8	40.9	31.0	31.6	28.1	17.1	18.5	37.0
Cumulative surplus of AEAs		34.8	75.7	106.7	138.3	166.4	183.5	202.0	239.0
Latvia									
AEA		9.3	9.4	9.4	9.5	9.7	9.8	9.9	10.0
Emissions	8.5	8.8	9.0	9.0	9.1	9.2	9.1	8.7	8.4

Distance to target		0.5	0.3	0.4	0.4	0.5	0.7	1.3	1.6
Cumulative surplus of AEAs		0.5	0.8	1.3	1.7	2.2	2.9	4.1	5.7
Lithuania									
AEA		12.9	13.3	13.7	14.0	14.1	14.5	14.9	15.2
Emissions	13.3	12.4	12.9	13.3	13.9	14.1	14.3	14.3	14.0
Distance to target		0.5	0.4	0.4	0.1	0.0	0.2	0.6	1.2
Cumulative surplus of AEAs		0.5	0.9	1.3	1.4	1.4	1.6	2.1	3.3
Luxembourg									
AEA		9.5	9.3	9.1	8.9	8.7	8.5	8.3	8.1
Emissions	10.1	9.4	8.9	8.6	8.5	8.7	9.1	9.2	7.7
Distance to target		0.2	0.5	0.5	0.4	0.0	-0.5	-0.9	0.4
Cumulative surplus of AEAs		0.2	0.7	1.2	1.6	1.6	1.1	0.1	0.6
Malta									
AEA		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Emissions	1.1	1.3	1.3	1.3	1.3	1.4	1.4	1.4	1.3
Distance to target		-0.1	-0.1	-0.1	-0.2	-0.3	-0.2	-0.3	-0.1
Cumulative surplus of AEAs		-0.1	-0.2	-0.3	-0.5	-0.8	-1.0	-1.2	-1.4
Netherlands									
AEA		122.9	120.7	118.4	116.1	114.1	111.8	109.6	107.4
Emissions	127.8	108.3	97.9	101.1	101.3	102.3	99.7	97.1	90.2
Distance to target		14.7	22.8	17.3	14.8	11.7	12.1	12.5	17.2
Cumulative surplus of AEAs		14.7	37.5	54.8	69.6	81.3	93.4	105.9	123.0
Poland									
AEA		193.6	194.9	196.1	197.4	200.0	201.7	203.4	205.2
Emissions	180	186.1	181.5	186.8	198.7	211.5	213.0	209.1	205.1
Distance to target		7.5	13.3	9.4	-1.3	-11.5	-11.3	-5.6	0.1
Cumulative surplus of AEAs		7.5	20.9	30.2	29.0	17.4	6.1	0.5	0.5

Portugal									
AEA		49.3	49.6	49.9	50.1	47.9	48.3	48.7	49.1
Emissions	48.6	38.6	38.8	40.6	41.6	40.2	40.6	41.5	38.5
Distance to target		10.7	10.8	9.2	8.6	7.7	7.7	7.2	10.5
Cumulative surplus of AEAs		10.7	21.5	30.7	39.3	47.0	54.7	61.9	72.4
Romania									
AEA		75.6	77.5	79.3	81.1	84.1	86.0	87.9	89.8
Emissions	75.5	72.7	72.5	74.6	73.1	75.4	77.6	75.2	77.1
Distance to target		2.9	4.9	4.7	8.0	8.7	8.3	12.7	12.7
Cumulative surplus of AEAs		2.9	7.8	12.5	20.5	29.2	37.5	50.2	62.9
Slovakia									
AEA		24.0	24.4	24.7	25.1	25.0	25.3	25.6	25.9
Emissions	23	21.1	19.8	20.1	19.8	21.2	21.1	20.1	18.9
Distance to target		2.9	4.6	4.7	5.3	3.8	4.3	5.6	7.1
Cumulative surplus of AEAs		2.9	7.5	12.2	17.5	21.3	25.6	31.2	38.2
Slovenia									
AEA		12.3	12.4	12.4	12.4	12.2	12.2	12.3	12.3
Emissions	11.8	10.9	10.5	10.7	11.2	10.9	11.0	10.8	9.8
Distance to target		1.4	1.9	1.7	1.2	1.3	1.2	1.5	2.6
Cumulative surplus of AEAs		1.4	3.3	4.9	6.1	7.4	8.6	10.1	12.7
Spain									
AEA		227.6	225.6	223.7	221.8	218.3	216.3	214.3	212.4
Emissions	236	200.3	199.8	196.2	198.5	201.1	203.0	201.9	184.2
Distance to target		27.3	25.9	27.6	23.3	17.2	13.3	12.5	28.2
Cumulative surplus of AEAs		27.3	53.2	80.8	104.1	121.3	134.5	147.0	175.2
Sweden									
AEA		41.7	41.0	40.4	39.8	37.8	37.2	36.7	36.1
Emissions	43.5	35.3	34.5	33.9	32.6	32.5	31.4	31.7	29.4
Distance to target		6.4	6.5	6.5	7.2	5.3	5.8	5.0	6.7

Cumulative surplus of AEAs		6.4	12.9	19.4	26.6	31.9	37.7	42.7	49.4
United Kingdom									
AEA		358.7	354.2	349.7	345.2	360.4	357.2	354.1	350.9
Emissions	417.8	339.5	324.4	326.0	333.9	332.1	329.9	329.1	296.1
Distance to target		19.3	29.8	23.7	11.3	28.4	27.4	25.0	54.8
Cumulative surplus of AEAs		19.3	49.1	72.7	84.0	112.4	139.7	164.7	219.5

9 LULUCF

Table 13 shows the accounted emissions and removals for the land use, land use and change, and forest (LULUCF) sector in 2021 for EU total and for each Member State. Computation of the accounts per land category, applying the standardised rules in the regulation.[88]

Table 13: LULUCF Accounted emissions and removals in 2021 (2023 submission per Member State and land category)[89]

Member State	Accounted Land category	Accounted emissions and removals ($KtCO_2$-eq)
Austria	Deforested Land	1244
	Afforested Land	-1437
	Managed Cropland	393
	Managed Grassland	-296
	Managed Wetland	
	Managed Forest Land	-6295
	Sum annual	-2863
Belgium	Deforested Land	753
	Afforested Land	-302
	Managed Cropland	173
	Managed Grassland	-87
	Managed Wetland	
	Managed Forest Land	-208
	Sum annual	329
Bulgaria	Deforested Land	84
	Afforested Land	-173
	Managed Cropland	735
	Managed Grassland	1236
	Managed Wetland	

[88] One year (2021) of reported data is used, all Harvested Wood Products (HWP) reporting is included under managed forest, not all land use conversions are yet identified in the GHG inventories, indirect non-CO_2 emissions are sometimes not disaggregated by land category in the GHG inventories, Forest Reference Level (FRL) cap (Art 8(2)) has been manually applied to the following Member States: Austria, Bulgaria, Croatia, Hungary, Latvia, Lithuania and Sweden, possible technical corrections to the forest reference level have not been applied. Possible application of flexibilities and mechanisms on natural disturbances has not been applied.

[89] 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 2023 for 1990-2021 based on final MS' 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, 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.

	Managed Forest Land	-4283
	Sum annual	-2098
Croatia	Deforested Land	22
	Afforested Land	-266
	Managed Cropland	-1,478
	Managed Grassland	-147
	Managed Wetland	
	Managed Forest Land	-1941
	Sum annual	-1493
Cyprus	Deforested Land	8
	Afforested Land	-17
	Managed Cropland	-4
	Managed Grassland	7
	Managed Wetland	
	Managed Forest Land	72
	Sum annual	66
Czech Republic	Deforested Land	285
	Afforested Land	-586
	Managed Cropland	-25
	Managed Grassland	-148
	Managed Wetland	
	Managed Forest Land	15201
	Sum annual	14727
Denmark	Deforested Land	153
	Afforested Land	-1174
	Managed Cropland	-1230
	Managed Grassland	411
	Managed Wetland	
	Managed Forest Land	-2708
	Sum annual	-4547
Estonia	Deforested Land	397
	Afforested Land	-324
	Managed Cropland	588
	Managed Grassland	81
	Managed Wetland	
	Managed Forest Land	2208
	Sum annual	2950
Finland	Deforested Land	2979
	Afforested Land	-180
	Managed Cropland	905
	Managed Grassland	-101
	Managed Wetland	
	Managed Forest Land	15146

	Sum annual	18749
France	Deforested Land	11379
	Afforested Land	-10418
	Managed Cropland	-7079
	Managed Grassland	146
	Managed Wetland	
	Managed Forest Land	35688
	Sum annual	29717
Germany	Deforested Land	1735
	Afforested Land	153
	Managed Cropland	171
	Managed Grassland	1474
	Managed Wetland	48
	Managed Forest Land	-16308
	Sum annual	-12728
Greece	Deforested Land	44
	Afforested Land	4
	Managed Cropland	-555
	Managed Grassland	-1613
	Managed Wetland	
	Managed Forest Land	-181
	Sum annual	-2303
Hungary	Deforested Land	380
	Afforested Land	-1148
	Managed Cropland	362
	Managed Grassland	173
	Managed Wetland	
	Managed Forest Land	-6412
	Sum annual	-4096
Ireland	Deforested Land	64
	Afforested Land	-3021
	Managed Cropland	-210
	Managed Grassland	235
	Managed Wetland	-183
	Managed Forest Land	747
	Sum annual	-2367
Italy	Deforested Land	1961
	Afforested Land	-4430
	Managed Cropland	408,13
	Managed Grassland	1390,004
	Managed Wetland	
	Managed Forest Land	-5715
	Sum annual	-6385

Latvia	Deforested Land	1084
	Afforested Land	-182
	Managed Cropland	27
	Managed Grassland	-488
	Managed Wetland	
	Managed Forest Land	-1936
	Sum annual	-471
Lithuania	Deforested Land	143
	Afforested Land	-1183
	Managed Cropland	-2439
	Managed Grassland	1014
	Managed Wetland	
	Managed Forest Land	-1755
	Sum annual	-4152
Luxembourg	Deforested Land	45
	Afforested Land	-13
	Managed Cropland	-36
	Managed Grassland	30
	Managed Wetland	
	Managed Forest Land	-217
	Sum annual	-191
Malta	Deforested Land	-0,4
	Afforested Land	-0,3
	Managed Cropland	-8
	Managed Grassland	5
	Managed Wetland	
	Managed Forest Land	0,0
	Sum annual	-4
Netherlands	Deforested Land	777
	Afforested Land	-493
	Managed Cropland	-811
	Managed Grassland	-873
	Managed Wetland	
	Managed Forest Land	84
	Sum annual	-1316
Poland	Deforested Land	336
	Afforested Land	-1803
	Managed Cropland	736
	Managed Grassland	-153
	Managed Wetland	
	Managed Forest Land	3085
	Sum annual	2202
Portugal	Deforested Land	743

	Afforested Land	-1670
	Managed Cropland	-817
	Managed Grassland	-801
	Managed Wetland	
	Managed Forest Land	7725
	Sum annual	5180
Romania	Deforested Land	1143
	Afforested Land	-1582
	Managed Cropland	-12993
	Managed Grassland	-3920
	Managed Wetland	
	Managed Forest Land	-6828
	Sum annual	-24180
Slovakia	Deforested Land	60
	Afforested Land	-344
	Managed Cropland	-131
	Managed Grassland	263
	Managed Wetland	
	Managed Forest Land	-1516
	Sum annual	-1668
Slovenia	Deforested Land	270
	Afforested Land	-177
	Managed Cropland	-30
	Managed Grassland	194
	Managed Wetland	
	Managed Forest Land	309
	Sum annual	566
Spain	Deforested Land	1366
	Afforested Land	-10008
	Managed Cropland	-3864
	Managed Grassland	185
	Managed Wetland	
	Managed Forest Land	1244
	Sum annual	-11077
Sweden	Deforested Land	1780
	Afforested Land	-1099
	Managed Cropland	-845
	Managed Grassland	343
	Managed Wetland	
	Managed Forest Land	-6799
	Sum annual	-6620
EU total	Sum annual	-14073

Table 14: LULUCF total final accounted (2021), approximated accounted (2022), and projected accounted (2023-2025) emissions and removals, as reported by Member States, and average per year over the five year period (2021-2025) ($ktCO_2$-eq)[90]

		Accounted	Approximated		Projection		Scenario
Country	**Avg per year**	**2021**	**2022**	**2023**	**2024**	**2025**	
Austria	-3591,68	-2862,96	-2862,96	-4077,48	-4077,48	-4077,48	WEM
Belgium	125,68	329,33	329,33	-10,0852	-10,09	-10,09	WAM
Bulgaria	-1754,25	-2098,08	-2140,75	-1510,82	-1510,82	-1510,82	WEM
Croatia	-2507,10	-1492,88	-1492,88	-3183,26	-3183,26	-3183,26	WAM
Cyprus	65,23	65,59	64,87				
Czechia	12259,88	14727,37	11501,13	11690,3	11690,30	11690,30	WEM
Denmark	-3346,69	-4546,77	-4546,77	-2546,63	-2546,63	-2546,63	WEM
Estonia	2342,85	2950,29	2945,04	1939,634	1939,63	1939,63	WAM
Finland	6551,58	18748,71	17298,99	-1096,6	-1096,60	-1096,60	WEM
France	18121,45	29716,49	29852,80	10345,98	10345,98	10345,98	WEM
Germany	-34744,99	-12728,04	-18542,61	-47484,8	-47484,80	-47484,80	WEM
Greece	-1530,51	-2302,50	-2148,95	-1067,03	-1067,03	-1067,03	WEM
Hungary	-3183,58	-4870,69	-4319,96	-2242,42	-2242,42	-2242,42	WEM
Ireland	-1537,66	-2367,36	-2400,55	-973,463	-973,46	-973,46	WAM
Italy	-15295,83	-6384,88	-10598,54	-19831,9	-19831,90	-19831,90	WEM
Latvia	-128,85	-470,80	1324,64	-499,36	-499,36	-499,36	WAM
Lithuania	-2067,48	-4152,13	-4197,62	-662,55	-662,55	-662,55	WAM
Luxembourg	-389,40	-190,66	-331,92	-474,81	-474,81	-474,81	WAM
Malta	1,66	-3,72	-3,74	5,25	5,25	5,25	WEM
Netherlands	-1154,88	-1316,29	-1244,81	-1071,11	-1071,11	-1071,11	WEM
Poland	-8944,32	2201,78	2011,04	-16311,50	-16311,50	-16311,50	WEM
Portugal	4527,88	5180,34	4912,15	4182,30	4182,30	4182,30	WEM
Romania	-27443,07	-24180,13	-25436,46	-29199,60	-29199,60	-29199,60	WEM
Slovakia	-727,92	-1667,97	-1883,41	-29,41	-29,41	-29,41	WAM
Slovenia	1185,51	565,52	959,85	1467,40	1467,40	1467,40	WAM
Spain	-8344,68	-11076,96	-11053,71	-6530,90	-6530,90	-6530,90	WAM
Sweden	-4397,58	-6619,63	-6623,85	-2914,80	-2914,80	-2914,80	WEM

[90] Values show total accounted cumulative emissions and removals (kt CO_2-eq) (as reported under Annex XXV table 5b Governance Regulation), and the average per year over the five-year period (2021-2025). 2021 emissions/removals are based on the final accounted value calculated from inventory reports, 2022 emissions/removals are accounted values calculated from approximated inventory reports. For 2023-2025 emissions are based on the most recent WAM emissions projections reports, or in the absence of WAM projections the WEM projections are used. LULUCF Managed Forest land, including harvested wood products assuming instantaneous oxidation where available is used.

10 HORIZONTAL ASSESSMENT OF COLLECTIVE PROGRESS OF MEMBER STATES ON CLIMATE ADAPTATION[91]

In recent year Europe has been confronted with severe climate hazards that have deeply impacted people, ecosystems, and economies. Adapting to the present, and preparing society for the future, climate hazards is of critical importance.

Achieving a climate resilient Europe with communities equipped to deal with the unavoidable impacts of climate change is at the heart of EU's climate policy and its European Climate Law. Article 5.1 of this law obliges the relevant Union institutions and the Member States to ensure continuous progress in enhancing adaptive capacity, strengthening resilience, and reducing vulnerability to climate change. Article 6.1.b requires the Commission to assess the collective progress made by all Member States on climate adaptation, which is the objective of this report. In this section, we assess the state of our collective efforts, delving into the specifics of the progress made by Member States and our trajectory towards a healthy, safe, and resilient future.

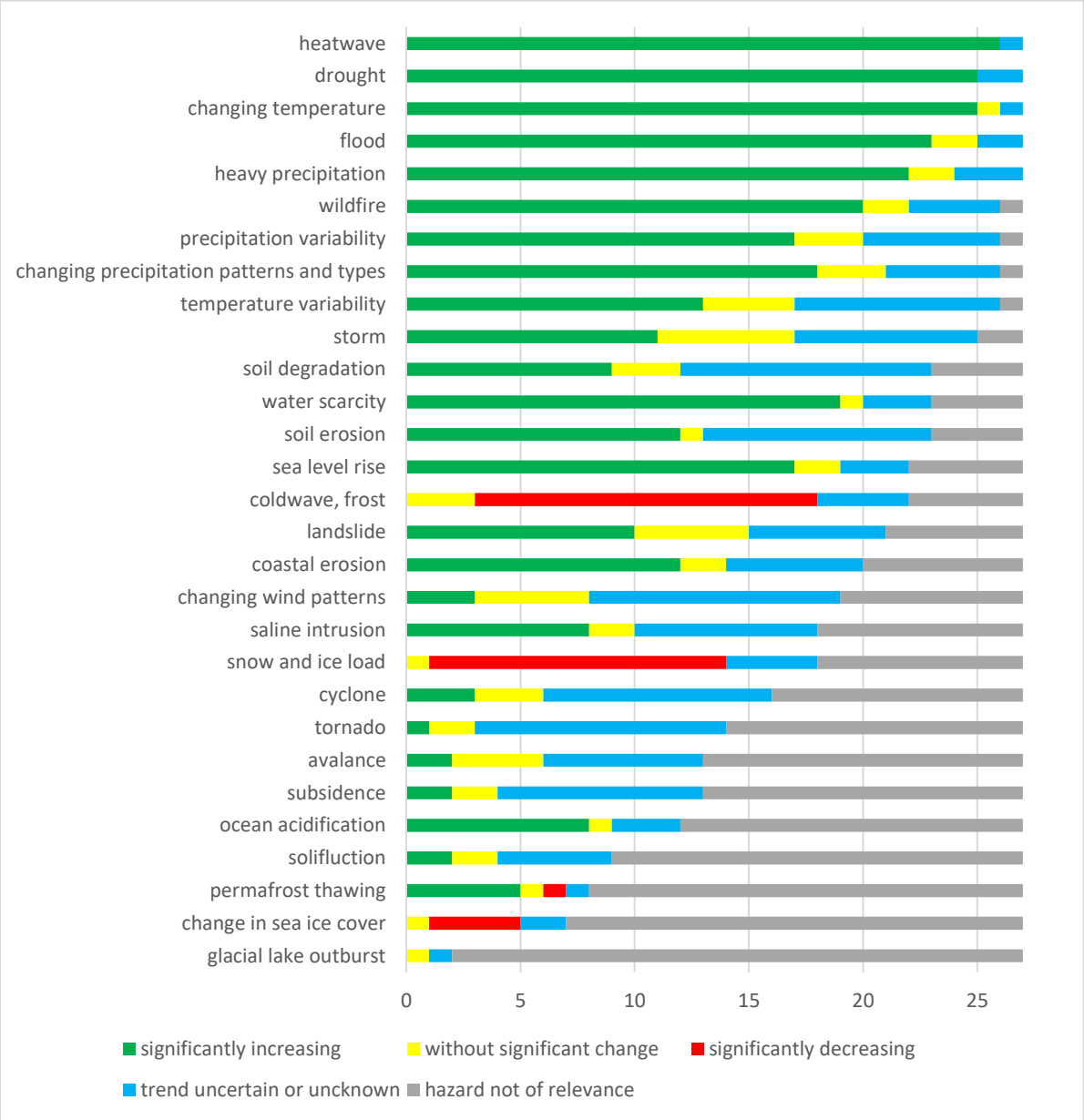
10.1 CLIMATE-RELATED HAZARDS, VULNERABILITIES, AND RISK

Member States reported heatwaves, droughts, floods, heavy precipitation, and wildfires as the most observed acute (i.e., sudden) climate hazards in Europe, while changing average temperatures and variability in temperature, precipitation and hydrology remain the most often reported observed chronic (i.e., persistent) climate hazards. With a few region-specific exceptions, there are no significant geographical differences in the reported hazards.

Expected future hazards mirror the current observations, with Member States' projections foreseeing a significant increase of heatwaves, droughts, floods, heavy precipitation, and wildfires among the acute hazards and changing temperature, water scarcity, changing precipitation patterns and types, sea level rise, and precipitation and hydrological variability among the chronic hazards. Member States reported that some hazards will be less frequent and/or intense in the future, such as cold spells, and change in snow and ice load. With a few exceptions, the hazards reported as expected future hazards are the same as the observed hazards. The biggest difference can be found for the chronic water-related hazard water scarcity, reported by seven more countries as a future key hazard compared to being an observed hazard.

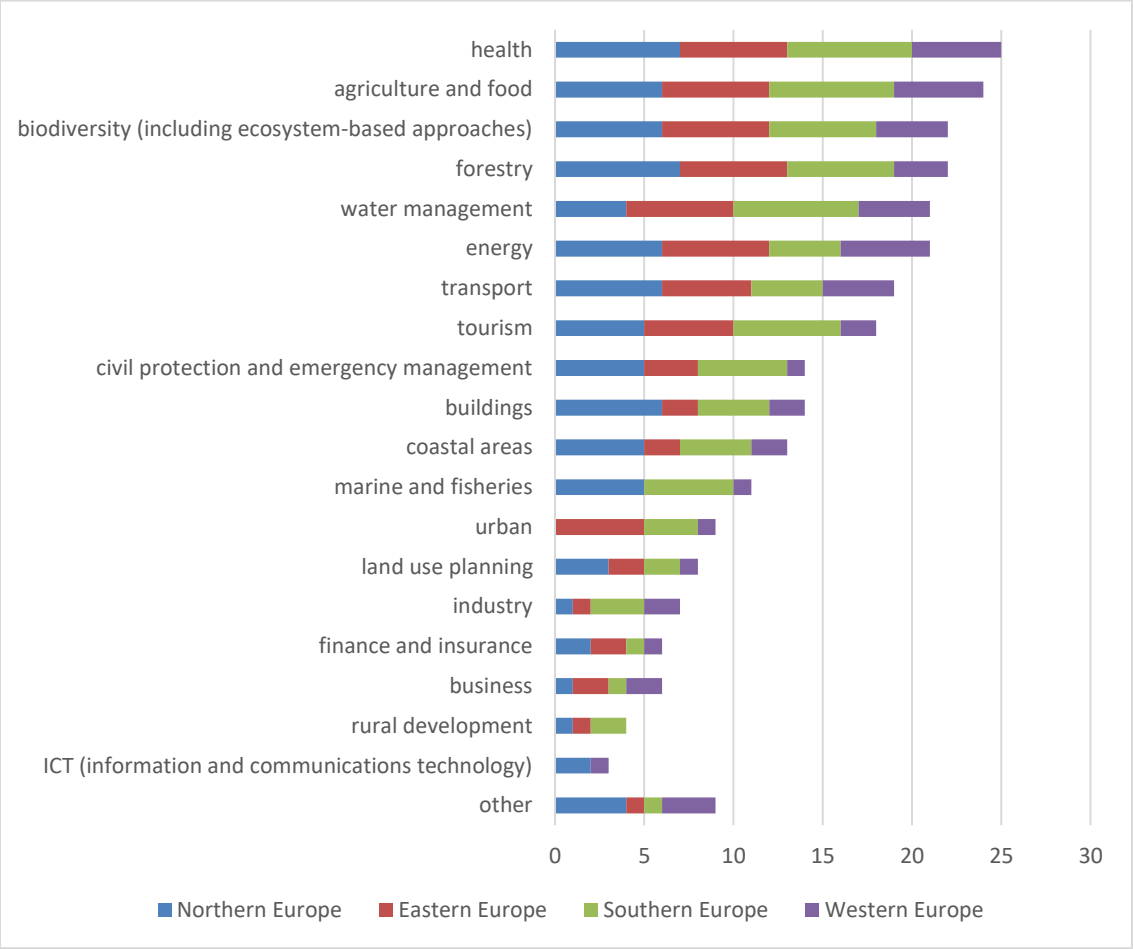
[91] This assessment is based on diverse sources, including the reporting of the Member States under art.17 and 19 on the Governance Regulation 2023, the EEA briefing "National adaptation action in 2023 - is Europe on track towards climate resilience?" and the ETC/CA technical report "Is Europe on track with climate resilience? - Status of reported national adaptation actions in 2023" .

Figure 10. *Key future hazards reported*



source: [EEA Briefing 'National adaptation actions in 2023 - is Europe on track towards climate resilience?']

Figure 11. Key affected sectors per geographical area



source: EEA Briefing 'National adaptation actions in 2023 - is Europe on track towards climate resilience?'

The sectors reported as being the most impacted by climate threats in Europe are health, agriculture, forestry, biodiversity, energy, and water management. In the future, Member States expect a high risk of being impacted by climate change for 45% of the key affected sectors, while for 31% of the sectors the future risk is expected as 'medium'.

In the case of 21 Member States the identification and reporting of relevant vulnerabilities and risks is fully in line with those indicated in the INFORM climate change-tool[92], while the correspondence is partial in the case of five Member States.

[92] Analyses based on the INFORM-tool at the Disaster Risk and Knowledge Management Centre of the European Joint Research Centre (JRC).

The hazards and affected key sectors reported by the Member States stemming from their climate vulnerability and risk assessments are overall in line with their reporting in the field of disaster risk management.[93]

10.2 CLIMATE RISK ASSESSMENTS

Member States reported further progress in assessing climate-related hazards, vulnerabilities[94] and risks, confirming that enhancement, expansion and deepening of the knowledge base on climate risks is a continuous process in many countries. From 2021 onwards a significant share of Member States (16) updated existing or conducted new climate risk and vulnerability assessments or obtained new climate risk-related information considered relevant for the national and sub-national policy-making perspective.

Different forms of climate risk assessments (CRA) or related knowledge products can be distinguished: national multi- or cross-sectoral climate risk assessments (or climate change assessments), thematic or sector-specific assessments at national scale, and sub-national climate risk assessments. From 2021 onwards, 14 of the Member States have conducted one or more of these forms of CRA.

The process of conducting CRA is recognized as time and resource-intensive, which might be a reason for the persistent disparities between countries that are advanced in CRA and those that are still lagging. Only 7 Member States have begun to tackle strategic knowledge gaps that are crucial to a more systemic adaptation (i.e., cross-border and international climate risks; cross-sectoral interactions; complex, compound, and cascading risks), however at rather low pace and to a limited extent.

Regarding governance, CRA and their periodic review have been increasingly institutionalized through new or enhanced legal requirements, often established under national climate laws. However, countries with legal commitments still represent a minority (see below).

Two thirds of the countries are either already engaged in ongoing work towards revising and updating their CRA or will report about respective plans soon.

Only two Member States indicated that they are working towards standardisation of their CRA, and in many countries, CRA and monitoring, reporting, and evaluation systems appear to be rather separate and parallel processes. Lack of data, knowledge, and information remain the most frequently reported barriers to progress in adaptation, including CRA. These gaps include inadequate identification of climate risks, limited capacity for systemic risk assessments, inadequate identification of climate risks and translation of climate risk information into practical

[93] and the Member State's reports of summary information on national risk assessment under the Union Civil Protection Mechanism, article 6 Decision (EU) 1313/2013

[94] Vulnerability: the propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements, including sensitivity or susceptibility to harm and lack of capacity to cope and adapt (source: IPCC, Assessment Report 6, WG 2 report, Glossary).

solutions. It is recognized that these barriers hampering progress in CRA appear to stem from limitations in financial and human resources, further emphasizing the resource-intensive nature of CRA.

10.3 ADAPTATION POLICIES AND PRIORITIES

Climate change adaptation policies in the European Union are constantly evolving, with five Member States having established new national adaptation strategies (NAS) and/or national adaptation plans (NAP) since 2021, and 12 Member States being in the process of updating their NAS and/or NAP or otherwise re-adjusting the respective policy setting. Compared to 2021, the adaptation priorities have not changed significantly. About half of the Member States reported their priorities in sectoral terms, the other half did so in terms of general objectives. As of 2023, the priority sectors most mentioned by Member States are health, biodiversity, water management, energy, agriculture and food and transport.

Increasingly, national policies are referring to European programs under the Multiannual Financial Framework 2021-2027, as well as the policies that constitute the Green Deal framework.

European legislation, such as the European Climate Law, is inspiring a growing number of countries to enact climate laws. At least eight Member States have climate laws that include provisions for adaptation, with six countries having newly introduced or amended them since 2021 while two countries are in the process of adopting one. The climate acts comprise of legal mandates for the NAS and/or NAP, obligatory climate risk assessments, review and revision cycles of policy documents and CRA, political and coordination policies, horizontal and vertical coordination bodies, scientific advisory bodies, and reporting requirements. Apart from the traditional NAS and NAP and climate laws, countries are also enacting additional legislative instruments that complement the adaptation policy framework.

Thirteen Member States were found to clearly link their adaptation plans and strategies to the climate vulnerabilities and risks they were facing, particularly in key affected sectors.

Two thirds of the Member States responded to new challenges by increasing efforts in their policies, 11 countries also at subnational level. Priorities for adapting to climate change reported by the countries are overall consistent with those reported in 2021, reflecting the long-term nature of adaptation policies. However, small shifts have been observed, notably the increased prioritization of the energy sector and coastal areas. The even distribution of priority areas reported among the four European geographic areas[95] as well as the listing of sectors, both in priority and as key affected sector are consistent with the previous reporting cycle. The health sector remains both a key affected sector and a priority across all reporting countries.

It is worth noting that the level and manner of integration of adaptation policies vary widely, reflecting differing national circumstances, governance structures, and institutional frameworks.

[95] The geographical areas classification of countries encompasses the following: Northern = Denmark, Estonia, Finland, Ireland, Latvia, Lithuania and Sweden; Eastern = Bulgaria, Czechia, Hungary, Poland, Romania and Slovakia; Southern = Croatia, Cyprus, Greece, Italy, Malta, Portugal, Slovenia and Spain; and Western = Austria, Belgium, France, Germany, Luxembourg and the Netherlands.

There is a prevalence of soft policies and voluntary cooperation, but one can detect an increasing trend towards legally binding national climate laws.

Almost all Member States (23) reported challenges, gaps and barriers related to the governance of adaptation. Shortcomings in organizing and implementing coordination and collaboration across sectors, levels and actors are among the most prevalent identified issues and appear to hamper implementation progress considerably. Effective adaptation actions appear not only to be dependent on the existence of coordination bodies, cooperation structures and regulatory frameworks, but also on the existence of clear responsibilities, awareness, and high political saliency. Insufficient coordination is often a direct consequence of a lack of financial resources, institutional and administrative capacities, expertise, skills, and training.

In conclusion, the policy landscape is characterized by a combination of continuity in long-term priorities, increasing alignment with European frameworks, evolving legislative instruments, incremental shifts in policy focus, and grappling with the challenges, gaps, and barriers to the governance of adaptation.

10.4 ADAPTATION POLICY GOVERNANCE

Institutional arrangements at national and subnational levels

Diverse national coordination bodies and mechanisms for horizontal policy integration and multi-level (vertical) coordination have been further developed and are now in place in almost all Member States. At the same time, governance systems for climate adaptation display a large and dynamic diversity, both across and within countries, where developments have taken place since the 2021 reporting in two-thirds of the Member States.

Legal requirements to enforce horizontal policy integration and binding vertical governance frameworks are increasing, however, 'soft' and collaboration-based forms of government still prevail. In at least eight Member States legislation is in place that defines binding requirements for the planning, implementation, and governance of adaptation to climate change policy.

High-level inter-ministerial or inter-sectoral coordination bodies concerned with developing, steering, monitoring, and reviewing national adaptation policies are established in 25 Member States. However, the mandates and the operational efficiency of these bodies vary.

Subnational adaptation policymaking is further progressing in all countries. Two-thirds of Member States reported progress since 2021 about cooperation at the subnational level, and about half of Member States indicate progress in reviewing and updating subnational adaptation policies, strategies, and plans.

Only nine Member States legally oblige regional, and local governments to prepare adaptation strategies and/or plans. 'Soft', collaboration-based forms of vertical steering for subnational levels are still more common than top-down regulatory frameworks and obligation for adaptation policymaking at the subnational level.

All Member States have a supportive governance framework for subnational levels in place, comprising policy inputs, capacity building (knowledge generation and provision, advisory services, and training), cross-level dialogue, support for participation in networks, as well as funding and financing. The presence of this framework is independent from the type of vertical steering present, be it either collaboration-based or top-down regulatory frameworks.

Subnational

The number of cities and municipalities with a local adaptation strategy and/or plan is increasing. A number of these local entities are signatories of the Covenant of Mayors, which offers active support in developing these strategies and plans. Countries also report the growing involvement of local and regional authorities in the EU Horizon Europe Mission on adaptation to climate change.

Regarding the implementation of adaptation, almost all countries reported substantial barriers, gaps and challenges, in terms of institutional, financial, technical, and human capacities. More than half of all countries report gaps in coordination, cooperation, and policy coherence, which are often connected to unclear division of responsibilities, lack of awareness and low political attention.

International and transnational cooperation

In most countries, international and transnational cooperation on adaptation issues continues to advance with a large number and diversity of forms and modes. In Europe, three types of transnational/international cooperation can be distinguished: managing transboundary climate risks, managing shared cross-border resources (e.g., river basins, maritime and coastal environment, and biodiversity), and coordinating national adaptation policies and actions across borders. Progress has been made by 19 Member States on international and transnational cooperation.

Major international conventions and multilateral policy frameworks addressing climate adaptation (e.g., Paris Agreement, UN Sendai Framework, Sustainable Development Goals) continue to play a crucial role in all countries, facilitating the strengthening of links between climate adaptation, sustainable development, and disaster risk reduction. One-third of the Member States reported new synergies in this field since 2021.

EU funding schemes for transnational cooperation (e.g., EU Interreg Programmes) and research (e.g., Horizon Europe, LIFE) continue to be strong enablers of transnational adaptation efforts for most Member States. These programmes bolster national policy processes and stimulate the development and implementation of innovative climate resilience measures across borders. Several countries reported the involvement of regional and local governments in the EU Horizon Europe Mission on Adaptation to Climate Change. This Mission focuses on supporting EU regions, cities, and local authorities in their efforts to build resilience against the impacts of climate change. It experiments with innovative solutions and pays specific attention to supporting

transnational cooperation and citizens engagement. Over 300 regional and local authorities from 25 EU Member States have signed the Mission Charter.[96]

Stakeholder engagement

The regular consideration of social justice and equity in adaptation measures is still nascent, highlighting a key area of focus in the future, to address the disproportionate impacts of climate change on vulnerable groups.

Progress in adaptation policy-related stakeholder engagement was found across 20 Member States. Examples of progress include the introduction of climate platforms, climate dialogues, and urban adaptation plans.

15 Member states are reporting an increase in attention to vulnerable populations, equality, and fairness, both at the national and the subnational level since 2021. With a quarter of the Member States reporting that they have made progress in this field since 2021, they are also stepping up their efforts to involve the private sector in the development and implementation of national adaptation policies. Various resources are provided to assist the private sector, such as online platforms, climate-related information seminars, and sector-specific risk assessment tools. Governments also finance adaptation projects to spur innovation in the private sector.

Seven Member States pointed to elements of new 'good practices and lessons learnt' such as Portugal's National Vector Surveillance Network in the health sector or Austria's peatland restoration projects.

10.5 IMPLEMENTATION AND FINANCING

Mainstreaming – or integrating - climate adaptation into different sectoral policies and plans is a crucial element of climate adaptation policy, and a specific objective of the EU Adaptation Strategy.

Compared to the 2021 reporting cycle, the number of Member States that reported mainstreaming of climate change into sectors or sectoral policies and plans directly affected by climate change impacts have further increased to 16. Some Member States increased the number of sectors considered considerably, most commonly transport, infrastructure, health, forestry, and water management.

Significant progress has been made in integrating climate change impacts into national disaster risk management frameworks and sectoral planning, such as national disaster risk management plans, flood risk management plans, and river basin management plans.

Seven countries report NAP and sectorial adaptation plans as key policy instruments that support effective integration (mainstreaming) of adaptation into national and sectoral policies, strategies, and plans.

[96] More information on the EU Mission on Adaptation to Climate Change, including the Mission Charter, can be found on https://climate-adapt.eea.europa.eu/en/mission/

The environmental impact assessment and especially the strategic environmental assessment are also instrumental in mainstreaming adaptation into sectoral policies and plans. Member states reported further progress in the availability of helping tools for the application of these instruments, such as online tools, checklists, and guidance.

More than half of Member States reported that since 2021 they have made progress with implementing adaptation measures. Regarding progress made in meeting adaptation priorities since 2021, more than half of Member States replied positively as well.

Efforts to boost adaptive capacity and reduce vulnerability have become more prevalent, with countries implementing a range of activities such as awareness-raising, capacity building, knowledge enhancement, and regional and local support. 16 Member States reported to have increased their adaptive capacity in 2023 compared to that in 2021. These efforts are further bolstered by sectoral programs and plans, the strengthening of local activities, like local adaptation strategies and plans and the alignment of research efforts with national adaptation priorities. As a result, more than half of Member States reported that since 2021 they have made progress towards reducing their climate impacts, vulnerabilities, and risks as well as increasing their adaptative capacity.

Assessing the investments made in different sectors to make it more resilient to climate threats remains a challenge for many Member States and is often only done partly (e.g., at national, regional level and/or sectoral level). Challenges are exacerbated by the absence of a common methodology to assess the investments costs made and to track financing of implementation of adaptation strategies and plans. Despite these difficulties, all Member States report an increase in investments made in sectors due to adaptation.

Most countries indicate that their NAS, NAP, sectoral adaptation plans, and regional adaptation plans do not have dedicated budgets or financing streams for their implementation. Also, the majority of countries report that dedicated adaptation funds for financing adaptation action are lacking, although the number of Member States that have these funds is on the rise.

10.6 MONITORING, REPORTING, AND EVALUATION

For monitoring, 18 Member States reported that they were conducting activities while 5 Member States were developing these activities (remaining 6 Member States for which there was no clear indication of monitoring activities or was insufficient information available). For reporting, 17 Member States reported conducting activities and 4 developing them (remaining 8 with no clear indication or insufficient information). And for evaluation, 11 Member States reported activities and 10 reported being developing them (remaining 8 with no clear indication or insufficient information). Although more countries are conducting or planning evaluations, these are still less commonly reported than monitoring or reporting activities.

Many Member States have incorporated monitoring, reporting, and evaluation in their NAS and NAP. These activities also take place as part of regional adaptation strategies and plans on a regional and local scale. Overall, half of the Member States reported an increase in monitoring, reporting and evaluation activities since 2021, at the national, regional, and local level. However,

the scale and depth of monitoring, reporting and evaluation activities for adaptation at subnational level varies. Seven Member States indicate that the monitoring and evaluation of actions implemented on a subnational scale are conducted in conjunction with the NAP and NAS, while 13 other Member States state that municipalities and regions are responsible themselves for the implementation and evaluation of their respective strategy or measures at regional and local level. So, in most countries, the subnational monitoring and evaluation process is not formally linked to national level planning.

Over three-quarters of Member States have made progress in reviewing and updating national adaptation policies, strategies, plans and measures. In some cases, laws have been adopted to ensure NAS are regularly reviewed, often every five years.

Using various methodological approaches and combining quantitative and qualitative data are key to effective monitoring, reporting and evaluation. Several countries highlighted the important role of indicators and reported on the new development of criteria for monitoring reduction of climate impacts, vulnerabilities, and the implementation of adaptation measures. Some countries prioritize developing multi-purpose indicators, which benefit more than one sector. Also, the development of performing qualitative assessments and evaluations, in close cooperation with stakeholders, was reported. While most of the Member States have implemented changes to their climate monitoring and modelling framework since 2021, more progress can be expected in the upcoming years.

Monitoring, reporting, and evaluation occurring at national, regional, and local level has the potential to be a powerful instrument to influence decision-making throughout the adaptation policy cycle.

Still, few Member States explicitly report how monitoring, reporting and evaluation is supposed to feed back into the development of adaptation polices or how and by whom the activities are coordinated. When it comes to good practices, most Member States that reported progress imply that the role of a coordinating actor, such as a ministry, governmental agency, or an institute of environmental protection (or such) is often significant when both scaling up the adaptation actions or when evaluating their progress.

10.7 CONCLUSIONS

Climate adaptation measures are almost always tailored towards the specific sector and the local conditions. However, the sum of all the activities defines the resilience of a territory or a country to the unavoidable impacts of climate change. Also, the threats and impacts of climate change are not restricted to national or regional borders; if a country or region does not take appropriate action, climate impacts may cascade to neighbouring areas. Through an analysis of the reporting of Member States of their progress in the field of climate adaptation, it has been possible to pinpoint areas of success, identify potential gaps and shortfalls, and determine the best practices to be adopted, replicated, and scaled across different regions.

Member States reported heatwaves, droughts, floods, heavy precipitation, and wildfires as the most observed acute climate hazards in Europe, while changing temperature, changing precipitation patterns, sea level rise and hydrological variability among the most often reported observed

chronic climate hazards. Anticipated future hazards are the same as the observed hazard, with exception for water scarcity, reported by seven more countries as a future key hazard compared to being an observed hazard.

Health, agriculture, forestry, biodiversity, energy, and water management are the sectors reported as being the most impacted by climate threats in Europe.

Almost all Member State have carried out climate risk assessments, 14 of these have been updated in recent years, and the rest are scheduled for updates soon.

All Member States have national adaptation strategies (NAS) and/or national adaptation plan (NAP) in place. A considerable part of these strategies and plans have recently been renewed or are under revision and will be renewed in the coming years. Also, more national sectoral adaptation plans have been adopted. The policy landscape is characterized by a combination of continuity in long-term priorities, increasing alignment with European frameworks, evolving legislative instruments, incremental shifts in policy focus, and grappling with challenges, gaps, and barriers to the governance of adaptation.

National and subnational governance structures and mechanisms for horizontal policy integration and multi-level (vertical) coordination have been further developed and are now predominantly in place, with regular review cycles. The mandates and operational features of these bodies vary greatly. Despite the growing number of Member States (specifically, 8 Member States) embedding vital elements of their adaptation policy systems in binding legal frameworks, soft and collaboration-based forms of vertical and horizontal governance still predominate. The variety in mandates and operational features is also caused by the difference in governance structures cooperation culture. Some countries have tasked dedicated adaptation working groups (as permanent bodies or temporary task force-type groups) of coordination at technical and operational level. In some countries, the development of NAS and NAP is steered by several thematic working groups, while in other countries this competence of the inter-ministerial working group.

On international and transnational cooperation, progress has been made in two-thirds of the countries. The regular consideration of social justice and equity in adaptation measures is still nascent, highlighting a key area of focus in the future, to address the disproportionate impacts of climate change on vulnerable groups. Progress in adaptation policy-related stakeholder engagement was found across two-thirds of the Member States.

Member States are progressing in the implementation of adaptation measures, including mainstreaming of adaptation in sectoral policies and plans. Significant progress has been made in integrating climate change impacts into national disaster risk management frameworks and sectoral planning. Assessing the costs of adaptation remains a challenge for many Member States and is often only done partially. NAP and NAS often do not have dedicated budgets or financing streams for their implementation, nor do most countries have dedicated adaptation funds for financing adaptation action.

Half of the Member States reported an increase in monitoring, reporting and evaluation activities since 2021, at the national, regional, and local level.

Understanding our progress towards the climate adaptation objective is not only a mechanic exercise of accountability, but also a critical step in designing a better future course of action. Together, as the Union and the Member States, we must continuously refine our approach to climate resilience, enhance cooperation and share good practices. Our path involves amplifying our use of existing solutions and infusing innovation to bolster systemic climate resilience. In doing so, we aim to protect our communities, safeguard the environment, and fortify the economic foundations that depend on them, especially in the face of escalating climate challenges.

Figure 12. *Overview of progress made since 2021 for a set of adaptation policy indicators (summary view)*

Table 15 : List of full questions examined for each indicator.

Questions	Possible values
SECTION 1.1, 1.2: NATIONAL CIRCUMEMBER STATESTANCES RELEVANT TO ADAPTATION ACTIONS AND CLIMATE MONITORING AND MODELLING FRAMEWORK	
1. Have there been any changes to the climate monitoring and modelling framework since 2021?	Yes – Fully, Yes – Partially, No, Unclear - No Submission, N/A
SECTION 1.3: ASSESSMENT OF CLIMATE IMPACTS, VULNERABILITY AND RISKS, INCLUDING ADAPTIVE CAPACITY	
2. Has the Member State considered the following sectors as a key affected sector: agriculture and food, and water management?	Yes – Fully, Yes – Partially. No, Unclear - No Submission N/A
3. Have there been any changes to the reported vulnerabilities and risks since 2021?	Yes , No, Unclear - No Submission, N/A
4. Based on the INFORM climate change tool, have all relevant vulnerabilities and risks been identified in their 2023 submission?	Yes – Fully, Yes – Partially, No, Unclear - No Submission, N/A
4a. Are heatwaves identified as a future climate hazard by the Member State?	Yes, No, Unclear - No Submission, N/A
SECTION 2: LEGAL AND POLICY FRAMEWORKS AND INSTITUTIONAL ARRANGEMENTS	
5. Are there relevant national governance structures in place to support adaptation actions?	Yes – Fully, Yes – Partially, No, Unclear - No Submission, N/A
6. Have there been any changes to the national governance structures since 2021?	Yes – Fully, Yes – Partially, No, Unclear - No Submission, N/A
SECTION 3: ADAPTATION STRATEGIES, POLICIES, PLANS AND GOALS	
7. Are the adaptation priorities, strategies, policies, plans, and efforts taken by the Member State correlated with the vulnerabilities and risks identified? Are they well aimed to reduce these?	Yes – Fully, Yes – Partially, No, Unclear - No Submission, N/A
8. Is there a decrease in the 2023 reported challenges, gaps and barriers to adaptation compared to 2021?	Yes – Fully, Yes – Partially, No, Unclear - No Submission, N/A
9. Are there any new key efforts identified in national strategies, polices and plans? Are these new efforts in line with any new vulnerabilities and risks identified?	Yes – Fully, Yes – Partially, No, Unclear - No Submission, N/A
10. Are nature-based solutions and ecosystem-based adaptation promoted in national strategies, policies and plans?	Yes – Fully, Yes – Partially, No, Unclear - No Submission, N/A
11. Has progress been made in integrating climate change adaptation into sectoral policies, plans and prograMember States?	Positive, Neutral (no progress), Negative, Progress is unclear

12. Has progress been made engaging with stakeholders particularly vulnerable to climate change impacts in relation to adaptation policy?	Positive, Neutral (no progress), Negative, Progress is unclear
13. Has progress been made engaging with private sector stakeholders in relation to adaptation policy?	Positive, Neutral (no progress), Negative, Progress is unclear
SECTION 4: MONITORING AND EVALUATION OF ADAPTATION ACTIONS AND PROCESSES	
14. Has progress been made in establishing and operationalising monitoring mechanism since 2021?	Positive, Neutral (no progress), Negative, Progress is unclear
15. Has progress been made in the implementation of adaptation measures?	Positive, Neutral (no progress), Negative, Progress is unclear
16. Has progress been made towards reducing climate impacts, vulnerabilities, and risks?	Positive, Neutral (no progress), Negative, Progress is unclear
17. Has progress been made towards increasing adaptive capacity?	Positive, Neutral (no progress), Negative, Progress is unclear
18. Has progress been made in meeting adaptation priorities?	Positive, Neutral (no progress), Negative, Progress is unclear
19. Has progress been made in addressing barriers to adaptation?	Positive, Neutral (no progress), Negative, Progress is unclear
20. Has progress been made in reviewing and updating vulnerability and risk assessments?	Positive, Neutral (no progress), Negative, Progress is unclear
21. Has progress been made in reviewing and updating national adaptation policies, strategies, plans, and measures?	Positive, Neutral (no progress), Negative, Progress is unclear
SECTION 5: COOPERATION, GOOD PRACTICES, SYNERGIES, EXPERIENCE AND LESSONS LEARNED IN THE FIELD OF ADAPTATION	
22. Are there any new 'good practices and lessons learnt' compared to 2021?	Yes – Fully, Yes – Partially, No, Unclear - No Submission, N/A
23. Are there any new synergies identified with other international frameworks and/or conventions compared to 2021?	Yes – Fully, Yes – Partially, No, Unclear - No Submission, N/A
24. Has progress been made with regards to cooperation?	Positive, Neutral (no progress), Negative, Progress is unclear
SECTION 6 - SUBNATIONAL LEVEL INFORMATION	
25.Are relevant subnational governance structures in place to support adaptation actions?	Yes – Fully, Yes – Partially, No, Unclear - No Submission, N/A
26. Are there any new key efforts identified in subnational strategies, polices, plans and efforts?	Yes – Fully, Yes – Partially, No, Unclear - No Submission, N/A

27. Has progress been made in engaging with stakeholders in relation to adaptation policy?	Positive, Neutral (no progress), Negative, Progress is unclear
28. Has progress been made in reviewing and updating subnational adaptation policies, strategies, plans, and measures?	Positive, Neutral (no progress), Negative, Progress is unclear
29. Has progress been made with regards to cooperation at a subnational level?	Positive, Neutral (no progress), Negative, Progress is unclear

11 OVERVIEW OF SUSTAINABLE FINANCE POLICIES

Since 2018, the Commission has endeavoured with the **Sustainable Finance Action Plan** to put in place a comprehensive regulatory framework to enable the reorientation of private capital flows to finance the transition towards a sustainable economy[97]. Three core and interdependent objectives underpinned the actions set out in the Action Plan, namely: i) the reorientation of capital flows towards a more sustainable economy; ii) mainstreaming sustainability into risk management and; iii) fostering transparency and long termism (in investment decisions). In 2021, the Commission updated its strategy through the **Renewed Sustainable Finance Strategy**[98] with a view mainstream transition finance considerations into the current regulatory framework. In that context, the Commission published in June 2023 a non-binding recommendation on Transition Finance.[99] This document provides a strict definition of Transition Finance that is aligned with the 1.5ºC target and some recommendations for a wide range of stakeholders including inter alia financiers, non-financial corporates and supervisors to highlight how the various components of the EU sustainable finance toolbox can be used to foster the raising of transition finance.

This regulatory framework notably centres around the **EU Taxonomy**, a dynamic tool defining activities that can be considered environmentally sustainable. Most importantly, by defining sustainability at the granular level of economic activities, the Taxonomy allows to monitor the shares of sustainable expenditures and turnover at company level. This in turn allows to compare the sustainability of different companies and of the portfolios exposed to such companies. The Taxonomy follows an iterative process with a first set of activities centring on the Climate Change mitigation and Adaptation objectives adopted in 2021 and a second set of activities contributing to the Water, Circular Economy, Pollution and Biodiversity Objectives adopted in 2023. Together with the Platform on Sustainable Finance, the Commission will keep working on the Taxonomy, to add new activities and to update existing criteria reflecting technological and regulatory changes.

Relatedly, the Commission put in place the first regulations in the world to require sustainability disclosures for corporates and financial market participants. These are respectively the **Corporate Sustainability Reporting Directive** (**CSRD**) - amending the existing Non-Financial Reporting Directive (NFRD), notably by extending the scope of companies required to disclose on their sustainability impacts and risks in accordance with the double materiality principle – and the **Sustainable Finance Disclosures Regulation** (**SFDR**). Regarding the CSRD, the Commission adopted in July 2023 the **European Sustainability Reporting Standards** (**ESRS**), a comprehensive set of corporate reporting standards covering 12 environmental, social and governance factors. This set of standards will be complemented in the future with sector-specific reporting standards as well as SME-specific ones. Reporting under this directive will be progressive, starting in 2025 for the 2024 financial year for the corporates already in the scope of the NFRD and rolling out until 2028. Similarly, regarding the SFDR, the Commission adopted in 2022 a set of reporting standards for financial market participants, requiring investors to explain their sustainability strategies, impacts and risks both at entity-level and at financial product-

[97] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018DC0097
[98] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021DC0390
[99] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32023H1425

level.[100] These standards are currently being revised, in part to make them consistent with the upcoming corporate reporting under the CSRD but also to improve their overall usability. Additionally, the Commission has begun a comprehensive review of the SFDR to assess whether and how this framework could be improved. A public consultation will be launched by end 2023.

Relatedly, in August 2022, new requirements on financial advisors and distributors entered into force, providing them to ask for the sustainability preferences of their clients using the Taxonomy.[101] This is an important new development which will only further underscore the existing demand for sustainable and ESG financial products by making the link from retail investors all the way to non-financial corporates through asset managers.

While the aforementioned pieces of legislation provide mostly soft incentives to enable the reorientation of capital flows, the Corporate Sustainability Due Diligence Directive (CSDDD)[102] currently still in the codecision process represents the hardening of sustainable finance policy. Indeed, while the CSRD only requires corporates to disclose on their material sustainability risks and impacts, the CSDDD shall require corporates to act on these risks and impacts by implementing adequate mitigation measures and due diligence. This would be a major step forward in sustainable finance policy and aside from a few isolate cases (e.g France's Loi sur le devoir de vigilance), a world's first, with the potential for the EU to export its environmental and social norms.

In 2023, the Commission adopted a proposal for an ESG Ratings Regulation[103], aiming as its name suggests, to regulate ESG ratings agencies and ESG service providers. Notably, these will have to disclose on the methodologies used to rate entities, explaining what is rated (risks, impacts or both) and how. Credit ratings are not in the scope of the ESG Ratings Regulation. However, the Commission mandated the European Securities and Markets Authorities (ESMA) to provide its advice by end 2024 on whether and how credit ratings could incorporate sustainability factors.

Sustainable Finance policy also aims at making the financial sector more resilient to sustainability risks. For instance, as of 2023, banks are going to start publishing ***sustainability disclosures***, including on their exposure to climate risks, any mitigating actions, and the degree to which their assets are aligned with the green Taxonomy. Furthermore, the proposed changes to the Capital Requirements Regulation shall task the European Banking Authority to consider whether ESG elements need to be factored in when computing ***bank capital requirements*** (e.g. the introduction of a green supporting factor or a brown penalizing factor). Finally, the European Commission asked in 2023 European ***supervisory authorities*** to analyze the resilience of the European financial sector against the EU's climate targets for 2030.

[100] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02022R1288-20230220

[101] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32021R1253&from=EN

[102] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52022PC0071

[103] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52023PC0314

12 COMMISSION'S ASSESSMENT OF LONG-TERM STRATEGIES

Stable long-term strategies **are crucial to help achieve the economic transformation needed** and broader sustainable development goals, as well as move towards the long-term climate goals we committed to globally in the Paris Agreement and within the EU with the Climate Law **to reach net zero greenhouse gas emissions by 2050**. Long-term strategies improve the knowledge of 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**[104] 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.

In September 2022, in view of the substantial delay of **Bulgaria**, **Ireland**, **Poland** and **Romania** in notifying their long-term strategies, the Commission opened formal infringement proceedings and sent letters of formal notice to these countries.[105] The case has been closed for **Bulgaria**, which on 27 October 2022 submitted its strategy, but the other three infringement proceedings are ongoing. The Commission will consider the next steps according to further developments. Based on the replies to the Commission's letters, the remaining strategies are expected to be delivered in the course of 2023, or early 2024, at latest.

Since October 2021, one additional Member States, **Bulgaria**, has submitted its long-term strategy to the Commission. The strategy, presents alternative scenarios, including a pathway to approach climate neutrality by 2050, without defining a specific goal.

Overall, by October 2023, 24 Member States[106] have submitted their long-term strategies required by the Governance Regulation. Of these, 14 Member States[107] clearly expressed their aim to achieve climate neutrality or carbon neutrality[108] by 2050 or before.[109] Others aim to be largely

[104] Article 15 of Regulation (EU) 2018/1999.
[105] 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) for failing to notify their national long-term strategies under Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action.
[106] BE, BG, CZ, DK, DE, EE, EL, ES, FR, HR, IT, CY LV, LT, LU, HU, MT, NL, AT, PT, SI, SK, FI, SE. LT and HU submitted an update of their initial strategies in July and September 2021, respectively.
[107] AT, DK, ES, FI, FR, HU, IT, LT, LV, LU, PT, SE, SI, SK.
[108] While neutrality means by definition that residual emissions are compensated by removals, not all Member States provided the respective share of emission reductions and removals and the level of ambition for actual reductions varies.
[109] FI by 2035 and SE by 2045.

climate neutral[110] or to achieve reductions of 80-95% by 2050. Only nine Member States, however, have reported legally binding goals or targets.[111] 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, although this is not clearly stated in all cases. Likewise, where a target has been set, it is not always clear if it is legally binding.[112]

The national long-term strategies also provide useful information at sectoral level, which allow strengths and remaining challenges to be identified and recognised, although coverage varies significantly across Member States or lack details on the precise scope, notably the expected role of land use and removals (see Table 16). In this respect, it is worth mentioning that the current land use and forestry EU regulation provides that Member State may use the managed forest land flexibility only if their long-term strategy has included ongoing or planned specific measures to ensure the conservation or enhancement of forest sinks and reservoirs.[113]

***Table 16**: Summary of the national long-term strategies' main features submitted by the EU Member States*

Long-term strategies' main features	AT	BE	BG	HR	CZ	DK	EE	FI	FR	DE	GR	HU	IT	CY	LV	LT	LU	MT	NL	PT	SK	SI	ES	SE
Climate neutrality by 2050 or earlier	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	
Emission projections by sectors	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
Estimated share of renewable	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	
Estimated investment needs			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
Adaptation Policies and Measures	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

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[114] also varies across Member States, with gaps in needs for research, development and innovation, estimated long-term investments, CO_2 intensity of GDP and, to a lesser extent, on the expected contributions of renewable energy, energy efficiency, and agriculture-specific emission reductions (see Table 17 for more details). As for

[110] DE - it should be noted, however, that the German long-term strategy, as submitted to the Commission in January 2020, was prepared in 2016. According to the Climate Change Act, as amended in July 2021, Germany now aims at achieving climate neutrality by 2045.

[111] DK, EE, FR, HU, LU, MT, NL, ES, SE. Beside the information provided in the national long-term strategies, also Germany and Ireland have enshrined climate targets in legislation.

[112] Another limitation in the submitted national strategies concerns the scope of GHG covered by modelling results, scenarios and targets. The strategies submitted by 15 Member States (AT, BG, HR, EE, FI, FR, DE, HU, IT, LT, LU, MT, NL, ES, and SE) cover CO_2, CH4, N2O and F-gases. For the remaining Member States, the coverage of gases was not always clear.

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

[114] See Annex IV of Regulation (EU) 2018/1999.

their legal status, less than half of the long-term objectives have been enshrined into national law, according to the information submitted to the Commission.[115]

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 and, in case of missing data, on other available information,[116] points to a reduction of GHG emissions of around 85% by 2050 for the EU as a whole. This means that roughly 700 million tonnes of CO_2 equivalents still need to be cut or absorbed to achieve climate neutrality by 2050.[117] This amount appears to be above the CO_2 absorption capacity resulting from the different model-based analyses underpinning EU climate initiatives.[118] 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. This underlines the importance to continue developing policies to increase and meet ambition over time.

[115] For a more detailed assessment of the long-term strategies submitted by Member States, please refer to the DG CLIMA 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

[116] These estimates use, where possible, information from the national long-term strategies with a specific order: first the national targets or, when unavailable or unclear, scenario results (i.e. in case of range of values, the most ambitious scenario is considered). In 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, we used information Member States submitted to the Commission under other reporting exercise (i.e. integrated National Energy and Climate Plans, 2021 GHG projections). Only when national information were not available, we used, as a last resort, data from the 2020 Reference Scenario EU Reference Scenario 2020 (europa.eu). Overall, three quarter of the 2020 EU GHG emissions are covered by national sourced information. Unfortunately, the aggregated data and analyses are less meaningful when it comes to CO_2 removals and energy data, where lack of data in the national long-term strategies are significant.

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

[118] See, for example, Section 4.7.2 of the In depth Analysis in support of the Commission Communication "A Clean Planet for all", or Figure 11 of SWD(2016)249. Moreover, these estimates do not include emissions from international maritime and aviation, which could partly be covered by the EU climate neutrality objective.

Table 17: 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 to 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 to 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 natural and technical sinks needed to reach carbon neutrality	CO_2 intensity of GDP of GDP investment needs 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 climate change impact on agriculture address energy poverty	information at national level GHG and CO_2 intensity of GDP 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's investment need < 15bn up to 2050 technical sinks to reach carbon neutrality	GHG and CO_2 intensity of GDP emission reductions by sub-sector socio-economic impact
Croatia (24/06/2021)	Unspecified	(-57%, -73%)	yes	no	?	(53.2%, 65.6%)	(-25%, -37%)	overall impact on GDP uncertain around 40'000 new green jobs additional investment above 1.5% of GDP	reductions and removals in LULUCF socio-economic impact 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 gradual closure of thermal power plants natural and tech. sinks to reach neutrality	GHG and CO_2 intensity of GDP emission reduction in buildings socio-economic impact
Czechia (20/12/2019)	Unspecified	-80%	?	no	?	n.a.	n.a.	investment peak with expansion of CCS strengthen energy taxation Increase share of nuclear in energy mix	GHG and CO_2 intensity of GDP emission reductions by sector socio-economic impact
Denmark (20/12/2019)	Climate neutrality	n.a.	yes	yes	no	n.a.	n.a.	targets enshrined in law doubling organic farming increase spending in green research	public consultation emission reductions power & buildings socio-economic impact
Estonia (30/12/2019)	quantitative GHG emission reduction target	-80%	yes	no	no	n.a.	n.a.	targets enshrined in law large investment needed in RES minor impact on GDP and jobs	CO_2 intensity of GDP emission reductions in buildings 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 employment sensitive to arable lands annual investment ~3% of GDP	CO_2 intensity of GDP emission reductions in buildings strategies for related R&D&I

Country (date of submission)	Overall LTS goal by 2050	Projected GHG emission reductions by 2050 (% change compared to 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 to 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 positive impact on GDP annual investment ~3.5% of GDP	GHG and CO_2 intensity of GDP reductions and removals in LULUCF 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 to recent review of the country's target aimed at reaching climate neutrality by 2045	GHG and CO_2 intensity of GDP emission reductions by sector investment & socio-economic impact
Greece (08/01/2020)	Unspecified	(-83%, -95%)	?	?	?	(82%, 114%)	n.a.	increase use of heat pumps (buildings) and biofuel (transport) investment needs €0.1 to €1.1 bn per year	GHG and CO_2 intensity of GDP emission reductions agriculture & waste socio-economic impact
Hungary (21/09/2021)	Climate neutrality	-100%	yes	yes	no	close to 90%	(-30%, -37.4%) (compared to 2017)	positive impact on GDP and jobs annual investment ~4.8% of GDP avoided damage and benefits > costs	reductions and removals in LULUCF emission reductions in buildings
Italy (11/02/2021)	Climate neutrality	(-84%, -87%)	yes	no	no	(85%, 90%)	-49%	slightly negative impact on GDP boost sustainable finance focus on adaptation strategies	emission reductions in waste Investment needs socio-economic impact
Latvia (27/12/2019)	Climate neutrality	-85% (by 2040)	?	yes	?	n.a.	-37% (primary energy consumption)	positive impact on GDP annual investment ~1.4% of GDP creation of new (green) jobs	CO_2 intensity of GDP emission reductions in buildings 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 4% of GDP invested in R&D&I by 2040 focus on adaptation strategies	public consultation GHG and CO_2 intensity of GDP emission reductions by sector
Luxembourg (04/11/2021)	Climate neutrality	-100% (including LULUCF)	yes	yes	no	100%	n.a.	support sustainable finance ensure a just transition for citizens and enterprises	emission reductions in 2050 for all sectors reductions and removals in LULUCF estimated investment needs
Malta (21/10/2021)	Unspecified	-82%	yes	no	no	n.a.	n.a.	increased job opportunities improved air quality and health investment in renewables > €2bn to 2050	CO_2 intensity of GDP LULUCF, RES, FEC/PEC targets
Netherlands (18/12/2019)	Quantitative GHG emission reduction target	-95%	yes	yes	no	n.a.	n.a.	net-zero requires large scale CO_2 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

Country (date of submission)	Overall LTS goal by 2050	Projected GHG emission reductions by 2050 (% change compared to 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 to 2005)	Highlights from investment needs, enabling policies and socio-economic impact	Key reporting gaps
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 CO_2 intensity of GDP strategies related to R&D&I adaptation policies and measures
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 CO_2 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 €66 to €72 bn focus on a climate resilient society	GHG and CO_2 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	CO_2 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 CO_2 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) In the case of Germany, the 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 at achieving climate neutrality by 2045. (3) In April 2021, Denmark submitted an update of its LTS under Art. 18(1)(a) and Annex VI(b) of the Governance Regulation, to reflect the Danish Climate Act adopted in June 2020, which sets a near-term target of reducing Denmark's total greenhouse gas emissions by 70% by 2030 compared to the 1990 level and sets a long-term target of achieving climate neutrality by 2050 at the latest. (4) In July 2023, with the entry into force of the Climate Act, Netherlands has a legally binding target to achieve climate neutrality by 2050. (5) Projected GHG emission reductions are all expressed as percentage change compared to 1990 level (except for BE, PT and SI where reduction rates refer to 2005 GHG emission levels, MT to 2020 level and FR to 2015 level), as a target or as the extreme values of the projected range. In the case of Denmark, projections in the LTS refer to a scenario with existing measures, not in line with the goal, therefore they have not been reported in the table. (6) "?" means that the LTS does not provide enough 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 percentage change compared to 2005 consumption level. (8) Annual investment needs are generally considered additional to a business as usual (BAU) or with existing measures (WEM) scenarios for the period 2020-2050. (8) Key reporting gaps are meant to provide only a general view of the completeness of the LTS and do not distinguish between mandatory and non-mandatory elements.

13 EXAMPLES OF FUNDING OF CLIMATE RELATED PROJECTS

Indicative list of examples for boxes for the "communication version" of the report.

Example 1. Climate monitoring reports

The monthly climate monitoring reports from the European Union's Copernicus Climate Change Service, the US National Oceanic and Atmospheric Administration and NASA confirm the extraordinary pace of climate change because of heat-trapping greenhouse gases in the atmosphere.

Global ocean surface temperatures were the highest ever recorded and expected to further increase due to the El Nino event, leading to more marine heatwaves and devastating impacts on marine ecosystems, including coral bleaching. Sea ice also reached lowest coverage ever recorded in July 2023.

Example 2. Climate action campaign for low-income households

To support consumers in the transition to a net-zero emission economy, the LIFE - Doppel Plus project encouraged changes in the everyday behaviour of low-income households in Austria. In the Austrian State of Tyrol, approximately 100 000 people are threatened by poverty and estimated 10 000 households are affected by energy poverty. Between 2016 and 2021, the LIFE project Doppel Plus trained 91 energy and climate coaches, who provided advising sessions to 806 Tyrolean low-income household (mainly single parents, asylum seekers, long-term unemployed, migrants and retirees). The target group received free advice on how to minimise energy costs and adopt a more climate-friendly approach to everyday life. Through individual coaching sessions on matters related to heating, cooling and ventilation, but also mobility and nutrition, and the distribution of "starter packages" (led lamps, aerators for taps and other practical items), each household was able to save an average of 2091 kWh of household energy per year, corresponding to a reduction of 667 kg CO_2-eq and EUR 200 in savings. In addition, stakeholders such as electricity utility companies, transport companies and public bodies were addressed through lectures, workshops, and train-the-trainer programmes to build up a broad network and integrate the sustainability goals and offers of the project into various sectors. Today, the activities of Doppel Plus are being continued by the project partners with the support of the State of Tyrol as part of the *Tirol 2050 energie autonom* energy strategy.

Example 3. Reducing carbon emissions in the EU through sustainable diets

In the EU, the food we produce, consume and waste has a significant impact on climate and environment, accounting for 30% of all EU GHG emissions and polluting land and water resources. Between 2018 and 2022, the project **LIFE-SU EATABLE**, coordinated by the Barilla Foundation, carried out a series of pilot engagement activities at university and company canteens in Italy and UK to promote the adoption of a sustainable and healthy diet. Combining educational and informative campaigns with a sustainable food offering and the use of a dedicated digital platform, the project involved 17 partners (companies, universities and caterers) and 6557 people, leading to an estimated saving of about 1.7 kg of CO_2-eq. and 1,67 litres of water per person per

day, compared to the daily average impact of an EU citizen. Furthermore, SU-Eatable has encouraged the replication of its solutions through communication activities, scientific publications, implementation guidelines and replication toolkits.

Example 4. European Hydrogen Bank

Hydrogen is one of the key technologies of Europe's Net-Zero Industry Act. Hydrogen is a clean fuel that will play an important role in the EU's transition to climate neutrality by 2050, with high relevance for the decarbonization of the industrial sector. The European Hydrogen Strategy (COM/2020/30) set out the objective to produce 10 million tons of renewable hydrogen domestically in the EU, and the REPowerEU plan (COM(2022) 230) complemented this goal by facilitating additional 10 million tones in imports by 2030. In 2023, the setting up of the European Hydrogen Bank was announced, with the objective to close the infrastructure investment gap and connect future supply of renewable hydrogen with European demand. The Hydrogen Bank is organized in two parts, one directed to support domestic market creation, and another directed to promote imports into the EU. The production of renewable hydrogen in Europe will be supported by auctioning fixed green premiums on the unitary costs for producing hydrogen. The premiums will be provided by using funds from the ETS Innovation Fund. A first pilot auction, with a budget of 800 million euros, is planned to be held by the end of 2023. This approach will create a transparent and efficient risk sharing mechanism with the private sector. The auctioning system developed under the European Hydrogen Bank may be also offered to Member States as a service to allocate their own funds, and so create a one stop window at European level for hydrogen projects and reduce administrative burdens for applicants.

Example 5. Collaborative Observatory for Assessment of the EU ETS

LIFE21-GIC-IT-LIFE COASE As the international community struggles to put global greenhouse gas (GHG) emissions on a trajectory consistent with the main objective of the Paris Agreement, carbon markets represent valuable tools to successfully achieve climate mitigation targets. The growing role of carbon markets is testified by the number of jurisdictions that have adopted or consider adopting an emissions trading system (ETS) to meet their long-term goals. In this context, the EU ETS continues to be the centrepiece of EU climate policy as well as a fundamental element of the global carbon market and a reference model for many governments outside the EU. This crucial exchange model aims to achieve ambitious climate neutrality targets by 2050. The phasing-out of regulated emissions needs to be accomplished by minimising carbon leakage and safeguarding the international competitiveness of regulated industries, a process which should be perceived as fair by European citizens and involving a call for stronger climate action by other countries. All these expectations call for a solid and comprehensive system to monitor EU ETS functioning, including its environmental end economic effects, interactions with other policies and changes within the carbon market. A comprehensive monitoring of the system should also cover forward-looking analyses, taking into consideration any relevant developments outside the EU so to help policymakers to assess ex-ante the consequences of different policy/regulatory options and to exchange information with experts and representatives of other major carbon markets. To various degrees, activities of monitoring, assessment, and information exchange around the EU ETS are already ongoing, out but there is a strong need for enhancing and implementing them on a more regular basis.

Example 6. Belgium Renovates for Energy Efficient Living

The energy use of Belgian houses is 70% higher than the European average, showing the enormous potential for energy saving and greenhouse gas (GHG) emission reductions. The **LIFE BE REEL** project, started in 2018 under the coordination of the Flemish Energy and Climate Agency, is supporting the full implementation of the renovation strategies of the Flemish and Wallonia regions, targeting over 4.1 million homes and representing 14% of the total GHG-emissions for Belgium in 2015. BE REEL is developing and demonstrating structural measures to increase the renovation rates and improve the energy performance of buildings. The demonstration includes the design and implementation of innovative technical concepts and tools, along with financial instruments, communication activities and actions to build capacity and enhance cooperation among public administrations, citizens, NGOs, contractors, renovation professionals, federations and other relevant stakeholders. The pilot projects of BE REEL will lead to 8,585 renovated dwellings, generating over 18,600 tonnes of CO_2 emission reductions per year. The innovative solutions of BE REEL will create the conditions for the full implementation of the regional renovation strategies, which aim at renovating all existing housing and achieving a reduction of 75-80% of CO_2 emissions and energy use by 2050.

Example 7. Renewable bio-hydrogen production technologies from lignocellulosic waste and sewage sludge co-fermentation

Vast amounts of rice straw are burned annually in the rice fields near Albufera Natural Park (Province of Valencia, Spain), emitting greenhouse gases and particulate matter, affecting the environment and the quality of life of surrounding populations. When techniques other than burning or burying are used, the management of this bio-waste is expensive for farmers. The **LIFE REPTES** project, started in 2022 under the coordination of *Depuración de Aguas del Mediterráneo* (DAM), will demonstrate a new circular model that will allow rice straw from fields to be disposed of, while also reducing greenhouse gas and particulate emissions. LIFE REPTES will design, build and implement a demonstration plant at the Pinedo wastewater treatment plant. Using an innovative dark fermentation process, the project will integrate the production of biohydrogen from pre-treated lignocellulosic crop by-products and the sludge produced in wastewater treatment plants. The resulting fermented liquid stream will be used as an anaerobic digestion co-substrate to produce biogas. In addition to reducing greenhouse gas emissions and improving air quality in the region, the project will provide local authorities with new tools to achieve a climate neutral economy by increasing the generation and use of renewable energy and improving energy efficiency.

Example 8. Reduction of Agricultural Greenhouse gases Emissions Through Innovative Cropping systems

Significant potential exists in Europe to decrease the flux of carbon to the atmosphere from croplands, and for cropland management to sequester soil carbon, linked to the amount of carbon stored in cropland soils. The **LIFE AGRESTIC** project, implemented between 2019 and 2023 in Emilia Romagna, Tuscany and Puglia (Italy), focused on the inclusion of legumes and catch crops in the rotations of cereals and industrial crops (tomato and sunflower) in three demonstration sites in order to reduce greenhouse gas emissions, increase the carbon sequestration and the availability

of organic nitrogen. The project developed an innovative decision support tool for efficient management of the multi-year crop rotation system, rationalizing the use of external inputs (nitrogenous fertilizers, pesticides, etc.) and non-renewable resources (soil and fuels) and maintaining, or even increasing, quantity, quality and safety of the products. The project also developed a prototype for the automated and continuous monitoring of soil GHG fluxes, a quality label for products based on carbon footprint and schemes for the payment of Ecosystem Services.

Example 9. Development and implementation of a result-based funding mechanism for carbon farming in EU mixed crop livestock systems

The project **LIFE CARBON FARMING**, coordinated by *Institut de l'Elevage*, will bring together actors involved in agriculture and other economic sectors (public bodies, industrial companies and banks) to implement carbon finance mechanisms in six European countries. Between 2021 and 2027, the project will support Carbon Farming Projects in 700 farms in Belgium, France, Germany, Ireland, Italy, Spain to help farmers reduce the carbon footprint of their farms and measure the progress achieved. LIFE CARBON FARMING will develop and disseminate a harmonised sustainability assessment methodology and a common process for monitoring, reporting and verifying carbon removals. Moreover, the project will implement voluntary carbon markets that will provide EUR 6.34 million in estimated revenues from carbon credits. A European network of farmers and partners involved in Carbon Farming Projects will share knowledge and replicate the project results and tools. The farmers involved are expected to reduce the carbon footprint of agricultural products by 15% within six years, using result-based funding.

Example 10. Achieving Resiliency by Triggering Implementation of nature-based Solutions for climate Adaptation at a National scale

The **LIFE IP ARTISAN** project is providing support to the French strategy for climate change adaptation, reinforcing the resilience of the country to climate change. In particular, it aims at mainstreaming biodiversity into climate adaptation by developing and promoting the use of Nature based Solutions. The project, launched in 2019, is implementing ten pilot demonstration projects on Nature-Based Solutions and setting up a network of at least 200 local advisers and 13 regional networks cooperating on ecosystem-based adaptation. LIFE IP ARTSAN is creating a favourable framework for new local projects by building capacity, mainstreaming good practices and improving the coordination among climate change and biodiversity policies and funding parties. For example, the local advisors created an online database gathering information on public and private funding for climate adaptation activities that use Nature-Based Solutions. In particular, the project will also facilitate the coordinated use of EUR 3.8 billion of complementary funding from the European Regional Development Fund, the European Agricultural Fund for Rural Development and other national funds, especially from water agencies, to support nature-based adaptation solutions. Furthermore, the project team is involved in the development of the new French strategy on climate adaptation.

Example 11. Team Europe Initiative on Adaptation and Resilience in Africa

African countries have suffered unprecedented climate events. By 2050, climate impacts could cost $50 billion annually. The EU-AU Summit in 2022 increased efforts on climate resilience through the EU-Africa Global Gateway Investment Package. This package supports a strong,

inclusive, green and digital recovery for Africa with investments of €150 billion from the EU, member States, financial institutions and the private sector.

At COP27, the EU and its Member States launched the Team Europe Initiative on Climate Change Adaptation and Resilience in Africa. It aims at providing a coordinated European response on adaptation, including to enhance access by African partners to climate adaptation finance. It brings together existing and new adaptation programmes of over EUR 1.4 billion from the Commission and several Member States (CZ, DE, DK, FR, and NL to date). There are four pillars of action:

- Reinforcing early warning systems at regional and national level
- Developing and implementing Climate and Disaster Risk Finance and Insurance (CDRFI) tools and mechanisms
- Increasing public sector readiness and supporting mechanisms to mobilise international climate finance on adaptation, including from the private sector.
- Supporting climate risk data collection and analysis to improve decision-making processes.

This Team Europe Initiative is part of the broader support to adaptation to climate change that the EU and EU Member States are delivering in Africa.

Example 12. EU mission on adaptation to climate change: Large scale demonstrators of climate resilience creating cross-border value - RESIST and Regions4Climate projects

The projects from the EU mission on adaptation to climate change are currently deploying large-scale demonstrations of scientifically sound innovative solutions (including social innovation) to increase climate resilience in 24 regions of Europe.

The RESIST[119] project, on the one hand, is testing adaptation solutions to five key climate challenges: floods, droughts, heatwaves, wildfires, and soil erosion, in four demonstrator regions (Southwest Finland, Central Denmark, Catalonia and Centro Portugal) and eight twinning regions across Europe (Normandy, East Macedonia, Blekinge, Zemgale, Puglia, Baixo Alentejo, Vesterålen and Extremadura). RESIST involves stakeholder collaboration in designing and testing more than 100 innovative solutions – adaptation products, regulations, policies and methods. It is also developing 12 Graphical Digital Twins through immersive technologies, to support decision-making.

On the other hand, the Regions4Climate[120] project aims to collaboratively develop and demonstrate a socially-just transition to climate resilience. The project will create and implement innovations combining sociocultural, technological, digital, business, governance, and environmental solutions to reduce the vulnerability of European regions to the impacts of climate change. It will develop a comprehensive Adaptation Framework including a Regional Climate Resilience Dashboard for each partner region, and will design, deploy and scale up solutions through a twinning approach, including 12 demonstration cases across Europe (Basque Country, South Aquitaine, Azores, Toscana, Koge Bay, Burgas, Uusimaa, Pärnumaa, Crete, Castilla y León, Nordic Archipelago, Cyprus).

119 https://cordis.europa.eu/project/id/101093873
120 https://cordis.europa.eu/project/id/101093873

Example 13. Horizon 2020 CONSTRAIN project: Providing improved evidence base for effective adaptation and mitigation strategies

Predicting how the climate will change over the next 20-50 years, as well as defining and implementing the emissions pathways that will put the world on track for keeping the warming in check, requires a better understanding of how several human and natural factors will affect the climate in coming decades. These include how atmospheric aerosols affect the Earth's carbon budget, and the roles of clouds and oceans in driving climate change. The EU-funded Horizon 2020 CONSTRAIN[121] project, a consortium of 14 European partners, is developing a better understanding of these variables, feeding them into climate models to reduce uncertainties, and creating improved climate projections for the next 20-50 years on regional as well as global scales. It is also supported the scientific efforts towards more effective translation of new physical science into an improved evidence base for policy decisions. CONSTRAIN results provided important contributions to the IPCC Sixth Assessment reports and the 2023 UNFCCC Global Stocktake, cementing EU's position as the world-leader in understanding climate sensitivity and climate variability.

Example 14. Horizon, Cluster 5 – Energy

Project SYMBIOSYST[122] under Horizon Europe Cluster 5 started in January 2023 and will contribute to the decarbonisation of the energy sector by delivering standardised cost-effective solutions for agri-voltaics. This will involve developing PV modules, mounting structures, and operation and maintenance practices that meet the specific needs of different crops, climates, and landscapes. The project will ensure the solutions developed are aesthetically pleasing and harmoniously integrated with farming practices.

Example 15. Horizon, Cluster 5 – Mobility

The Horizon Europe Cluster 5 project NextETRUCK[123] under the 2ZERO Partnership started in July 2022 and will help accelerate the transition towards zero tailpipe emission road mobility across Europe by demonstrating innovative and affordable zero-emission e-mobility concepts that are both competitive and synergistic. The project will also advance knowledge through innovations in e-powertrain components and architectures, intelligent charging infrastructure and management, improved thermal design of the cabin, and fleet management systems utilising IoT and digital tools.

Example 16. Horizon, Cluster 4 – Industry

[121] https://cordis.europa.eu/project/id/820829

[122] Create a Symbiosis where PV and agriculture can have a mutually beneficial relationship | SYMBIOSYST | Project | Fact sheet | HORIZON | CORDIS | European Commission (europa.eu)

[123] Efficient and affordable Zero Emission logistics through NEXT generation Electric TRUCKs | NextETRUCK | Project | Fact sheet | HORIZON | CORDIS | European Commission (europa.eu)

Project Plastics2Olefins[124] under the Processes4Planet Partnership in Horizon Europe Cluster 4 started in June 2022 and will demonstrate a novel plastics recycling process based on high-temperature pyrolysis, as the main product will be a gas stream instead of a liquid, so it will reduce the lifecycle GHG emissions by more than 70% compared to existing plastics recycling processes for unsorted plastic waste. The project will realise this in a two-step approach: first by adapting and testing a scaled pilot plant to optimise the components and process conditions and finally, a pioneering full-scale industrial demonstration plant at Repsol's petrochemical site.

Example 17. Horizon, Soils Mission – Carbon Farming

Project MRV4SOC[125] under the EU Mission on Soil Health and Food started in June 2023 and aims to support the implementation of key actions of the European Commission Communication on Sustainable Carbon Cycles and carbon farming and the proposed regulatory framework on carbon removals certification by designing a comprehensive, robust, and cost-effective approach, accounting for changes in as many carbon pools as possible, to estimate GHG and full carbon budgets, coupling carbon and nitrogen cycles, quantify Soil Organic Carbon (SOC) accumulation, and assess the results of traditional management practices and carbon farming.

[124] Recycling plastic waste into high-value materials- Closing the Loop | Plastics2Olefins | Project | Fact sheet | HORIZON | CORDIS | European Commission (europa.eu)
[125] Monitoring, Reporting and Verification of Soil Organic Carbon and Greenhouse Gas Balance | MRV4SOC | Project | Fact sheet | HORIZON | CORDIS | European Commission (europa.eu)