



Technical background document

Accompanying the report *Trends and Projections in Europe 2023*

European Environment Agency

Kongens Nytorv 6

1050 Copenhagen K

Denmark

Tel.: +45 33 36 71 00

Web: eea.europa.eu

Enquiries: eea.europa.eu/enquiries

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1 Targets

The *Trends and projections in Europe 2023* report uses the most recent information available to assess achievement of the climate and energy targets 2030. It includes data on emissions, energy consumption and renewable energy shares in 2021 and includes approximated data for the year 2022. Recent trends are used to illustrate the pace and direction of reductions in GHG emissions, deployment of renewable energy and gains in energy efficiency.

2030 targets

The *Trends and projections in Europe 2023* report describes how current trends and developments may contribute to achieving the current 2030 targets for reducing GHG emissions, deploying renewable energy and making energy efficiency gains at the European level, and also for reducing GHG emissions at the Member State level. In 2021, the EU set a more ambitious target of a net 55 % domestic reduction compared with 1990 in the European Climate Law (EU, 2018c). This target was submitted as an updated nationally-determined contribution to the UNFCCC (Council of the European Union, 2020) and is enshrined in the European Climate Law (EU, 2021). This target replaces the binding EU target of a minimum of 40% domestic reduction in GHG emissions by 2030 compared with 1990 (EC, 2014), which was submitted to the UNFCCC as the EU's first nationally determined contribution (EC, 2015).

Most key proposals of the Fit-for-55 package, to align EU policies with the updated 2030 targets, have been adopted by co-legislators in the years 2022 and 2023. This package introduces ambitious policies aimed at accelerating the reduction of greenhouse gas emissions, fostering the adoption of renewable energy sources, and enhancing overall energy efficiency by 2030. With respect to this report, adopted amendments to the legislation on effort sharing, emission trading, and land use, land use change and forestry (LULUCF) are highly relevant. Further key legislation, addressing energy dimensions, have already been adopted and are relevant for this report, i.e. the revision of the Energy Efficiency Directive (EED) and the Renewable Energy Directive (RED). Both outline ambitious 2030 targets.

With these revisions, the current 2030 targets for GHG emissions, renewable energy and energy efficiency at the EU level are:

- A target of at least a net 55% reduction in the EU-27's domestic GHG emissions (compared with 1990 levels). The maximum contribution of natural sinks from the LULUCF sector to this target is limited to -225 MtCO₂e. A binding emission cap is set for the sectors covered by the EU ETS (EU, 2023b). Binding annual minimum targets for reducing GHG emissions from 2021 to 2030 are set for EU Member States for domestic transport (excluding CO₂ emissions from aviation), buildings, agriculture, small industry and waste (EU, 2023e). Furthermore, the revised LULUCF Regulation (EU, 2023f) sets an EU-wide net removal target of 310 MtCO₂e for 2030 and shares this target between the Member States. The former national 'no debit' target, where 'EU Member States have to ensure that accounted GHG emissions from land use, land use change or forestry are offset by at least an equivalent removal of CO₂ from the atmosphere', only applies now for the period 2021-2025;

- A binding target to increase the share of energy from renewable sources in the EU-27 to 42.5 % of gross final energy consumption by 2030, with an additional top-up of 2.5 % (Council of the European Union 2023).
- A target of at least a 11.7 % reduction in EU energy consumption by 2030 at EU level (compared with the Commission's 2020 reference scenario) (EU 2023c). This is spelled out as a binding final energy consumption Union target of no more than 763 Mtoe in 2030 and an indicative target for primary energy consumption amounting to no more than 992.5 Mtoe in 2030.

In addition to the EU-27 targets for 2030, GHG emission reduction targets have been set for 2030 under the Effort Sharing Regulation at national level. In the *Trends and projections in Europe 2023* report, progress towards meeting the national 2030 GHG emission targets can be measured, since these are established and binding at the national level. National, non-binding contributions in the areas of renewable energy deployment and energy efficiency contributions have been set by Member States in the context of their national energy and climate plans (NECPs). Updated draft NECPs were due at the end of June 2023. In these, all Member States provide updates to their national contribution. Submissions are still ongoing and thus these contributions could not yet be taken into account in this report. Final updated NECPs are due to be submitted in June 2024.

Effort sharing legislation targets for emission reductions

The regulation on binding annual emission reductions by Member States (Regulation (EU) 1018/842 as amended by Regulation (EU) 2023/857), and the Effort Sharing Regulation (EU, 2023e), set out binding annual GHG emission targets for Member States for the period 2021-2030. The amendment increased the Effort Sharing Regulation's EU-wide GHG emission reductions target from 29% to 40% by 2030 compared to 2005 levels, with respective revisions of Member State targets for 2030. This regulation is the 'follow-up' to the Effort Sharing Decision, which established national emission targets for Member States in effort sharing sectors for the period 2013-2020. The regulation recognises the different capacities of Member States to act by differentiating targets according to GDP per capita across Member States. This ensures fairness, because the Member States with the highest incomes take on more ambitious targets than Member States with lower incomes. EU leaders recognised that an approach for high-income Member States based solely on relative GDP per capita would mean that, for some, the costs associated with reaching their targets would be relatively high. To address this, these targets have been adjusted to reflect cost-effectiveness for Member States with an above average GDP per capita, while maintaining the overall GDP per capita-based reduction in emissions required from this group of Member States. The resulting 2030 GHG emission reduction targets range from 10-50% compared with 2005 base year levels.

Iceland and Norway also implement the Effort Sharing Regulation.

Renewable energy targets

In June 2018, the EU endorsed an EU-level, binding renewable energy target of at least 32% of the gross final energy consumption by 2030 (EU, 2018a). As a result of the Fit-for-55 package and the REPowerEU plan, as part of a series of measures to reduce the EU's dependence on Russian fossil fuels (EC, 2022), proposed in May 2022 by the European Commission, the EU-wide share of renewable sources increased to 42.5% by 2030, with an additional top-up of 2.5% (Council of the European Union, 2023). The RED is adopted in October 2023. This target will be reached through the collective efforts of all Member States, and countries are free to set their own national contributions.

Under the Regulation on the Governance of the Energy Union and Climate Action (Regulation (EU) 2018/1999), Member States presented their NECPs. These included planned national objectives, targets and contributions related to all dimensions of the Energy Union, together with planned policies and measures and the anticipated investment needed to meet the national targets, objectives and contributions. For renewable energy these included not only 2030 targets but also indicative trajectories from 2021 onwards, with reference points in 2022, 2025 and 2027 (Art. 4.2 of the Governance Regulation) (EU, 2018d).

Energy efficiency targets

On 14 June 2018, the European Commission, the Parliament and the Council reached a political agreement that includes a binding energy efficiency target of 32.5% for the EU to achieve by 2030 compared with the 2007 baseline scenario, with a clause allowing an upwards revision by 2023 (EU, 2018b). The Governance Regulation (EU, 2018d) states that Member States should set indicative national energy efficiency contributions to achieve the 2030 targets, based on primary or final energy consumption, primary or final energy savings, or energy intensity. Member States should also set an indicative trajectory for that contribution from 2021 onwards, based on their indicative contributions to the EU 2020 and 2030 targets. Through the Fit-for-55 package, the EU Green Deal incentivises more efforts on energy efficiency to address the ambitious GHG reduction target. In the REPowerEU plan presented in May 2022, the Commission proposed to raise the ambition further to reduce the EU's reliance on fossil fuel imports from Russia (EC, 2022). The EED recast 2023/955 has been adopted in July 2023, which sets an 11.7% reduction in EU energy consumption in 2030, compared to the 2020 reference scenario projections (EU, 2023c).

Member States contribute to the realisation of the European targets by providing indicative national 2030 contributions, based on both final and primary energy consumption, accompanied by indicative trajectories for each. The recently adopted directive offers a comprehensive list of factors and national characteristics that Member States can consider when calculating their contributions. Importantly, they can use a formula designed to enable Member States to determine their contributions in a fair and feasible way (see Annex 1 of the EED recast). A gap-filling mechanism is defined to make sure that all the Member States' contributions add up to the EU's 11.7% target.

Overview of national targets 2030

Table 1.1 provides an overview of the EU's climate and energy targets, while Table 1.2 informs on the national targets and contributions for each of the topic areas covered in the *Trends and projections in Europe 2021* report – GHG emissions, renewable energy and energy efficiency. They reflect the information provided throughout the report and are included here as a comprehensive reference.

Table 1.1 Main EU-wide climate and energy targets for 2030

ETS target	ESR* target	LULUCF target	Renewable energy share	Primary energy consumption	Final energy consumption
MtCO ₂ e	MtCO ₂ e	MtCO ₂ e	percent	Mtoe	Mtoe
766	1,513	-310	42.5%	993	763

Note: *Effort Sharing Regulation (ESR)

Sources: EU (2023a, 2023b, 2023c, 2023e, 2023f).

Table 1.2 Main national climate targets and energy contributions for 2030

Country	Participation in EU-ETS	ESR target	2005 ESR base-year emissions	LULUCF target	Renewable energy share	Primary energy consumption	Final energy consumption
		change vs. 2005 (%)	MtCO ₂ e	MtCO ₂ e	share of renewable energy sources	Mtoe	Mtoe
Austria	x	-48.0%	57.0	-0.9	46.0%	30.8	25.6
Belgium	x	-47.0%	81.6	-0.3	17.5%	42.7	35.2
Bulgaria	Since 2007	-10.0%	22.3	-1.2	27.1%	17.5	10.3
Croatia	Since 2013	-16.7%	18.1	-0.6	36.4%	8.2	6.9
Cyprus	x	-32.0%	4.3	-0.1	22.9%	2.4	2.0
Czechia	x	-26.0%	65.0	-0.8	22.0%	41.4	23.7
Denmark	x	-50.0%	40.4	-0.4	55.0%	18.3	15.8
Estonia	x	-24.0%	6.2	-0.4	42.0%	5.5	2.9
Finland	x	-50.0%	34.4	-2.9	51.0%	34.8	24.9
France	x	-47.5%	401.1	-6.7	33.0%	202.2	120.9
Germany	x	-50.0%	484.7	-3.8	30.0%	216.0	185.0
Greece	x	-22.7%	63.0	-1.2	35.0%	20.5	16.5
Hungary	x	-18.7%	47.8	-0.9	21.0%	30.7	18.7
Ireland	x	-42.0%	47.7	-0.6	34.1%	13.7	11.2
Italy	x	-43.7%	343.1	-3.2	30.0%	125.1	103.8
Latvia	x	-17.0%	8.6	-0.6	50.0%	4.1	3.6
Lithuania	x	-21.0%	13.1	-0.7	45.0%	5.5	4.5
Luxembourg	x	-50.0%	10.1	0.0	25.0%	3.5	3.1
Malta	x	-19.0%	1.0	0.0	11.5%	1.1	0.8
Netherlands	x	-48.0%	128.1	-0.4	27.0%	46.6	43.9
Poland	x	-17.7%	192.5	-3.3	21.0%	91.3	67.1
Portugal	x	-28.7%	48.6	-1.0	47.0%	21.5	14.9
Romania	Since 2007	-12.7%	78.2	-2.4	30.7%	32.3	25.7
Slovakia	x	-22.7%	23.1	-0.5	19.2%	15.7	10.3
Slovenia	x	-27.0%	11.8	-0.2	27.0%	6.4	4.7
Spain	x	-37.7%	242.0	-5.3	42.0%	98.5	73.6
Sweden	x	-50.0%	43.2	-4.0	65.0%	40.2	29.7
Iceland	Since 2008	-33.0%	3.1				
Liechtenstein	Since 2008						
Norway	Since 2008	-50.0%	28.9				
Switzerland	Since 2021						

Notes: The Faroe Islands and Greenland are not part of the EU and, therefore, are not covered by the targets presented here. The 2030 contributions for renewable energy and energy consumption listed in the table are from Member States NECPs submitted to the European Commission in 2019. Member States are in the process of updating the NECPs. Draft updated NECPs were due in June 2023 and final updated NECPs are due in June 2024.

Sources: EU (2023e, 2023f); EC (2020b).

Goals to 2050 and beyond

Although the 2030 targets provide a concrete objective in the medium term, they also provide a milestone towards achieving longer-term goals for the greater reductions in GHG emissions in the EU-27. In the European Climate Law (EU, 2021), a binding objective of the EU achieving climate neutrality by 2050 is set out in pursuit of the long-term temperature goal in point (a) of Article 2(1) of the Paris Agreement. The climate neutrality objective requires that all EU-wide GHG emissions and removals, as regulated in EU law, are to be balanced within the EU by 2050 at the latest, reducing emissions to net zero by that date. Thereafter, the EU will aim for negative emissions. It is also stated that the Regulation will be amended to include a 2040 climate target, based on a detailed impact assessment.

The impact assessment (EC, 2020a) published by the European Commission, together with the proposal to raise the EU's ambition, presented several scenarios on how this can contribute to the objective of net-zero GHG emissions in 2050. It previewed a set of actions required across all sectors of the economy and proposed the launch of revisions of key legislative instruments. When referring to the scenarios accompanying the Commission's impact assessment, the *Trends and projections in Europe 2023* report describes the levels depicted in the assessment's 55% reduction scenarios rather than specific values.

2 Data sources

The information in the *Trends and projections in Europe 2023* report is based on the latest official data on greenhouse gas (GHG) emissions and energy consumption in 2021, as reported by Member States to the European Commission and the EEA under the Governance Regulation (EU, 2018d), and to the European Commission under the Energy Statistics Regulation (EU, 2008). The report also reflects approximated data for GHG emissions in 2022, as reported under the Governance Regulation in July 2023, and early EEA estimates of renewable energy shares and energy consumption in 2022. Designed to ensure the monitoring of GHG emissions and related information that is necessary to track the EU's and Member States' progress towards the achievement of the 2030 and long-term objectives and targets in line with the 2015 Paris Agreement on climate change, the Governance Regulation has been in effect since 2019, replacing the MMR (EU, 2013c) which had been in place since 2013.

The Governance Regulation-related data are submitted by countries to the EEA's environment data repository Reportnet (⁽¹⁾), after which the EEA, supported by its European Topic Centre on Climate Change Mitigation (ETC/CM), performs quality control procedures in consultation with individual countries. For example, the national inventory data are quality checked, Emissions Trading System (ETS) data are verified, effort sharing legislation emission data are reviewed, and projection data are quality checked. Reviews and quality-checking procedures ensure that potential estimates in the national inventory data are detected and corrected, and this helps to reduce the uncertainty inherent in projections.

The EEA and ETC/CM then compile the reported data and publish data sets, data viewers and related products on the EEA's website.

The following data sets are highlighted in the *Trends and projections in Europe 2023* report:

- the GHG emission inventory for the period 1990-2021, reported under Article 26 of the Governance Regulation 2023;
- effort sharing emission data for the period 2013-2021. For 2005 to 2012, the Effort Sharing Decision data refers to calculated numbers in 2022 and for the period 2013-2020, as legislatively fixed in respective implementing decisions. This data considers the respective scope and global warming potential (GWP) from AR4. Data on the Effort Sharing Regulation emissions in the report refer to the scope of the Effort Sharing Regulation with GWPs from AR5. The reported data from Member States for 2021 has been used;
- ETS emission data for the years 2005-2022, from the European Union Transaction Log (EUTL), extracted in July 2023;
- GHG emission projection data until 2050, reported under Article 18 of the Governance Regulation in March 2023;

(¹) <https://reportnet.europa.eu>

- estimated 'proxy' GHG emission data for the year 2022, reported by Member States in July 2023 and gap-filled with estimates by the EEA, although national proxy data was not provided by Bulgaria. The 2005-2020 share of energy from renewable sources, related to renewable energy use in Europe, reported under the Energy Statistics Regulation and the Renewable Energy Directive (RED), and published by Eurostat in its SHARES tool in 2022 (Eurostat, 2020);
- the 2021 share of energy from renewable sources related to renewable energy use in Europe, reported under the Energy Statistics Regulation and the Renewable Energy Directive (RED), and published by Eurostat in its SHARES tool in 2023 (Eurostat, 2020);
- EEA early estimates for the share of energy from renewable sources in gross final energy consumption in 2022, as prepared by the ETC CM in collaboration with the EEA;
- the primary (PEC) and final energy consumption (FEC) (indicators FEC 2020-2030, PEC 2020-2030), reported in the Energy Statistics Regulation and published by Eurostat in its energy statistics database, extracted in August 2023;
- EEA early estimates for the primary and final consumption of energy in 2022, as prepared by the ETC CM in collaboration with the EEA.

Data sources for greenhouse gas emissions

The analysis presented in the *Trends and projections in Europe 2023* report is based on several sets of GHG emission data.

Historical trends in greenhouse gas emissions

GHG emission data for the period 1990-2021 are official data reported by the EU and Member States under the United Nations Framework Convention on Climate Change (UNFCCC) in their corresponding GHG inventory reports (EEA, 2020). The EEA is responsible for the compilation of the EU GHG inventory. Together with the ETC/CM⁽²⁾, the EEA implements a quality assurance and quality control (QA/QC) procedure (ETC/CME, 2021) to ensure timeliness, completeness, consistency, comparability, accuracy and transparency of the inventories reported by Member States that are used in the *Trends and projections in Europe 2023* report.

In 2016, a comprehensive review of GHG emission data took place under Article 19 of the MMR, in the context of the annual compliance cycle under the Effort Sharing Decision (ESD). This concerned the years 2005, 2008-2010, 2013 and 2014. The years 2015, 2016, 2017 and 2019 were reviewed in 2017, 2018, 2019 and 2021 respectively during the annual review cycle under Article 19 of the MMR and Article 38 of the Governance Regulation. In 2020, another comprehensive review of GHG emission data took place for the years 2005 and 2016-2018, which forms the basis for the calculation of annual emission allocations (AEAs) for 2021-2030 under the Effort Sharing Regulation (ESR).

From 2023 onwards, Member States' GHG inventories are based on the use of GWP_s from the IPCC's Fifth Assessment Report (AR5) (IPCC, 2014). Thus, all the emission estimates used in the *Trends and projections in Europe 2023* report were calculated using GWP_s from the IPCC's AR5.

⁽²⁾ The ETC/CME is a consortium of European institutes contracted by the EEA to carry out specific tasks in the fields of climate change mitigation and energy.

Early approximated estimates of 2022 GHG emissions were reported by Member States under the Governance Regulation by 31 July 2023. These estimates were aggregated to EU level by the EEA (EEA, forthcoming a). Bulgaria did not submit proxy GHG inventories, so proxies were calculated by the EEA and the ETC/CM. Gap-filling of aviation data was done by applying Eurocontrol data. International aviation was gap-filled for Bulgaria, Denmark, Luxembourg and Portugal. Domestic aviation was gap-filled for all Member States except Finland and Malta. Gap-filling of international navigation data was done by applying Eurostat monthly data regarding the supply and transformation of oil and petroleum products (Eurostat, 2022). Data from the Member States' 2021 GHG inventory was applied to gap-fill LULUCF. Gap-filling was done for Bulgaria and Croatia.

The methodology and data sources are laid out in detail in the ETC report *Approximated EU GHG inventory*, (EEA, forthcoming a).

Greenhouse gas emissions in the EU ETS since 2005

Data in the EU ETS are used to analyse emission trends and to determine the level of emissions covered under the ESD. For the years 2005-2012, ETS emissions include estimates to reflect the scope of the EU ETS for the third trading period 2013-2020, which has been updated in 2023 (EEA, 2023b). These data are publicly available from the EUTL⁽³⁾ and the EEA ETS data viewer (EEA, 2023a). The data considered in the trend analysis were extracted from the EUTL on 1 July 2023. Data used to determine the effort sharing emissions were extracted from the EUTL on 8 March of each year, as agreed by Working Group 1 under the EU Climate Change Committee in its session on 18 May 2015.

Emissions covered under the ESD

For analysing emission trends in the ESD, historical effort sharing emissions for the period 2005-2012 are calculated using the GHG inventory data of 2022, from which ETS emissions, carbon dioxide (CO₂) emissions from domestic aviation and nitrogen trifluoride (NF₃) emissions are subtracted. ETS emissions include EEA estimates to reflect the scope of the EU ETS for the third trading period for the period 2005-2012 (ETC/CME, 2019). This data has been fixed to distinguish between the different scopes and GWPs used for the calculation of effort sharing emissions.

ESR emissions for 2005, that are calculated with the latest inventory data, are different from ESR base-year emissions as published in (EU, 2023e), which are used to compare Member States' progress towards achieving national targets and making comparisons between Member States.

The effort sharing GHG emission data for the years 2013-2020 are consistent with the outcome of each yearly review of the national GHG inventory data for the period 2016-2022, pursuant to Article 19 of the MMR. These verified annual ESD data, are set out in Commission's implementing decisions and were used to determine Member States' compliance under the ESD for the years 2013- 2020.

Long-term trends in the ETS and ESD emissions

GHG emissions for the years 1990-2005 are split into those covered by the EU ETS and those covered by the ESD. These splits are based on the application of a percentage of each of the main source categories defined by the IPCC for the reporting of national GHG inventories and based on Member States' projections

⁽³⁾ The EUTL automatically checks, records and authorises all transactions in the EU ETS.

submitted in 2022. Projections for the ETS and ESR are reported by source categories in Member States' submissions.

Annual emission allocations (AEAs) under the effort sharing legislation

The AEA values for the period 2013-2020 were defined in Commission Decision No 2013/162/EU (EU, 2013a), and adjusted in accordance with Commission Implementing Decision No 2013/634/EU (EU, 2013b), to reflect the change in scope of the EU ETS in 2013.

Following the 2016 comprehensive review of Member States' historical GHG inventory estimates, the AEAs for the years 2017-2020 were revised to reflect updates in the methodologies for reporting GHG inventories (EU, 2017). This recalculation ensures that the level of effort originally intended (as a percentage) is maintained for each Member State in the ESD. The recalculation also ensures consistency between the targets and the emissions reported by the Member States for compliance with the ESD, as the current reported emissions already take account of the methodological updates.

AEA values for 2017-2020, used throughout the *Trends and projections in Europe 2021* report, follow Commission Decision No 2013/162/EU (EU, 2013a), Implementing Decision No 2013/634/EU (EU, 2013b) and Decision No 2017/1471 (EU, 2017).

The amended ESR defines Member States' minimum contributions required to achieve the EU's 2030 target of a 40% reduction in emissions compared with 2005 in ESR sectors (Table 1.2). Absolute AEA values for the period 2021-2030 were determined in the year 2020 (EU, 2020). They were based on the effort sharing legislation emissions for 2005 and the period 2016-2018, following a comprehensive review conducted in 2020. With the amendment of 2023, national ESR targets for 2030 are more ambitious. Therefore, the revised AEA values for 2023-2025 have been published in EC, 2023. AEAs for the years 2026-2030 are estimated, based on the trajectory defined in Article 4 of the 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 2021-2023 are used, adjusted for the Article 10(1)c ESR changes included in the AEAs for 2021-2023. This estimate assumes 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. 2021 emissions are based on the final inventory reports and 2022 emissions are based on approximated inventory reports. 2023 emissions are based on the most recent WAM emissions projections reports, or in the absence of WAM projections, the WEM projections. The first compliance check will take place in 2027.

The changes pursuant to Article 10(2) listed under Annex IV of the ESR are already considered in the AEA amounts for 2021 for the eligible Member States.

The amended ESR allows Member States to use flexibility provisions to meet their annual targets, with certain limitations:

- **Banking unused AEAs:** If emissions are below the annual emission allocation for that year, the overachievement can be carried over to subsequent years. For the year 2021 this banked amount is limited to 75% of the annual emission allocation for 2021, while for the years 2022-2029 it is capped to a total of 25%.
- **Borrowing:** Up to 7.5% of a Member State's AEA may be carried forward from the following year during the period 2021-2025. Borrowing, however, is limited to 5% of the AEA of the following year from the period 2026-2029.

- **AEA transfer:** Member States may transfer up to 10% of their AEAs to other Member States in the period 2021-2025 and 15% in respect of the years during 2026-2030. The receiving Member State may use this emission allocation for compliance of the given year, or for subsequent years until 2030 (ex-ante). Any overachievement in a year, during the period 2021-2029, may also be transferred to other Member States to use this emission allocation until 2030 (ex-post). The latter can only take place after emission data for the relevant year have been confirmed.
- **LULUCF flexibility:** There is new flexibility to use credits from the land use sector. Land mitigation units, from afforested land, managed cropland and managed grassland, allow the EU-27 to use up to 262 million credits over the entire period 2021-2030, in the whole of the EU, to comply with their national targets. With the ESR amendment of 2023, the total amount for each Member State is divided in half for use in the periods 2021- 2025 and 2026-2030. All Member States are eligible to make use of this flexibility, but those with a larger proportion of emissions from agriculture have greater access to it. In line with EU guidance, this recognises that there is a relatively low mitigation potential for emissions from the agricultural sector. Iceland and Norway also have access to this flexibility, since both are part of the ESR and LULUCF Regulation for the period 2021-2030.
- The ESR allows nine Member States the choice of using a limited amount of ETS allowances for offsetting emissions in the effort sharing sectors in the period 2021-2030. It concerns Member States that have national reduction targets significantly above the EU average and their cost-effective reduction potential, or they did not allocate any free EU ETS allowances to industrial installations in 2013. The Member States having this option are Austria, Belgium, Denmark, Finland, Ireland, Luxembourg, the Netherlands, Malta and Sweden.
- Iceland and Norway are also eligible, as they have agreed with the EU to implement the ESR.
- The maximum limit that can be used annually in the period 2021-2030 is set at 2% of each country's effort sharing emissions in 2005. Ireland, Luxembourg and Iceland, however, are allowed up to 4%, and the amendment of 2023, allows Malta a limit up to 7%. Six Member States, as well as Iceland and Norway, have given notice that they intend to use their full amounts of this flexibility, whereas Belgium intends to use 1.89%. The Netherlands and Sweden have decided not to use the flexibility. Member States may request revisions of their percentages for later years, in both directions, during the compliance period in 2024 and 2027. In such cases, the Member State concerned shall notify the Commission by the end of 2024, or by the end of 2027.
- Unlike the period 2013-2020, international project credits are excluded, since the EU target is to be met domestically.

The 2005 Effort Sharing Regulation base-year emissions

In the *Trends and projections in Europe 2023* report, 2005 ESR base-year emissions are used to express the distance between effort sharing emissions and effort sharing targets in a normalised way. The distance, calculated as the absolute difference between emissions and targets divided by 2005 ESR base-year emissions, is expressed as a percentage of the 2005 base-year emissions. It is then directly comparable with targets and reductions, as percentages of 2005 levels, and allows relevant comparisons between Member States.

2005 ESR base-year emissions may differ, sometimes significantly, from emissions in the effort sharing sectors for the year 2005 that are estimated based on the latest GHG inventories and ETS data.

Projections of greenhouse gas emissions

The *Trends and projections in Europe 2023* report uses GHG projection data that were reported by Member States under Article 18 of the Governance Regulation in 2023 (EEA, forthcoming b). Mandatory reporting of projections takes place every 2 years, i.e. 2015, 2017, 2019, 2021, 2023, while substantial changes to projections must be reported every other year, i.e. 2014, 2016, 2018, 2020, 2022. In 2022, Denmark, Iceland, Ireland and Latvia submitted updated projections.

Under Article 18 of the Governance Regulation, Member States report projections under three scenarios:

1. for existing policies and measures (WEM) the scenario considers the implementation of already implemented measures. It is a mandatory reporting requirement;
2. for additional and planned policies and measures (WAM) the scenario is also reported. It considers the implementation of additional measures (at the planning stage);
3. Member States also report projections without policies and measures (WOM).

In 2023, 18 Member States reported a WAM scenario, and Austria, Cyprus, Denmark, France, Greece, Hungary, Italy, Malta and Sweden each provided a WEM scenario.

EU scenarios are only calculated for WEM and WAM projections. To aggregate a WAM scenario at the EU level, data for the nine Member States that did not report a WAM scenario in 2023 were gap-filled using their 2023 WEM scenario. Iceland, Norway and Switzerland submitted WEM projections in 2023, but only Norway and Iceland provided WAM projections.

Member States' reported projections include: total and sectoral GHG emissions by source category; the split of these projections between those covered by the EU ETS; those covered by the effort sharing sectors. Total GHG projections are used to assess progress towards achieving the EU's 55% reduction target by 2030, and effort sharing projections are used to assess Member States' progress towards achieving their national 2030 targets, set under the ESR.

The EEA, together with its European Topic Centre on Climate Change Mitigation (ETC/CM), implements a QA/QC procedure to ensure timeliness, completeness, consistency, comparability, accuracy and transparency of the projections reported by Member States, and used in the *Trends and projections in Europe 2023* report. This procedure is described in *Quality assurance and quality control procedure for national and Union GHG projections* (ETC/CME, 2021).

By July 2023, Member States reported GHG projections to the European Commission in their draft updated national energy and climate plans. These may differ from those reported in March 2023 under Article 18 of the Governance Regulation and are not considered in the report.

Data sources for renewable energy

Historical trends in the share of energy from renewable sources in gross final energy consumption

The assessment of progress towards objectives and targets for the use of RES is based, for the most part, on information reported by Member States to Eurostat under Regulation (EC) No 1099/2008 on energy statistics (EU, 2008) and the RED. It is subsequently published by Eurostat via its SHARES tool (Eurostat, 2020).

The share of energy from renewable sources in gross final energy consumption 2005-2021

The RES share in gross final energy consumption, as well as information on statistical transfers, stem from Eurostat, based on national data transmitted under the Energy Statistics Regulation. In accordance with the accounting rules in the RED, electricity generated by hydropower over 15 years and wind power over 5 years, was normalised to account for annual variations. For details of the normalisation rules, see the SHARES manual provided by Eurostat (Eurostat, 2022). Because of their insular and peripheral geography, Cyprus and Malta's gross inland energy consumption is disproportionately high for aviation, and they are thus strongly affected by current technological and regulatory constraints. Therefore, they have exemptions on the amounts by which they can exceed the EU's average gross final consumption of energy in aviation in 2005, as assessed by Eurostat. For data up to 2020, the provisions of Directive 2009/28/EC (RED I) apply. For 2021 the provisions of Directive (EU) 2018/2002 (RED II) apply.

Approximated shares of renewable energy use in 2022

Approximated shares of renewable energy use in 2022 were estimated by the EEA (EEA, forthcoming f).

The 2030 targets for energy from renewable sources

The 2030 RES targets for each Member State were taken from the assessment of NECPs, reported by Member States under the Governance Regulation by 2020. These NECPs included planned national objectives for national contributions to the EU target on renewable energies (Table 1.2). The data from the draft updated NECPs submitted in 2023, could not yet be taken into account.

The share of energy from renewable sources on a sectoral level

The report also presents data on RES deployment on a sectoral level for electricity, heating, cooling, and transport. These data are based on the Eurostat's SHARES tool (Eurostat, 2022). Approximate 2022 values were estimated by the EEA (EEA, forthcoming f).

Data sources for energy efficiency

Under Article 3 of the Energy Efficiency Directive (EED) (EU, 2012), Member States have to set their own indicative national energy efficiency targets for 2020 and 2030. Depending on country preferences, these targets are based on primary or final energy consumption, primary or final energy savings, or energy intensity. Each national target reflects the specific situation of the Member State that adopted it.

Related to the 2030 targets, the revised EED Directive (EU) 2018/2002(EU, 2018b), asks Member States not only to set indicative national energy efficiency contributions towards achieving the EU's 2030 targets (notified as part of their NECPs), but also to set an indicative trajectory for primary and final energy consumption for that contribution from 2021 onwards.

The assessment is based on the energy efficiency 2030 contributions outlined in the Member States' NECPs, as submitted in 2019 under the Governance Regulation. The data from the draft updated NECPs submitted in 2023 could not yet be taken into account.

Final energy consumption is defined according to the Eurostat methodology for final energy consumption (Europe 2020-2030 indicators and FEC 2020-2030), which includes international aviation, transformation losses, consumption from blast furnaces, but excludes ambient energy (Eurostat, 2023b). The 2030 target for final energy consumption, as defined in Article 4 of the recently adopted EED recast, excludes transformation losses and consumption from blast furnaces. The recent definition is not yet applied in the Eurostat methodology to monitor Member States progress (EU, 2023d).

Historical trends in primary and final energy consumption

The assessment of progress towards achieving energy efficiency targets is based, for the most part, on information reported by Member States to Eurostat under the Energy Statistics Regulation. It is published by Eurostat via its energy statistics database, namely the Europe 2020-2030 indicators to monitor progress towards EU-27 2020-2030 targets, in addition to the complete energy balances (Eurostat, 2023a, 2023b).

Approximated estimates for primary and final energy consumption in 2020

Early estimates of 2022 primary and final energy consumption were prepared by the EEA . National estimates, sometimes only for selected fuel types or sectors, were collected for Austria, Germany, Denmark, Finland, France, Hungary, Ireland, Lithuania, Netherlands, Portugal, Slovenia, Italy and Spain.

National energy efficiency targets for 2030

The 2030 energy efficiency targets for each Member State were taken from the assessment of NECPs reported by Member States under the Governance Regulation at the end of 2019. These NECPs included planned national objectives for national contributions to the EU target on energy efficiency (Table 1.2), as defined under the EED Directive (EU) 2018/2002, and amended by Directive (EU) 2023/1791(EU, 2023c).

The data from the draft updated NECPs submitted in 2023 could not yet be taken into account.

3 Abbreviations

AEA	Annual emission allocation
AR4	Fourth Assessment Report
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
EEA	European Environment Agency
EED	Energy Efficiency Directive
ESD	Effort Sharing Decision
ESR	Effort Sharing Regulation
ETC/CM	European Topic Centre on Climate Change Mitigation
ETS	Emissions Trading System
EU	European Union
EU-27	The 27 EU Member States
EUTL	European Union Transaction Log
FEC	Final energy consumption
GDP	Gross domestic product
GHG	Greenhouse gas
GWP	Global warming potential
IPCC	Intergovernmental Panel on Climate Change
LULUCF	Land use, land use change and forestry
MMR	Monitoring Mechanism Regulation
Mt	Million tonnes
Mtoe	Million tonnes of oil equivalent
NECP	National energy and climate plan
PEC	Primary energy consumption
QA/QC	Quality assurance and quality control
RED	Renewable Energy Directive
RES	Renewable energy sources
UNFCCC	United Nations Framework Convention on Climate Change
WAM	With additional policies and measures
WEM	With existing policies and measures
WOM	Without policies and measures

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European Environment Agency
Kongens Nytorv 6
1050 Copenhagen K
Denmark
Tel.: +45 33 36 71 00
Web: eea.europa.eu
Enquiries: eea.europa.eu/enquiries



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