European Environment Agency

Technical background document

Accompanying the report Trends and Projections in Europe 2024

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Cover design: EEA
Cover photo: © Pixabay
Layout: EEA

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1 Targets

The *Trends and projections in Europe 2024* report uses the most recent information available to assess progress towards achieving the climate and energy targets for 2030. It includes data on emissions, energy consumption and renewable energy shares in 2022, as well as approximated data for 2023. Recent trends are used to illustrate the pace and direction of reductions in greenhouse gas (GHG) emissions, deployment of renewable energy and gains in energy efficiency.

2030 targets

The *Trends and projections in Europe 2024* 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 European level, and also to reducing GHG emissions at Member State level. In 2021, the EU set a more ambitious target of a net 55% domestic reduction compared with 1990. 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 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).

The Fit for 55 package introduces ambitious policies aimed at accelerating the reduction of GHG emissions, fostering the adoption of renewable energy sources, and enhancing overall energy efficiency by 2030. Most key proposals of the package that align EU policies with the updated 2030 targets have been adopted by co-legislators in the years 2022 and 2023. With respect to this report, adopted amendments to legislation on effort sharing, emission trading, and land use, land use change and forestry (LULUCF) are highly relevant. Further key legislation addressing energy dimensions — the revision of the Energy Efficiency Directive (EED) and of the Renewable Energy Directive (RED) —has already been adopted and is also relevant; Both revisions 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), including net removals from the land use, land use change and forestry (LULUCF) sector as well as emissions from international aviation and maritime transport activities regulated under EU law. The maximum contribution of natural sinks from the LULUCF sector to this target is limited to -225 Mt CO_2e. A binding emission cap is set for the sectors covered by the EU ETS (EU, 2023b) and binding annual minimum targets for reducing GHG emissions from 2021 to 2030 are set for EU Member States for domestic transport (excluding CO_2 emissions from aviation), buildings, agriculture, small industry and waste (EU, 2023f). Furthermore, the revised LULUCF Regulation (EU, 2023e) sets an EU wide net removal target of an additional 42Mt CO_2e for 2030, compared to the yearly average of the reference period of 2016-2018. The target is distributed among Member States through individual targets in a way that requires each Member State to increase its climate ambition in the land use policies. This will result in a total

net removal of 310Mt CO_2e in 2030.. 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 CO_2 from the atmosphere' now only applies 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 an 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 EU final energy consumption target of no more than 763Mtoe in 2030 and an indicative target for primary energy consumption amounting to no more than 992.5Mtoe in 2030.

In addition to the EU-27-wide targets for 2030, GHG emissions reduction targets have been set for 2030 under the Effort Sharing Regulation at national level. In the *Trends and projections in Europe 2024* report, progress towards meeting the national 2030 GHG emission targets can therefore be measured, as these are established and binding at 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 have been submitted and assessed by the European Commission (EC) in 2023. Final updated NECPs were due at the end of June 2024. In these, Member States provided the latest updates to their national contributions. Submissions are still ongoing, so these contributions could not yet be taken into account in this report.

Effort Sharing legislation targets for emissions reductions

The Effort Sharing Regulation (ESR) sets emissions reduction targets for each Member State for the year 2030, compared to ESR base-year emissions in 2005, as well as target pathways for 2021-2030 (Regulation (EU) 2018/842 as amended by Regulation (EU) 2023/857, the Effort Sharing Regulation). Binding annual GHG emissions targets for Member States for the period 2021-2025 are laid down in (EU, 2023f). The 2023 amendment to the ESR increased the EU-wide GHG emissions reductions target from 29% (for the EU-27) 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 emissions targets for Member States in effort sharing sectors between 2013 and 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 those 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 emissions targets range from -10% to -50%, compared with 2005 base year levels.

Iceland and Norway also implement the Effort Sharing Regulation.

LULUCF Regulation

The Regulation on emissions and removals from LULUCF ((EU) 2018/841 amended by (EU) 2023/839), provides a system targeted at improving the natural sink. The LULUCF Regulation sets an accounting framework for the years 2021-2025 for GHG emissions and removals from forest land, forest products, cropland, grasslands and land conversions to and from wetlands and settlements. With the revision of the LULUCF Regulation in 2023, the governance framework now divided into two phases. In the first phase (2021-2025), Member States should ensure that accounted emissions from land use are compensated by at least an equivalent amount of accounted removals. For the 2026-2030 phase, the compliance rules will be simplified by moving from accounting benchmarks to reported emissions and removals, and the governance framework will aim to achieve the EU-wide target of 310Mt CO_2e net removals by 2030. Member State targets for net emissions and removals for 2030 are included in the revised LULUCF Regulation. These targets are defined as increased removals compared to the 2016-2018 average net inventory results for the LULUCF sector in each Member State. The values of the net GHG removals in 2030, as outlined in the Annex to the LULUCF Regulation, are based on the GHG inventory submitted in 2020 and amount to an EU-wide net removal of 310Mt CO_2e by 2030. However, the final 2030 values will be established using the inventory submitted in 2032. In addition to the increased removal targets for 2030, national net removal 'budgets' will be defined for the years 2026-2029. To ensure compliance with both the target and the budget, some flexibility is allowed.

Renewable energy targets

In June 2018, the EU endorsed an EU-level, binding renewable energy target for 2030 of at least 32% of the gross final energy consumption (EU, 2018a). As a result of the Fit-for-55 Package and the REPowerEU plan — part of a series of measures to reduce the EU's dependence on Russian fossil fuels (EC, 2022) — proposed in May 2022 by the EC, the EU-wide share of renewable sources was increased to 42.5% by 2030, with an additional top-up of 2.5% (Council of the European Union, 2023). The RED recast with this new target was adopted in 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, 2018c).

Energy efficiency targets

On 14 June 2018, the EC, the European Parliament and the European Council reached a political agreement that includes a binding energy efficiency target for the EU, to be achieved by 2030, of 32.5% compared with the 2007 baseline scenario, with a clause allowing an upwards revision by 2023 (EU, 2018b). The Governance Regulation (EU, 2018c) 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. With the Fit-for-55 Package, the European Green Deal incentivises more efforts on energy efficiency to address the more ambitious GHG emissions reduction target. In the REPowerEU plan, presented in May 2022, the EC 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) was adopted in July 2023 and sets an 11.7% reduction in EU energy consumption by 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 utilise a formula designed to enable Member States to determine their contributions in a fair and feasible way (see Annex 1 of the EED recast). The results of their calculations have been published in (EC, 2024). A gap-filling mechanism has been established to ensure that all Member States' contributions add up to the EU's 11.7% target.

Overview of national targets 2030

Table A1.1 provides an overview of the EU's climate and energy targets, while Table A1.2 provides information on national targets and contributions for each of the topic areas covered in the Trends and projections in Europe 2024 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 A1.1 Main EU-wide climate and energy targets for 2030

ETS target	ESR target*	LULUCF target	Renewable Energy share	Primary energy consumption	Final energy consumption
Mt CO_2e	Mt CO_2e	Mt CO_2e	Percent	Mtoe	Mtoe
766	1,514	-310	42.5%	993	763

Note : *Preliminary value, taken from CAPR 2023

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

Table A1.2 Main national climate targets

Country	Participation in EU-ETS	ESR target change vs. 2005 (%)	2005 ESR base-year emissions Mt CO_2e	LULUCF target[a] Mt CO_2e
Austria	x	-48.0%	57.0	-0.9
Belgium	x	-47.0%	81.6	-0.3
Bulgaria	Since 2007	-10.0%	22.3	-1.2
Croatia	Since 2013	-16.7%	18.1	-0.6
Cyprus	x	-32.0%	4.3	-0.1
Czechia	x	-26.0%	65.0	-0.8
Denmark(b)	x	-50.0%	40.4	-0.4
Estonia	x	-24.0%	6.2	-0.4
Finland	x	-50.0%	34.4	-2.9
France	x	-47.5%	401.1	-6.7
Germany	x	-50.0%	484.7	-3.8
Greece	x	-22.7%	63.0	-1.2
Hungary	x	-18.7%	47.8	-0.9
Ireland	x	-42.0%	47.7	-0.6
Italy	x	-43.7%	343.1	-3.2
Latvia	x	-17.0%	8.6	-0.6
Lithuania	x	-21.0%	13.1	-0.7
Luxembourg	x	-50.0%	10.1	0.0
Malta	x	-19.0%	1.0	0.0
Netherlands	x	-48.0%	128.1	-0.4
Poland	x	-17.7%	192.5	-3.3
Portugal	x	-28.7%	48.6	-1.0
Romania	Since 2007	-12.7%	78.2	-2.4
Slovakia	x	-22.7%	23.1	-0.5
Slovenia	x	-27.0%	11.8	-0.2
Spain	x	-37.7%	242.0	-5.3
Sweden	x	-50.0%	43.2	-4.0
Iceland	Since 2008	-33.0%	3.1	
Liechtenstein	Since 2008			
Norway	Since 2008	-40.0%	28.9	
Switzerland	Since 2021			

Notes: [a] Additional net removals in comparison to the yearly average of the reference period 2016-2018;
(b) The Faroe Islands and Greenland are not part of the EU and therefore are not covered by the targets presented here.

Sources: EU (2023e; 2023f).

Table A1.3 Main national energy contributions for 2030 for EU targets, before revision of 2030 EU targets

Country	Renewable energy share	Primary energy consumption	Final energy consumption	Renewable energy share
	As reported or assumed from first NECPs, 2019			Calculated using the 2020formula
	percent	Mtoe	Mtoe	percent
Austria	57.0%	30.8	25.6	46%
Belgium	33.0%	42.7	35.2	25%
Bulgaria	33.0%	17.5	10.3	27%
Croatia	44.0%	8.2	6.9	32%
Cyprus	33.0%	2.4	2.0	23%
Czechia	33.0%	41.4	23.7	23%
Denmark	60.0%	18.3	15.8	46%
Estonia	50.0%	5.5	2.9	37%
Finland	62.0%	34.8	24.9	51%
France	44.0%	202.2	120.9	33%
Germany	41.0%	216.0	185.0	30%
Greece	39.0%	20.5	16.5	31%
Hungary	34.0%	30.7	18.7	23%
Ireland	43.0%	13.7	11.2	31%
Italy	39.0%	125.1	103.8	29%
Latvia	61.0%	4.1	3.6	50%
Lithuania	49.0%	5.5	4.5	34%
Luxembourg	37.0%	3.5	3.1	22%
Malta	28.0%	1.1	0.8	21%
Netherlands	39.0%	46.6	43.9	26%
Poland	32.0%	91.3	67.1	25%
Portugal	51.0%	21.5	14.9	42%
Romania	41.0%	32.3	25.7	34%
Slovakia	35.0%	15.7	10.3	24%
Slovenia	46.0%	6.4	4.7	37%
Spain	43.0%	98.5	73.6	32%
Sweden	76.0%	40.2	29.7	64%

Notes: 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. In addition, targets calculated using the formula in the Governance Regulation are displayed, as published in 2020.

Sources: EC (2020).

Table A1.4 Main national energy contributions for 2030, for revised EU targets

Country	Renewable energy share	Primary energy consumption	Final energy consumption	Renewable energy share	Primary energy consumption	Final energy consumption
	As reported or assumed in draft updated NECPs, 2023			Calculated using 2023 formula in Annex II of the Governance Regulation	Calculated using 2024 formula in Annex I of the EED recast	
	Percent	Mtoe	Mtoe	Percent	Mtoe	Mtoe
Austria	46%-50%	30.8	25.6	57%	24.0	20.2
Belgium	21.7%	36.5	29.9	33%	34.7	28.8
Bulgaria	29.9%	15.3	9.9	33%	14.2	8.3
Croatia	42.5%	8.1	6.6	44%	6.7	5.8
Cyprus	26.5%	2.3	1.9	33%	1.9	1.7
Czechia	30%	28.8	20.2	33%	29.2	20.4
Denmark	70.9%	16.7	14.2	60%	14.7	12.7
Estonia	65%	5.1	2.6	50%	3.1	2.5
Finland	51%	31.1	23.2	62%	29.7	20.4
France	33%	157.3	104.0	44%	158.7	106.9
Germany	40%	193.6	160.5	41%	191.1	154.8
Greece	44%	18.2	15.4	39%	17.6	14.7
Hungary	29%	30.7	17.9	34%	23.4	16.1
Ireland	31.4-34.1%	15.2	12.9	43%	11.3	10.5
Italy	40.5%	115.0	94.4	39%	111.2	92.9
Latvia	57%	4.1	3.4	61%	3.8	3.5
Lithuania	55%	5.2	4.2	49%	5.4	4.4
Luxembourg	37%	3.5	3.0	37%	2.8	2.7
Malta	11.5%	1.1	0.8	28%	0.8	0.7
Netherlands	27%	46.6	43.9	39%	45.3	38.1
Poland	23-31%	91.3	67.0	32%	79.9	58.5
Portugal	49%	20.8	14.9	51%	16.7	14.4
Romania	34%	31.4	23.2	41%	28.9	21.6
Slovakia	23%	15.7	10.3	35%	13.9	8.6
Slovenia	30-35%	6.0	4.4	46%	5.7	4.3
Spain	47.9%	96.7	70.2	43%	82.2	64.9
Sweden	65%	40.4	29.8	76%	35.8	24.7

Notes: The 2030 contributions for renewable energy and energy consumption listed in the table are from Member States' NECPs submitted to the European Commission in 2023 in the draft updated NECPs. In addition, calculated targets from the formulas are displayed.

Sources: EC (2023) and EC 2024.

Table A1.5 Cumulated differences between ESR emissions and AEA trajectories 2021 to 2030

ESR-emissions based on:	ESR-GHG inventory		Approximated ESR emissions	Projected ESR-emissions (with additional measures-scenario)						
Country	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
EU-27	3%	6%	7%	7%	5%	4%	2%	-2%	-7%	-14%
Austria	0%	2%	5%	3%	1%	-1%	-4%	-8%	-13%	-19%
Belgium	3%	9%	12%	10%	6%	3%	0%	-3%	-7%	-12%
Bulgaria	9%	12%	17%	18%	17%	14%	9%	2%	-8%	-20%
Croatia	1%	-7%	-7%	-6%	-6%	1%	6%	9%	11%	11%
Cyprus	-8%	-19%	-33%	-48%	-65%	-75%	-89%	-106%	-127%	-150%
Czechia	7%	7%	4%	6%	5%	6%	6%	3%	-1%	-7%
Denmark	1%	2%	1%	1%	1%	4%	5%	3%	0%	-5%
Estonia	8%	16%	13%	13%	11%	8%	4%	-3%	-12%	-23%
Finland	5%	9%	13%	20%	25%	29%	31%	31%	30%	26%
France	4%	9%	12%	12%	8%	4%	-3%	-12%	-24%	-38%
Germany	5%	9%	10%	11%	8%	6%	1%	-6%	-14%	-23%
Greece	3%	4%	7%	14%	21%	28%	36%	45%	56%	69%
Hungary	8%	7%	11%	8%	4%	2%	-2%	-6%	-11%	-18%
Ireland	-6%	-14%	-18%	-30%	-44%	-50%	-60%	-72%	-87%	-103%
Italy	-2%	-3%	-5%	-8%	-12%	-12%	-13%	-15%	-17%	-20%
Latvia	23%	28%	32%	34%	35%	36%	34%	33%	29%	27%
Lithuania	14%	13%	11%	5%	0%	0%	0%	0%	0%	0%
Luxembourg	3%	14%	23%	29%	34%	40%	45%	50%	55%	61%
Malta	72%	50%	36%	4%	-32%	-61%	-98%	-144%	-200%	-268%
Netherlands	4%	14%	20%	21%	19%	15%	9%	2%	-6%	-16%
Poland	4%	8%	7%	8%	7%	7%	4%	-1%	-9%	-20%
Portugal	5%	8%	8%	13%	17%	24%	32%	41%	53%	66%
Romania	6%	1%	-6%	-13%	-22%	-27%	-35%	-46%	-61%	-78%
Slovakia	13%	20%	24%	22%	21%	16%	9%	0%	-9%	-20%
Iceland	4%	5%	5%	2%	-1%	-2%	-3%	-4%	-6%	-10%
Norway	-1%	-4%	-7%	-10%	-14%	-14%	-16%	-19%	-25%	-33%
Total	3%	6%	7%	7%	5%	4%	1%	-3%	-8%	-14%

Sources: EEA (2024, forthcoming b, forthcoming c), EC (2023a).

Table A1.5 shows the cumulative balance of the (estimated) AEAs and estimated ESR emissions, as developing over the 2021-2030 period. The percentages express the differences between the cumulative AEAs up to the relevant years related to the respective 2005 baseline emissions for the country involved. Positive values indicate a cumulative surplus of AEAs, while negative values indicate a cumulative deficit of AEAs. 2024-2030 emissions are based on projections reported according to Regulation (EU) 2018/1999, excluding the ongoing NECP updates. No ETS or LULUCF flexibilities are taken into account. AEAs for 2026-2030 have been estimated on the basis of ESR emissions 2021 and 2022 calculated from the latest GHG inventory and 2023 approximated ESR emissions. Under Article 29 of Regulation (EU) 2018/1999, the Commission annually assesses whether the Union and its Member States have made sufficient progress towards meeting the obligations set out under Article 4 of the Effort Sharing Regulation. This assessment is included in the Climate Action Progress Report (CAPR) and not reflected by this table. More information on the progress assessment can be found in Chapter 3 of the CAPR.

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 greater reductions in GHG emissions in the EU-27. In the European Climate Law (EU, 2021) the 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.

2 Data sources

The information in the *Trends and projections in Europe 2024* report is based on the latest official data on GHG emissions and energy consumption in 2022, as reported by Member States to the EC and the EEA under the Governance Regulation (EU, 2018c), and to the EC under the Energy Statistics Regulation (EU, 2008). It also reflects approximated data for GHG emissions in 2023, as reported under the Governance Regulation in July 2024, and early EEA estimates of renewable energy shares and energy consumption in 2023. Designed to ensure monitoring of GHG emissions and related information that is necessary to track the EU's and its 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 Monitoring Mechanism Regulation (EU, 2013), which had been in place since 2013.

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 emissions data are reviewed and projection data are quality checked. Reviews and quality-checking procedures ensure that potential over- or underestimates in 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 2024 report:

- GHG emissions inventory for the period 1990-2022, reported under Article 26 of the Governance Regulation in the year 2024;
- Effort sharing emissions data for the period 2013-2022. For 2005 to 2012 ESD data refers to calculated numbers in 2022 and for the period 2013-2020 as legislatively fixed in respective implementing decisions. These data consider the respective scope and global warming potential (GWP) as given in the UN's Fourth Assessment Report. Data on ESR emissions refer to the scope of the ESR, with GWPs from the UN's Fifth Assessment Report. Data for 2021 and 2022 have been calculated by EEA;
- ETS emissions data for the years 2005-2023, from the European Union Transaction Log (EUTL), extracted in July 2024;
- GHG emissions projection data until 2050, reported under Article 18 of the Governance Regulation until September 2024;
- approximated ('proxy') GHG emissions data for 2023, reported by Member States in July 2024 and gap-filled with estimates by the EEA (national proxy data were not provided by Bulgaria);

([1]) https://reportnet.europa.eu

- The 2005-2020 share of energy from renewable sources related to renewable energy use in Europe, reported under the Energy Statistics Regulation and the RED, and published by Eurostat in its SHARES tool in 2022 (Eurostat, 2020);

- The 2021 and 2022 share of energy from renewable sources related to renewable energy use in Europe, reported under the Energy Statistics Regulation and the RED, and published by Eurostat in its SHARES tool in 2024 (Eurostat, 2020);

- EEA early estimates for the share of energy from renewable sources in gross final energy consumption in 2023, as prepared by the ETC CM in collaboration with the EEA;

- 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 April 2024;

- EEA early estimates for the primary and final consumption of energy in 2023, 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 2024 report is based on several sets of GHG emissions data.

Historical trends in greenhouse gas emissions

GHG emissions data for the period 1990-2022 are official data reported by the EU and its 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 the timeliness, completeness, consistency, comparability, accuracy and transparency of the inventories reported by Member States that are used in the Trends and projections in Europe 2024 report.

In 2016, a comprehensive review of GHG emissions data took place under Article 19 of the MMR, in the context of the annual compliance cycle under the (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 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 emissions data took place for the years 2005, 2016-2018, which forms the basis for the calculation of annual emissions allocations (AEAs) for 2021-2030 under the ESR.

From 2023 onwards, Member States' GHG inventories are based on the use of GWPs from the Intergovernmental Panel on Climate Change (IPCC)'s Fifth Assessment Report (AR5) (IPCC, 2014). Thus, all the emissions estimates used in the Trends and projections in Europe 2024 report were calculated using GWPs from the IPCC's AR5.

Early approximated estimates of 2023 GHG emissions were reported by Member States under the Governance Regulation by 31 July 2024. These estimates were aggregated to EU level by the 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

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

gap-filled for Bulgaria, Denmark, Luxembourg and Portugal. Domestic aviation was gap-filled for all Member States except Finland, Malta and Poland. Gap-filling of international navigation data was done by applying Eurostat monthly data about supply and transformation of oil and petroleum products (Eurostat, 2024). Data from Member States' 2024 GHG inventory were applied to gap-fill LULUCF data. 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 Emissions Trading System since 2005

Data in the EU ETS are used to analyse emissions trends and to determine the level of emissions covered under effort sharing. For the years 2005-2020, ETS emissions include estimates to reflect the scope of the EU ETS for the third trading period (2013-2020). The latter 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 2024. 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 Effort Sharing Decision and Effort Sharing Regulation

For analysing emissions 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 (CO_2) emissions from domestic aviation and nitrogen trifluoride (NF_3) 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). These data have been fixed to distinguish between the different scope and GWPs used for the calculation of effort sharing emissions.

The ESD GHG emissions data for the years 2013-2020 are consistent with the outcome of the 2016, 2017, 2018, 2019, 2020, 2021 and 2022 reviews of national GHG inventory data pursuant to Article 19 of the MMR. These annual verified ESD data are set out in EC implementing decisions and were used to determine Member States' compliance under the ESD for the years 2013 to 2020.

Emissions under the ESR 2021 and 2022 are calculated using the GHG inventory data of 2024, from which ETS emissions and carbon dioxide (CO2) emissions from domestic aviation are subtracted.

ESD and ESR emissions are available in a dataset (EEA, 2024).

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

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

Long-term trends in ETS and ESR emissions

GHG emissions for the years 1990-2005 are split into those covered by the EU ETS and those covered by the ESR. 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, based on Member States' projections submitted in 2024. Projections for the ETS and ESR are reported by source categories in Member States' submissions.

Annual emissions targets (annual emissions allocations) under the effort sharing legislation

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 (see Table A1.2). 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 and the annual emissions limits for 2023-2030 have been revised. The AEAs for 2023-2025 have been published in the Commission Implementing Decision EC (2023a). The AEAs for the years 2026 -2030 will be determined following a comprehensive review of the 2021-2023 ESR emissions. 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 on the basis of the assumption that the methodology applied to the AEAs for 2021 to 2025 continues unchanged for the years 2026-2030, and no further adjustments for changes to the EU ETS are required. 2021 and 2022 emissions for the calculation of the trajectory for 2026-2029 are based on the final inventory reports 2024, while 2023 emissions are based on approximated inventory reports. A comprehensive review will take place in 2025 to determine the AEAs for 2026-2030. 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 of unused AEAs**: If emissions are below the annual emissions allocation for that year, the overachievement can be carried over to subsequent years. For the year this banked amount is limited to 75% of the annual emissions 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 is limited to 5% of the AEA of the following year from 2026 to 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 2026 to 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, which may use this emission allocation until 2030 (ex post). The latter can take place only after emissions data for the relevant year have been confirmed.

- **LULUCF flexibility**: This flexibility allows for the use of credits from the land use sector up to a limit. Land mitigation units from afforested land, managed cropland and managed grassland can be used by EU Member States, up to a total of 262 million credits divided equally over the entire period 2021-2030. 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 leaders' 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 both the EU average and their cost-effective reduction potential, or that did not allocate any EU ETS allowances for free to industrial installations in 2013. 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 in the period 2021-2030 is set annually at 2% of each country's effort sharing emissions in 2005, except for Ireland, Luxembourg and Iceland, which are allowed a limit of up to 4%. With the amendment of 2023, Malta is allowed a limit of up to 7%. Six Member States, as well as Iceland and Norway, have given notice that they intend to use their full flexibility allowance, whereas Belgium intends to use 1.89%. Sweden has decided to use the flexibility in 2023. Member States may request revisions of their percentages for later years by the end of 2024 and 2027 respectively.

- Different to the period 2013-2020, international project credits are excluded, as the EU target is to be met domestically.

2005 Effort Sharing Regulation base-year emissions

In the *Trends and projections in Europe 2024* 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 in percentage points (a share of 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 from emissions in the effort sharing sectors for the year 2005 that are estimated based using the latest GHG inventories and ETS data.

Projections of greenhouse gas emissions

The *Trends and projections in Europe 2024* report uses GHG projection data that were reported by Member States under Article 18 of the Governance Regulation in 2024 (EEA, forthcomingc). Mandatory reporting of projections takes place every 2 years (2015, 2017, 2019, 2021, 2023). Member States must also report substantial changes to projections every other year (2014, 2016, 2018, 2020, 2022, 2024). In 2024, Austria, Belgium, Denmark, Estonia, Germany, Ireland, Italy, Latvia, Lithuania, Luxembourg and Sweden submitted updated projections.

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

- A 'with existing policies and measures' (WEM) scenario considers the implementation of existing (already implemented) measures. It is a mandatory reporting requirement.
- If available, a 'with additional and planned policies and measures' (WAM) scenario is reported too. It considers the implementation of additional measures (at the planning stage).
- If available, Member States also report projections without policies and measures (WOM).

In 2024, a WAM scenario is available from 22 Member States. Denmark, France, Greece, Hungary and Malta provided only a WEM scenario.

EU scenarios are only calculated for WEM and WAM projections. To aggregate a WAM scenario at EU level, data for the six Member States that did not report a WAM scenario were gap-filled using their latest WEM scenario.

Iceland, Norway and Switzerland submitted WEM projections in 2023, but only Iceland provided WAM projections.

Member States' reported projections include total and sectoral GHG emissions by source category as well as the split of these projections between those covered by the EU ETS and 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 estimate Member States' emissions in the period 2024-2030. Targets for the emissions are set under the ESR.

The EEA, together with its ETC CM, implements a QA/QC procedure to ensure the timeliness, completeness, consistency, comparability, accuracy and transparency of the projections reported by Member States and used in the Trends and projections in Europe 2024 report. This procedure is described in Quality assurance and quality control procedure for national and Union GHG projections (ETC/CME, 2021).

In 2024, Member States reported GHG projections to the EC in their updated NECPs. These may differ from those reported under Article 18 of the Governance Regulation, although the submission date under this Article has been extended until August 2024 to allow a more harmonised approach.

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 renewable energy sources (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 and published by Eurostat via its SHARES tool.

Share of energy from renewable sources in gross final energy consumption, 2005-2022

The shares of RES 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 and published in its SHARES tool 2024.

In accordance with the accounting rules in the RED, electricity generated by hydro- and wind power was normalised to account for annual variations (hydropower over 15 years and wind power over 5 years). 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 disproportionally high for aviation, and they are thus strongly affected by current technological and regulatory constraints. Therefore, there are exemptions on the amounts by which aviation in these countries can exceed the EU's average gross final energy consumption in 2005, as assessed by Eurostat. For data up to 2020, the provisions of Directive 2009/28/EC (RED I) apply. For values from 2021 onwards, the provisions of Directive (EU) 2018/2002 (RED II) apply.

Approximated shares of renewable energy use in 2023

Approximated shares of renewable energy use in 2023 were estimated by the EEA and the ETC CM (EEA, forthcominga).

The 2022 milestones for energy from renewable sources

The Governance Regulation sets an interim 2022 trajectory reference point, requiring that 18% of the distance between the 2020 and 2030 target was achieved that year. The 2022 milestones for each Member State were calculated with an interim trajectory between the 2020 targets and the 2030 contributions as outlined in the Member States' NECPs submitted in 2019 under the Governance Regulation and as published in the European Commission's assessment of the national energy and climate plans (EC 2020) (see table A1.3).

2030 targets for energy from renewable sources

The 2030 RES targets for each Member State were taken from the assessment of draft updated NECPs, reported by Member States under the Governance Regulation in 2023 and assessed in EC 2023. These NECPs included planned national objectives for national contributions to the EU target on renewable energies and the assessment included calculated 2030 contributions according to the formula in the Governance Regulation (see Table A1.4). The data from the final updated NECPs submitted in 2024 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 and cooling, and transport). These data are based on Eurostat's SHARES tool (Eurostat, 2022). Approximate 2023 values were estimated by the EEA (EEA, forthcominga).

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 for 2022 is based on a trajectory calculated between 2020 targets and the energy efficiency 2030 contributions outlined in the Member States' NECPs, as submitted in 2019 under the Governance Regulation, as published in EC 2020 (see table A1.3).

Final energy consumption is aggregated by Eurostat according to the 2030 target for final energy consumption as defined in Article 4 of the recently adopted EED recast, which includes international aviation and excludes transformation losses and consumption from blast furnaces and ambient energy (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 and is published by Eurostat via its energy statistics database, namely the Europe 2020-2030 indicators to monitor progress towards EU-27 2020-2030 targets, next to the complete energy balances (Eurostat, 2023a, 2023b).

Approximated estimates for primary and final energy consumption in 2023

Early estimates of 2023 primary and final energy consumption were prepared by the EEA and the ETC CM (EEA, 2024 forthcoming). National estimates, sometimes only for selected fuel types or sectors, were collected for Austria, Belgium, Denmark, Finland, France, Ireland, Lithuania, Germany, Hungary, Latvia, Slovenia and Spain.

National energy efficiency targets for 2030

The 2030 energy efficiency targets for each Member State are the calculated values from the formula given under the EED and were taken from the guidelines for the interpretation of Article 4 on energy efficiency after adjustment (EC, 2024). Information from the assessment of NECPs, reported by Member States under the Governance Regulation at the end of 2019 and in 2023 are displayed in Tables A1.3 and A 1.4. These NECPs included planned national objectives for national contributions to the EU target on energy efficiency (see Table A1.2), as defined under the EED ((EU) 2018/2002), as amended by Directive (EU) 2023/1791 (EU, 2023c). The data from the updated NECPs submitted in 2024 could not yet be taken into account.

Abbreviations

AEA	Annual emission allocation
AR4	Fourth Assessment Report
CO_2	Carbon dioxide
CO_2e	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 (post-Brexit)
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

Technical background document accompanying the *Trends and projections in Europe 2024* report

2024 — 25 pp. — 21 x 29.7 cm

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