

Trends and projections in Europe 2021



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About this report and its scope

This report explores the historical trends, most recent progress and projected future paths towards mitigating climate change through reduced greenhouse gas emissions, renewable energy gains and improved energy efficiency. It builds upon data reported by the 27 EU Member States and EEA member countries.

This year's edition of Trends and projections in Europe is more concise than in previous years, as it transitions toward synthesizing information published across the EEA's wide portfolio of related indicators, briefings and reports. The report is accompanied by a technical background document, which describes the data sources and targets in more detail.

Throughout the report, the following scope applies, unless noted otherwise:

- References to the EU relate to the 27 EU Member States.
- Projections are those reported by Member States in 2021 under Article 18 of the Governance Regulation, including preliminary projections from Germany.
- Global warming potentials from the Intergovernmental Panel on Climate Change's Fourth Assessment Report are used to represent greenhouse gas emissions.

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Executive summary

The year 2020 saw remarkable progress towards meeting the EU's climate and energy targets. Rarely in the publication of the annual *Trends and projections in Europe* report has this executive summary presented such substantial progress as this edition does. Preliminary estimates indicate that, in 2020, we witnessed the full achievement — and even overachievement — of Europe's 20-20-20 goals for climate change mitigation, renewable energy deployment and energy efficiency gains. This keeps Europe well on track in its journey towards climate neutrality by mid-century.

Although the achievements of 2020 build upon many years of work towards climate and energy sustainability, the progress made in 2020 is also rooted in exceptional circumstances. The global COVID-19 pandemic has disrupted many key facets of European society and economy and has forced adaptation and change through crisis. At the time of this report's publication, Europe is slowly reopening from the lockdowns imposed in response to the pandemic, and stability is again becoming palpable. However, with the return of normalcy is the risk of returning to old habits, old consumption patterns and unsustainable practices. The way that European countries recover from the COVID-19 crisis will largely determine how much Europe's climate and energy progress can be accelerated in the coming years. Although the EU reached its greenhouse gas (GHG) emissions target for 2020 well before the pandemic and its impacts, and it was well on its way towards achieving the 2020 target for renewable energy shares, achieving climate neutrality by mid-century will demand change at a much more rapid pace over the next three decades.

Estimated full achievement of the 2020 targets

Over the past 7 years, GHG emissions in the EU have remained below the 2020 target levels, with one exception (2017). Largely decoupled from economic development, the falling emission levels have been driven by a wide range of policies and measures that support more sustainable practices in all economic sectors. In 2020, GHG emissions in the 27 EU Member States (EU-27) were estimated to

have fallen by 31 % below 1990 levels and net emissions by 34 % below 1990 levels. This constitutes a substantial overachievement of the targeted 20 % reduction by 2020. This is illustrated in Figure ES.1.

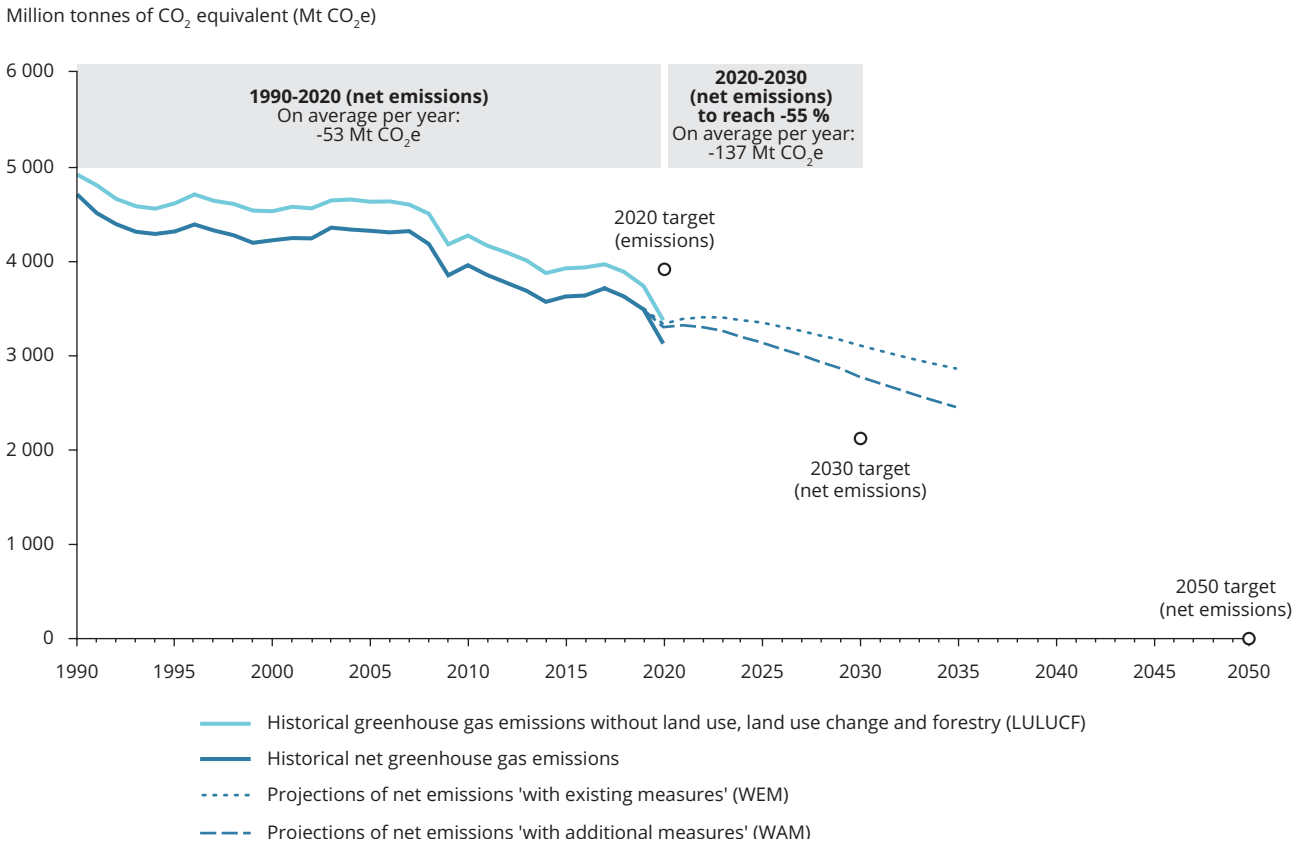
While progress has been positive in terms of overall GHG emission reductions, more varied developments have been observed in the individual economic sectors. The most notable emission reductions have been in the sectors covered by the EU Emissions Trading System (ETS), which includes large installations and the power sector in particular. In 2020, partly because of the reduction in economic activity as a result of the COVID-19 pandemic, stationary EU ETS GHG emissions in the EU-27 demonstrated an extraordinary 1-year reduction of 12 %, resulting in a total decline of 41 % below the baseline levels of 2005.

While the pandemic may have affected the trading sectors' emissions, the 2020 achievement only confirms a trend already established before the pandemic. From 2018 to 2019, a decline in emissions of 9 % was achieved, indicating a possible longer-term transition sparked by the replacement of coal power generation with less emission-intensive gas installations.

Meanwhile, the sectors covered by national emissions targets, including transport, buildings and agriculture, have demonstrated a slower pace in reductions.

Despite an estimated full achievement of 2020 targets at EU level, only 21 Member States are expected to have reached emission levels below their national target in 2020 (as illustrated in Figure ES.4). The remaining countries (Bulgaria, Cyprus, Finland, Germany, Ireland and Malta) will probably need to make use of flexibilities to comply with their legal objectives. In these so-called 'Effort Sharing' legislation sectors, the total approximated decline of 6 % in 2020 comprised a more substantial jump in progress than has been achieved in recent years, when emission reductions have been more sluggish. The reduction in 2020 may therefore be largely attributable to the effects of the COVID-19 pandemic, but it also demonstrates the scale of change that will be necessary year on year to achieve carbon neutrality in the long term.

Figure ES.1 Historical trends and projections of greenhouse gas emissions



Note: The historical development of greenhouse gas emissions is shown excluding land use, land use change and forestry (LULUCF) (light blue solid line, labelled 'emissions') and including LULUCF (dark blue solid line, labelled 'net emissions'). Both of these trend lines include approximated values for 2020. The light blue line relates to the scope of the 2020 target, while the dark blue line reflects the 2030 target's scope; both include international aviation. Projections are shown in dashed and dotted lines according to the 2030 target's scope, starting from 2019. The projections reflect the most recent data submitted by all Member States; Germany's projections are only preliminary. The pace notations in the bar at the top indicate the actual average annual change in net emissions (including LULUCF and international aviation) for 1990-2020. The necessary future change to achieve the net 55 % reductions between 2020 and 2030 is calculated on an average annual basis, assuming a maximum LULUCF contribution of 225 Mt CO₂e (carbon dioxide equivalent) in 2030.

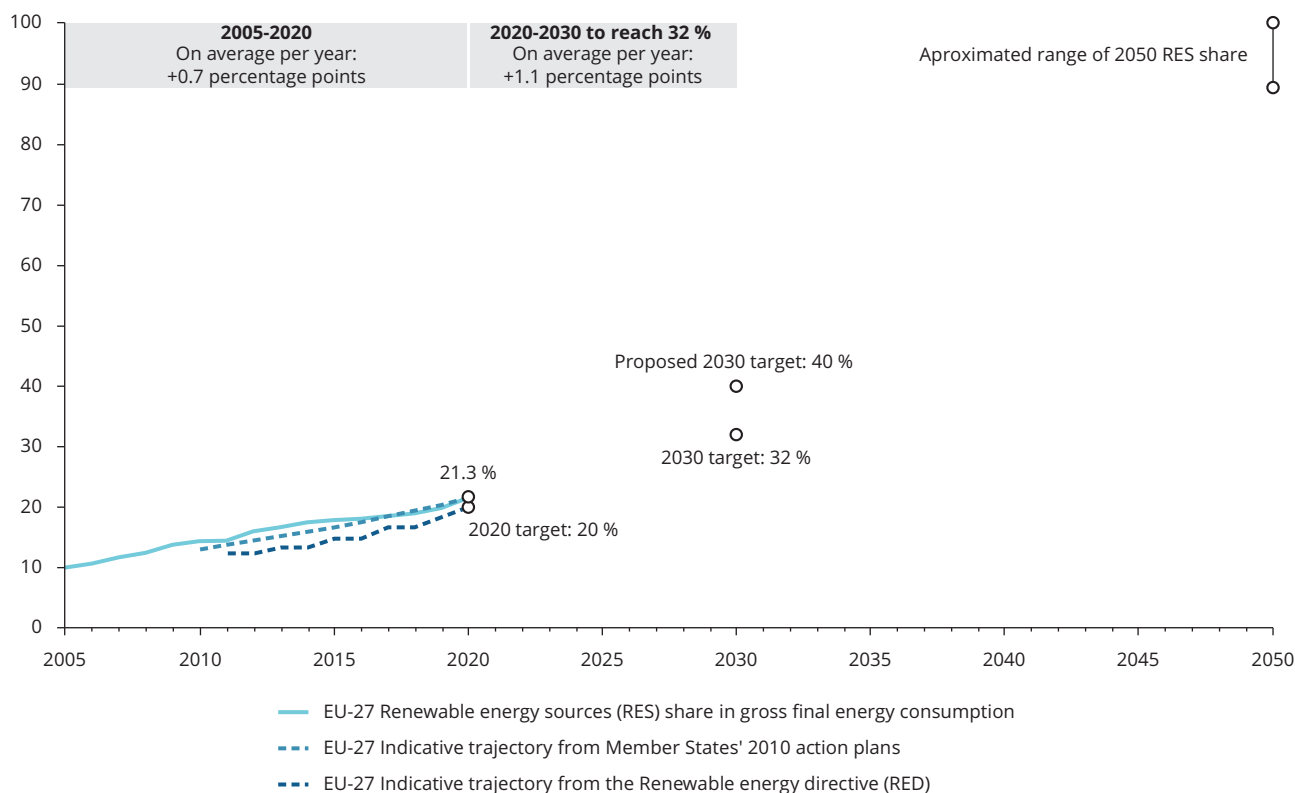
Sources: EEA (2021b, 2021d, forthcoming_b).

At the EU-27 level, land use, land use change and forestry (LULUCF) removes more GHGs than it emits, resulting in a net carbon sink. However, the size of this sink has been shrinking in recent years, especially as removals from forest land decline. In 2019, the EU's net carbon sink amounted to about 249 Mt carbon dioxide equivalent (CO₂e), corresponding to about 7 % of the EU's total GHG emissions. The net carbon sink is estimated to have remained at a similar level in 2020. Carbon removals through LULUCF have not been accounted for in the 2020 targets under the climate and energy package but will be critical in the next decade. This is especially true as Europe works towards new 2030 targets that are expressed as net emissions and include a cap of 225 Mt CO₂e of offsetting capacity.

The second headline target for 2020, which early estimates indicate has also been achieved, is the share of energy consumed that was obtained from renewable sources. The EEA's preliminary estimates show that a 21.3 % renewables share was achieved in 2020, and with it an overachievement of the target level for 2020 (as demonstrated in Figure ES.2). While renewable energy accounted for an increased share of energy consumed through electricity and heating and cooling uses, renewables consumption in transport increased more slowly. According to estimates, the 10 % target for renewable energy in the transport sector was achieved in 2020, although only by a very small margin of 0.1 percentage point.

Figure ES.2 Historical trends and outlook on renewable energy shares

Percentage of RES share in gross final energy



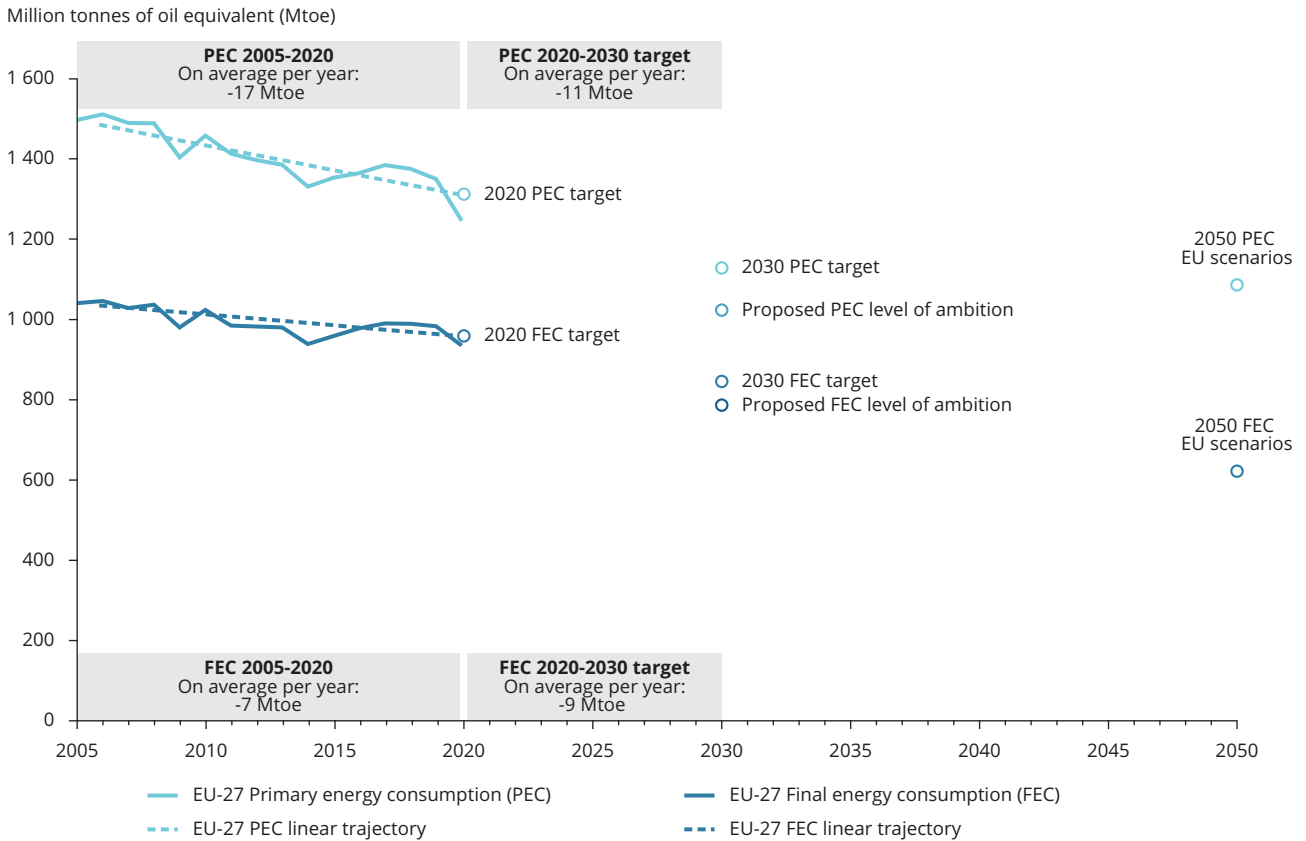
Note: The current 2030 target, adopted from the Renewable Energy Directive (2018/2001/EU), is a 32 % renewable energy share of gross final energy consumption (RES share). The proposed target from the 'Fit for 55 package' is a more ambitious 40 % RES share in 2030. The 2050 values represent the indicative share of renewable energy in the EU's gross final consumption as presented in figures 5 and 8 in a Commission staff working document (EC, 2020a) of scenarios that achieve a reduction of at least 55 % in 2030.

Sources: EC (2020a, 2021e); EEA (forthcoming_c); EU (2018); Eurostat (2021c).

While Member States' aggregated progress in renewable energy shares was enough to surpass the 2020 target, according to EEA preliminary estimates, 22 Member States appear to have met their national targets for 2020 in this area without making use of statistical transfers. As indicated in Figure ES.4, Belgium, France, Poland, Romania and Slovenia had estimated renewable energy shares in 2020 that were below their binding national targets. To fully achieve the EU target without yet accounting for statistical transfers, overachievement of national renewable energy targets in some countries offset underperformance in others. This will be balanced out through use of flexibility measures in the legislation, such as statistical transfers, joint projects and joint support schemes that were deployed between Member States in the year 2020. Reductions in energy consumption across Europe in 2020 also contributed to the overall achievement of the renewable energy target, which is defined as the percentage of gross final energy consumption that comes from renewable sources.

The third headline target for 2020 addresses energy consumption in total as a reflection of energy efficiency improvements. For many years, the achievement of this target — a 20 % reduction compared with a baseline projection for 2020 — seemed unlikely, with outright growth characterising Europe's final energy consumption trends over the past 5 years, and only marginal declines in primary energy consumption over the same period. The widespread lockdowns in 2020 appear to have substantially affected energy consumption in Europe, harnessing the growth in energy use by the transport sector for the first time since 2013 and curbing industrial production. This ultimately provided the momentous shift necessary to achieve the otherwise distant target levels. Both final and primary energy consumption levels in Europe are estimated to have fallen below the benchmark levels in 2020, by 2.6 % and 5.0 % respectively, leading to an expected achievement of the target. This is illustrated in Figure ES.3.

Figure ES.3 Historical trends and outlooks on energy consumption



Note: FEC denotes final energy consumption, while PEC denotes primary energy consumption. The targets labelled '2030' reflect the current 2030 targets of an energy consumption reduction of at least 32.5 % compared with projected 2030 energy use. The proposed levels of ambition depict increased 2030 ambition with a 36 % reduction for FEC and a 39 % reduction for PEC (both compared with the 2007 reference scenario projection for 2030) but have not yet been agreed.

Sources: EC (2020a, 2021f); EEA (forthcoming_a).

Among Member States, the primary energy consumption target for 2020 appears to be the most widely achieved. Only three Member States' estimated primary energy consumption levels exceeded target 2020 levels (Belgium, Bulgaria and the Netherlands). Achievement of the national 2020 target levels for final energy consumption appears to have been less extensive than for primary energy: seven Member States' estimated final energy consumption exceeded their national target levels for 2020 (Austria, Belgium, Bulgaria, Germany, Hungary, Lithuania and Slovakia). While 19 Member States are estimated to have achieved both their national primary and final energy consumption target levels in 2020, only sustained shifts in energy consumption patterns will prevent a rebound in energy use in the years of recovery from the COVID-19 pandemic. This will be necessary to keep this target area on track towards achieving longer-term goals.

2030: a step towards climate neutrality

Achievement of the 2020 targets occurs against a global backdrop of severe climate change impacts — flooding, heat

waves, forest fires and extreme weather have pervaded the past year globally and have been widely associated with the changing climate. With the Intergovernmental Panel on Climate Change's publication of the contribution of its Working Group I to the Sixth Assessment Report, the critical importance of real and lasting climate change mitigation has never been as evident.

The June 2021 adoption of the European Climate Law demonstrates the EU's commitment to contributing its share towards stabilising the global climate in the long term. The pledge to achieve climate neutrality by 2050 — and a net zero emissions economy in Europe — is now enshrined in law. This is a key starting point on the path towards long-term change, and will require efforts across Europe to accelerate substantially over the coming decades.

In addition to the 2050 goals, the European Climate Law sets a higher level of ambition for the 2030 benchmark on the way to mid-century. The previous binding 2030 target, of a 40 % reduction in GHG emissions, has been replaced by a net 55 % target to be achieved by the end of this decade. The estimated

overachievement of the 2020 target, with a net emissions reduction of 34 % calculated for 2020, demonstrates that the necessary scale of change to meet the new, more ambitious, target is possible. However, the progress already achieved will have to be maintained during the recovery from the COVID-19 pandemic.

EU countries' projected emission reductions over the next 10 years underline the importance of sustained efforts. When aggregated, these projections point to an anticipated reduction in net GHG emissions of 41 % by 2030 (compared with 1990 levels) with the introduction of additional policies and measures. Most Member States have not yet realigned their ambitions to the new net 55 % target for 2030, and the further introduction of more impactful policies and measures across Europe will be important to bring the 2030 target within reach. Higher 2030 targets for renewable energy and energy efficiency have been proposed to ensure their contribution to the net 55 % ambition level for 2030. Substantial additional effort will be needed to reach both.

In their national energy and climate plans (NECPs) for the period 2021-2030 that Member States submitted under Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action, countries have indicated their total intended national contributions for energy improvements. Together, these would bring the EU share of renewable energy to just over 33 % by the end of this decade and result in a slight overachievement of the existing 2030 target of 32 %. To achieve the proposed increased target of 40 % by 2030, a more rapid deployment of renewable energy sources would need to be initiated. This is also demonstrated in Figure ES.2.

More difficulty may be found in achieving the energy efficiency targets for 2030, as the NECPs indicate total national contributions that would fail to meet the existing target level of at least 32.5 %, with final energy consumption missing the current 2030 target by nearly 5 %. To align with the 55 % emission reduction target for 2030, more ambitious energy efficiency targets have also been proposed. These would seek to reduce primary and final energy consumption levels in 2030 by 39 % and 36 %, respectively. The need to establish focused and effective policies to reduce energy consumption, and to direct the trends towards achieving the existing and proposed targets is immediate. This is also demonstrated in Figure ES.3.

A just and sustainable transition

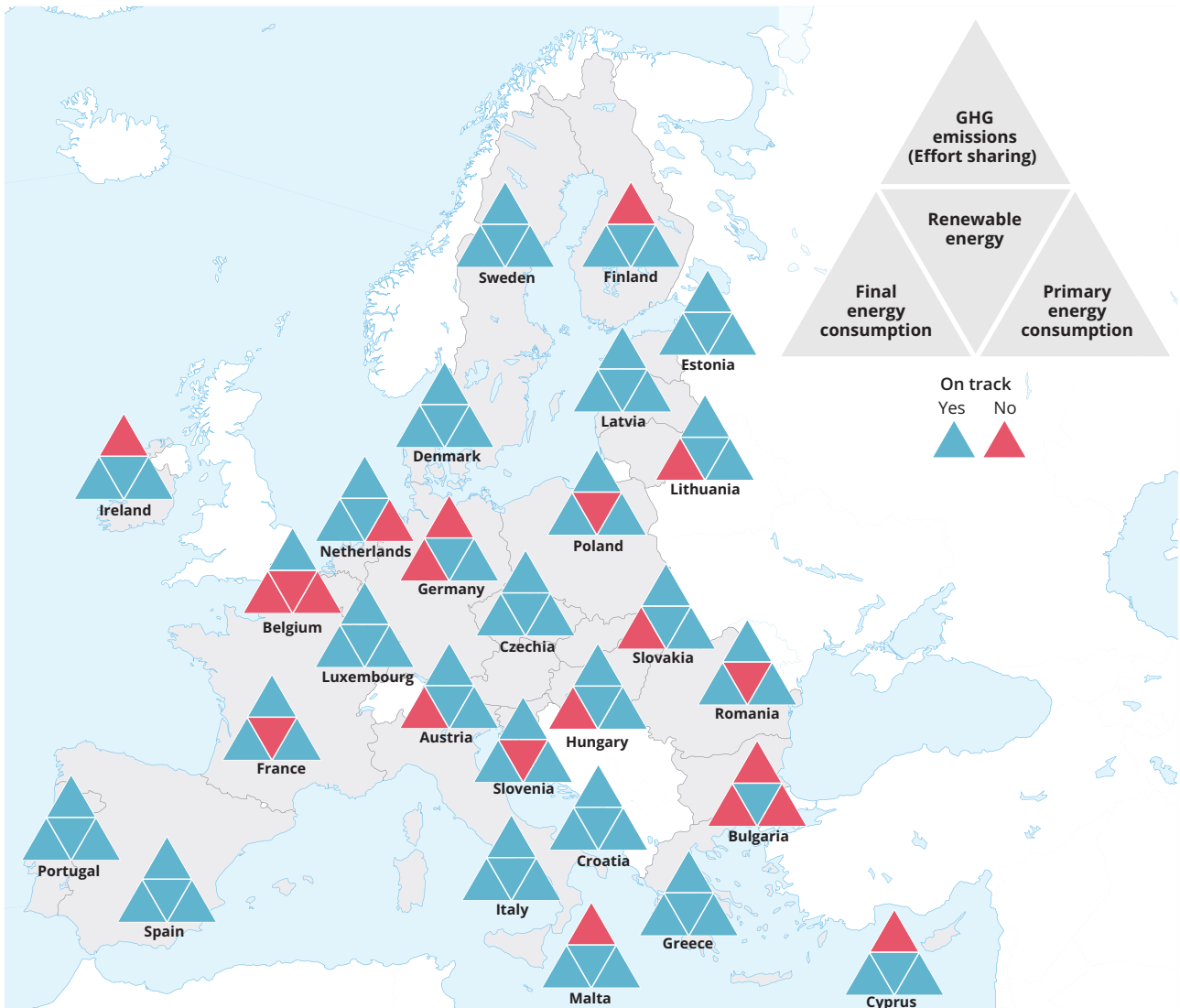
Achieving the 2030 targets will be critical to ensure a manageable subsequent increase in efforts towards achieving the 2050 goals. Deep and widespread change will be necessary in everything from how Europe's buildings are renovated, used, heated and cooled; to how goods are transported across Europe and people's mobility organised; to how land and forests are managed. In making these shifts, it is critical that the burden of change is evenly borne.

In the shorter term, recovery from the COVID-19 pandemic demands that, if new and more sustainable practices are to be maintained, they should be evenly spread across Europe. The EU's Recovery and Resilience Facility commits billions of euros to supporting a sustainable recovery from the COVID-19 pandemic, with at least EUR 248 billion earmarked for climate-related efforts up to 2026.

In the longer term, investments that are more consistent with sustainable development objectives will be needed to support Europe's climate and environment ambitions. Europe's new taxonomy for sustainable activities seeks to ensure that financial flows can be channelled into strengthening the kinds of innovation and practices that will be aligned with a more sustainable future economy and climate. Deploying renewable energy should not occur at the expense of biodiversity, resource efficiency must be aligned with continuing improvements in energy efficiency, and so on. Such comprehensive change will require increasingly integrated and systemic approaches.

And at a larger scale, environmental and social justice must be the cornerstones of EU climate and energy policy if real, lasting progress is to be achieved. The European Green Deal gives the Just Transition the highest priority, underlining that no part of Europe's green ambitions can be achieved to the exclusion of the others and that no one should be left behind. Tracking progress in climate change mitigation will necessarily be linked to tracking progress in all other areas of environmental sustainability. The indicators referenced in this report are a small but important part of a larger, critical monitoring system. This will be key in ensuring concerted efforts and progress towards achieving the ambitions of the European Climate Law and the European Green Deal.

Figure ES.4 Member States' progress towards 2020 national targets



Note: All calculations in this figure are based on the 2020 approximated data for GHG emissions, renewable energy shares and energy consumption, in comparison with national targets for 2020. The figure reflects progress before the use of flexibilities available for the Effort Sharing legislation sectors or statistical transfers for renewable energy. Thus, it does not indicate compliance with the national targets.

Sources: EEA (forthcoming_a, forthcoming_b, forthcoming_c).

1

Greenhouse gas emissions and energy trends in the EU

Key messages

- In 2019, the 27 EU Member States had greenhouse gas (GHG) emissions that were 24 % below 1990 levels, which was consistent with achieving the 2020 target. Renewable energy sources exhibited a 19.7 % share of gross final energy consumption in 2019, while Europe's final and primary energy consumption for 2019 was 2 % above the intended limits for that year. For these last two parameters, increased effort was necessary to reach the 2020 targets.
- Early estimates indicate that Europe exited 2020 having **fully achieved the 2020 climate and energy targets**. The COVID-19 pandemic is expected to have affected GHG emissions and energy consumption in 2020, but achievement of the 2020 targets first and foremost comes from sustained efforts over the previous decade.
- Between 2020 and 2030, **steeper GHG emission reductions** will be required to achieve a net 55 % reduction compared with 1990 levels. Net emission reductions in 2020 are estimated to have reached a level 34 % below 1990 emissions, and projections ⁽¹⁾ indicate that additional policies and measures planned across Europe will lead to a net emissions reduction of 41 % by 2030. Further introduction of policies and measures to reduce emissions in all sectors will be needed to achieve the net 55 % target.
- To reach the 2030 target of 32 % of European energy consumption from renewable sources, the **continuous introduction of renewable sources** for electricity generation needs to be sustained, especially in the light of additional direct demands for electricity from other sectors and for the production of other fuels such as hydrogen. For transport, heating and cooling purposes, the use of renewable energy sources will need to increase substantially. Technological and infrastructural developments, such as the spread of district heating and cooling networks and the integration of energy carriers other than bioenergy, need to be initiated.
- Efforts towards reaching the 2030 energy efficiency target of at least 32.5 % will need to achieve a **more rapid rate of decline in energy consumption**, and even more so if the energy efficiency target for 2030 is aligned to the net 55 % GHG target. Just to reach the existing 2030 target, the average annual decline in final energy consumption would need to be of at least 9 Mtoe across the EU, compared with an observed average annual decline of 7 Mtoe between 2005 and 2020, which includes the effects of the COVID-19 pandemic. The intensification will need to go well beyond the national contributions set out by Member States in their national energy and climate plans, as these already indicate a collective gap in ambition of 4.6 % from the current final energy consumption target for 2030.

⁽¹⁾ GHG emission projections reflected here stem from aggregating Member States' GHG emission projections that are submitted annually to the EEA. In the remainder of the report, these are referred to as 'projections' without further explanation.

1.1 EU-wide trends in greenhouse gas emissions and energy

Published in 2021, this report looks at the progress achieved so far towards achieving European targets for greenhouse gas (GHG) emission reductions, deployment of renewable energy sources and improvements in energy efficiency. It is the first year beyond the landmark 2020 targets of 20 % GHG emission reductions (compared with 1990 levels), 20 % share of gross final energy consumption from renewable energy sources and 20 % reduction in energy consumption (compared with the European Commission's 2007 baseline scenario). From preliminary data for 2020, it is possible for the first time to estimate the achievement of these targets. At the same time, 2021 is the first year on the path to Europe's ambitious 2030 targets, which serve as a milestone towards achieving climate neutrality in 2050.

This chapter synthesises the conclusions of indicators published by the EEA in 2021 with a number of key figures, and reflects the most recent data and information on emissions, renewable energy and energy efficiency. Together, this information indicates that Europe exited 2020 with a solid achievement of the 2020 targets and is well on the way towards achieving the next set of targets in 2030.

Figure 1.1 shows how the 27 EU Member States (EU-27) fare with respect to their 2020 and 2030 targets in four areas: GHG emissions, final energy consumption, primary energy consumption and renewable energy shares. Each area is explored further in Section 1.2.

1.2 Progress to 2020 and 2030 greenhouse gas emissions and energy targets

As illustrated in Figure ES.1 in the executive summary, **GHG emissions** in the EU-27 have declined rapidly in recent years, having reached 24 % below 1990 levels in 2019 and an estimated 31 % in 2020. These achievements include emissions from international aviation and do not account for land use, land use change and forestry (LULUCF) contributions (and thereby reflect the scope of the 2020 target). With one exception (2017), emissions in the EU-27 have been consistently below the EU's 20 % reduction target for 2020 over the past 7 years.

Notably, GHG emissions decreased by an approximated 10 % between 2019 and 2020, and this is assumed to be strongly related to the effects of the COVID-19 pandemic; the magnitude of this effect, however, is as yet uncertain. By comparison, between 2018 and 2019 — years without any notable crisis — EU-wide emissions fell by 4 %. This substantial reduction was strongly driven by the substitution of coal with gas and renewable energy sources in the EU power sector and may have

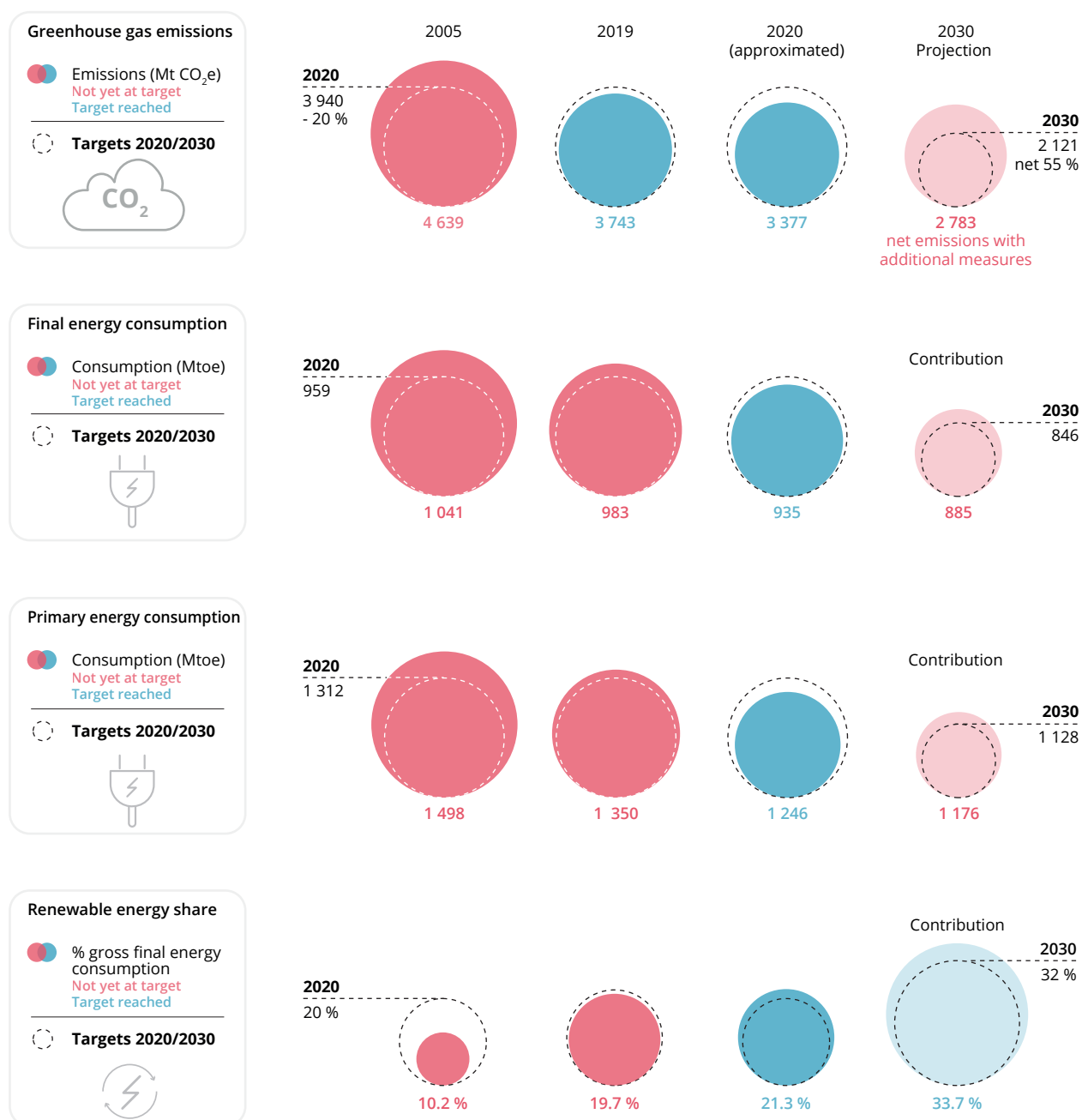
been the beginning of a trend that was carried forward and intensified by the pandemic.

In the coming decades, momentous emissions reductions will need to be sustained year on year, and throughout the recovery from the COVID-19 pandemic, to achieve climate neutrality in the long term. To reach the 55 % target, emissions would need to decline by 101 Mt CO₂e per year on average, which is about twice the average annual reduction which is observed between 1990 and 2020 (-53 Mt CO₂e).

This means that between 2020 and 2030, steeper GHG emission reductions will be required to achieve a net 55 % reduction compared with 1990 levels. This is visible in Figure ES.1, where there is a notable gap between the steepest projections curve towards 2030 and the new net 55 % target for 2030. While net GHG emissions reductions in 2020, including international aviation, are estimated to have fallen to 34 % below 1990 levels, projections indicate an expected net emissions reduction of 41 % by 2030 through the introduction of additional policies and measures. While the projected ambition level would be sufficient to achieve the original 40 % EU-wide reduction target, towards which most projections submitted by Member States in 2021 were still oriented, further efforts will be needed to achieve the net 55 % target. In July 2021, the European Commission proposed a comprehensive 'Fit for 55' policy package to set all relevant sectors on the path to the new 2030 climate target, and future projections should be oriented to the new, more ambitious target (EC, 2021a).

To support continuous reductions in GHG emissions in Europe, three key EU policies are in operation. The EU Emissions Trading System (ETS) and the Effort Sharing legislation foster reductions in GHG emissions in Europe — the former through a Europe-wide cap-and-trade system that mainly targets large power stations, industrial plants and aviation, and the latter through national targets for emissions reductions on a yearly basis in sectors such as road transport, buildings, agriculture and parts of the energy and industry sector that are not covered by the EU ETS. At the same time, the legislation on emissions and removals from LULUCF provides an accounting framework for Europe's net GHG emissions and removals from forest land and forest products as well as from cropland, grassland, wetland and settlements. This land sink plays a critical role in sequestering carbon, thereby reducing total net emission levels from other sectors. The following paragraphs describe these three policy areas in detail.

Emissions covered by the **EU ETS**, which encompasses large industry, power generation and other, similar installations, have decreased significantly since 2005. The reductions here have been particularly strong in the energy industries. These include emissions from public electricity and heat production, petroleum refining and the manufacturing of solid fuels and other energy industries, as well as fugitive emissions from fuel.

Figure 1.1 Current progress towards achieving the 2020 and 2030 targets in the EU-27

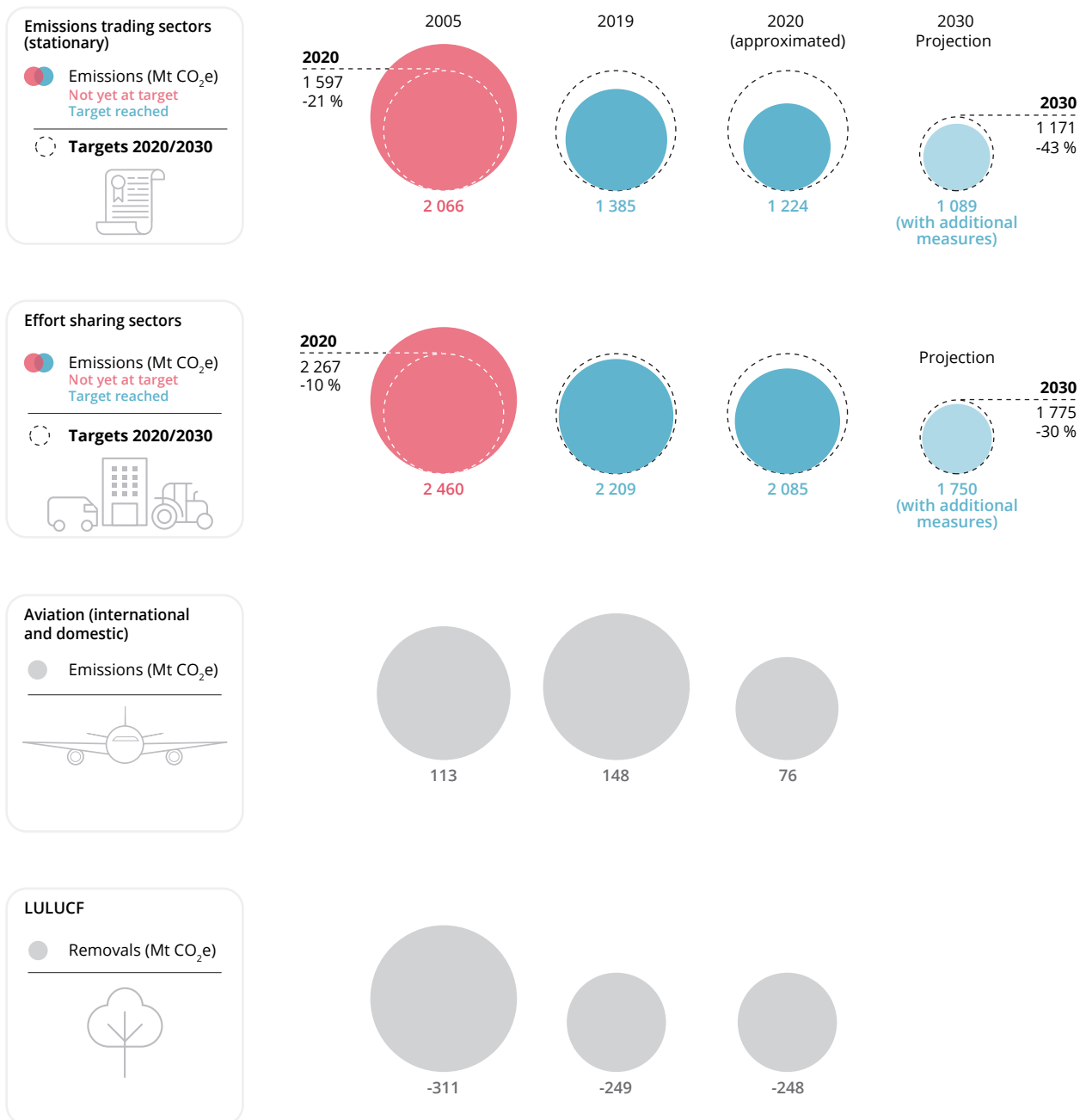
Note: The 2030 'with additional measures' projection for GHGs stems from the aggregation of national projections reported to the EEA, while energy consumption and renewable energy contributions for 2030 originate from final national energy and climate plans. Since no energy efficiency target was established for the EU-27 in 2020, the 2020 energy efficiency targets shown in the figure were taken from Eurostat. The final scope of the net emission target of -55% by 2030 is not determined yet. It is currently assumed that international aviation and LULUCF are included in the net emissions. International navigation has not been considered.

Sources: EC (2020c), EEA (forthcoming_a, 2021b, forthcoming_b, forthcoming_c), Eurostat (2021c, 2021d).

Figure 1.2 illustrates that 2020 emissions levels in the EU ETS were well below the cap set for that year. 2020 emissions in the EU ETS, largely affected by the COVID-19 pandemic, were nearly 12 % lower than in 2019. This notable reduction followed a 9 % drop in EU ETS emissions the previous year. In total, by 2020, emissions from EU-27 Member States' stationary

installations had already fallen by a full 41 % since 2005. This is an overachievement of the level necessary to reach the 2020 target, for which a reduction under the EU ETS of 21 % was planned. Notably, the reduction that has already taken place under the EU ETS is at about the level necessary to achieve the original 2030 target (43 %).

Figure 1.2 Breakdown of greenhouse gas emissions trends in the sectors covered by the EU Emissions Trading System, the Effort Sharing sectors and Land Use, Land Use Change and Forestry



Notes: The figure depicts the current EU ETS cap and the current 2030 target for the sectors covered by the Effort Sharing Regulation. Aviation consists of flights within the European Economic Area, which are covered by the EU ETS, and international and a part of domestic flights. This sector is shown separately here because its trends diverge substantially from those of the stationary facilities under the EU ETS, with consistently increasing emissions from aviation and a substantial expected drop in emissions in 2020 due to the effects of the COVID-19 pandemic. All GHG emissions shown refer to global warming potentials (GWPs) from the Intergovernmental Panel on Climate Change's (IPCC's) Fourth Assessment Report. To allow comparability between historical data and legal targets, the 2030 Effort Sharing target, expressed using GWPs from the IPCC's Fifth Assessment report, was converted to be expressed as emissions using GWPs from the IPCC's Fourth Assessment Report.

Sources: EEA (2021b, 2021c).

For 2030, national projections indicate that total emissions covered by the ETS in the EU-27 will be 1 216 Mt CO₂e with existing measures and 1 089 Mt CO₂e with the implementation of additional measures, thus staying well below the cap of 1 171 Mt CO₂e. However, actual progress will also be influenced by the development of the ETS price and progress in efficiency gains in the industry sector.

In 2019, EU emissions covered by **national emissions targets** in such sectors as non-ETS industry, transport, buildings, agriculture and waste, and covered by the Effort Sharing legislation, were also below 2005 levels, albeit by a more modest 10 %. Emission levels from 2015 to 2019 exceeded 2014 levels, although a strong decrease of 6 % was observed between 2019 and 2020, which can be largely ascribed to the COVID-19 pandemic.

One of the greatest challenges to achieving national emissions targets has been the transport sector. This is also reflected by an increase in final energy consumption in transport of 6 % between 2005 and 2019. The trends in GHG emissions and final energy consumption in the transport sector are strongly correlated with the economic context. The COVID-19 crisis reliably explains much of the observed 13 % decrease in transport emissions between 2019 and 2020, as restrictions put in place during the pandemic had wide impacts on people's and goods' mobility patterns. Disruptions often catalyse shifts in behaviour, and the pandemic may have encouraged more sustainable transport choices, but it remains unclear whether changes in transport during this particular crisis will be maintained in the longer run. The introduction of additional policies that support lower emitting and more efficient transport will be important to avoid a rebound effect after the pandemic and to ensure more sustainable transport behaviour in the long term (JRC, 2021a).

For 2030, projections of the effect of existing measures indicate an emissions reduction in the sectors covered by national emissions targets from 2 209 Mt CO₂e in 2019 to 1 938 Mt CO₂e, thus missing the target by 163 Mt CO₂e (9 %). With additional measures, a level of 1 750 Mt CO₂e could be achieved in 2030, meaning the current 2030 target of 1 775 Mt CO₂e could be reached. See also Section 2.1 for further details on projected emissions within the individual sectors.

In 2019, the **LULUCF sector** in the EU provided a net carbon sink of about 249 Mt CO₂e, corresponding to about 7 % of total GHG emissions. From 1990 to 2019 the size of the sink was, on average, 299 Mt CO₂e, albeit with variations from year to year and a tendency towards a reduction in the sink size over the past decade. This sink is the balance of net removals of CO₂ by forest land and carbon stored in harvested wood products, on the one hand, and of GHG net emissions mainly from cropland or the conversion of land to settlements, on the

other. The total size of the EU's net sink from forest land was 329 Mt CO₂e in 2019.

The new target for GHG emission reductions in 2030 is expressed as a net target. This new target takes into account the contributions of Europe's carbon sink and caps the net contribution of the LULUCF sector to the net 55 % target to a maximum level of 225 Mt CO₂e of reductions (although further removals beyond this cap are anticipated). This means that other sectors will have to achieve continued and accelerated emission reductions.

This maximum LULUCF contribution to the target is smaller than the current level of LULUCF removals, but Member States' projections indicate that in 2030, natural sinks would shrink by about 8 % with existing measures and by 1 % with planned, additional measures (compared to 1990). With a view towards achieving the climate neutrality target in 2050 and the aim of achieving net negative emissions levels thereafter, the EU-27 will need to increase its sink size in the future (EC, 2018). This will require investment in both the natural sink provided by certain land use types and forests and in technical sinks provided by removing carbon from the atmosphere via carbon capture and storage.

In the area of **renewable energy shares**, the EU-27 achieved a total level of 19.7 % of total energy consumption from renewable sources in 2019 (see Figure 1.1). Preliminary data for 2020 suggest that the EU-27 achieved a total share of renewables of 21.3 % in 2020. Thus, it appears that the EU has achieved its 2020 target of a minimum 20 % renewable energy share.

The greatest shares of renewable energy were observed in electricity consumption and, to a more limited extent, in heating and cooling. At the same time, a reduction of overall energy used in the transport sector in 2020 due to COVID-19 related restrictions has provided a contextual boost to the share of renewable energy consumed in this sector. Preliminary data for 2020 suggest that the 10 % target for transport was achieved by 0.1 percentage point, although it is likely that it was strongly affected by pandemic-related shifts in transport behaviour.

From 2005 to 2020, the total renewable energy share grew on average by 0.7 percentage points per year. To reach the current 2030 target of a 32 % renewable energy share, this average annual increase will need to grow to 1.1 percentage points from 2020 onwards. Progress in energy efficiency will be essential in reducing energy use from all sources, while the introduction of renewable sources for electricity generation needs to increase to support the electrification, and thereby decarbonisation, of other sectors. For heating and cooling and transport purposes, the use of renewable energy sources will also need to increase substantially.

As required in the Regulation on the Governance of the Energy Union and Climate Action, in 2019, EU Member States formulated national energy and climate plans (NECPs) and set intended national contributions for the continued introduction of renewable energy. Cumulatively, these intended national contributions would lead to a slight overachievement of the current 32 % target for renewable energy sources in 2030.

However, this 32 % renewable energy target was aligned with Europe's original 40 % GHG emission reduction target, and to achieve the net 55 % target, the renewable energy share in 2030 will need to be greater. The European Commission therefore proposes to increase the 2030 target for renewable energy shares to 40 % (EC, 2021e). Member States' deployment of renewable energy over the next decade would therefore need to exceed the contributions set in their existing NECPs. The next updates to the NECPs will be due in mid-2023.

For **energy efficiency**, the outlook to the 2020 targets has been uncertain for several years and has often been marked by diverging trends. Unlike the EU targets for GHG emissions, which are expressed in comparison with the emissions level in 1990, the EU targets for energy efficiency are based on energy consumption levels for the years 2020 and 2030, projected from the European Commission's 2007 baseline scenario.

The COVID-19 pandemic significantly affected levels of energy consumption across Europe as industry and transport slowed or stood still for several months in 2020. Whereas, by 2019, the EU-27^(?) had reduced energy consumption to a level only 2.0 % above the 2020 target for final energy consumption and 1.9 % above the target for primary energy consumption, these trends shifted substantially in 2020. Preliminary data indicate that, in 2020, energy consumption for the EU-27 was 2.6 % below the 2020 target for final energy consumption and 5.0 % below the target for primary energy consumption. This shift in 2020 means that the EU-27 met and overachieved the 2020 target in its final year, after not having been on track to do so.

Taking into account the substantial drop in energy consumption in 2020, the EU-27 therefore demonstrated an average annual decline in final energy consumption of 7.1 million tonnes of oil equivalent (Mtoe) from 2005 to 2020, or 0.7 % annually. In terms of primary energy consumption, this average annual reduction was 17 Mtoe between 2005 and 2020, which corresponds to a 1.1 % reduction per annum.

Efforts towards reaching the current 2030 energy efficiency target of at least a 32.5 % reduction in energy consumption will need to be maintained, and considerably intensified to support the net 55 % GHG emission reduction target.

Based on the energy efficiency levels estimated for 2020, the average annual decline in final energy consumption in the EU-27 from 2020 to 2030 would need to be at least 9 Mtoe, or a 0.9 % reduction, to reach the current target. Similarly, primary energy consumption would need to decline by at least 12 Mtoe per year, or 0.9 %. This would require that the energy consumption levels of 2020 (as observed during the height of the COVID-19 pandemic) be sustained. Any rebound in energy consumption during the recovery from the pandemic would require even greater subsequent reductions in energy consumption to bring the current energy efficiency target for 2030 within reach.

Such substantial intensification would need to go well beyond the national contributions set out by Member States in their NECPs. Taken together, these contributions already indicate a gap in ambition compared with the original 32.5 % energy efficiency target for 2030: the Member States' contributions aim for 885 Mtoe (see Figure 1.1), which is 4.6 % above the current final energy consumption target of 846 Mtoe by 2030.

In the proposal for the revised Energy Efficiency Directive, the European Commission has proposed more ambitious 2030 energy efficiency targets, corresponding to a reduction of 36 % for final and 39 % for primary energy consumption compared with the 2007 baseline projections (EC, 2021f) ^(?).

^(?) No 2020 energy efficiency target was established for the EU-27. 2020 energy efficiency targets were taken from Eurostat.

^(?) The proposal changes the way the targets are calculated and defined, comparing them to the latest baseline projections from the 2020 reference scenario (a reduction of 9 % compared with the projections for 2030).

Further reading

EEA indicators:

- [Total greenhouse gas emission trends and projections in Europe](#)
- [Share of energy consumption from renewable sources in Europe](#)
- [Use of renewable energy for transport in Europe](#)
- [Primary and final energy consumption in Europe](#)
- [Progress to national greenhouse gas emission targets in Europe](#)

Other sources:

- [An EU-wide assessment of national energy and climate plans](#)



2

Greenhouse gas emissions and energy trends at the sectoral level

Key messages

- Achievements in emission reductions since 2005 are **diverse at the sectoral level**. The highest reductions are observed in the energy supply sector, where emissions decreased by 43 % between 2005 and 2020. Considerably greater efforts are needed in the transport and agricultural sectors, where emissions fell by only 14 % and 2 %, respectively. While energy supply is widely covered by the EU Emissions Trading System, transport and agriculture are addressed by national targets and therefore require further adoption or implementation of measures at the national level.
- The latest greenhouse gas (GHG) projections show that considerable further emission reductions are expected up to 2030 from existing policies and measures. This is particularly true for the buildings sector, which covers energy consumption in private and commercial buildings, and also for agriculture, forestry and fishery. Additional policies and measures will also be important to **achieve emission reductions across all sectors**, particularly in the transport sector, where emissions are projected to stay relatively unchanged based on the contributions of existing measures alone.
- In the design of additional policies and measures that address GHG emission reductions, growth in renewable energy shares and improved energy efficiency and **interactions between the sectors and target areas** will need to be taken into account. Shifts in one area can directly or indirectly affect the others, requiring a systemic approach in line with the ethos of the European Green Deal.

Transitioning to a climate-neutral Europe requires that interactions between sectors are recognised and addressed. Projected emission reductions in one sector often impact other sectors, through higher demand for electricity or due to increased demand for biomass, for example. Competing uses of resources need to be monitored to avoid inconsistent or even competing developments in different sectors.

Since 2013, the annual *Trends and projections in Europe* report has presented progress in the linked areas of greenhouse gas (GHG) emissions, renewable energy and energy efficiency. Shifts in one of these areas can strongly affect the others, and achieving Europe's 2030 targets and long-term goals of climate neutrality by mid-century will require aligned efforts.

At a greater level of granularity, developments in GHG emissions, renewable energy and energy efficiency totals are the composite of developments in individual sectors. As described in Chapter 1, growth in the use of renewable sources of energy in transport has been lagging behind, while energy generation has made remarkable contributions to decarbonisation. This chapter looks more closely at developments within individual sectors and describes how interactions between them can necessitate a more effective, cross-sectoral approach to achieving Europe's climate sustainability targets in the medium and long terms.

2.1 Sectoral trends and projections

In this section, developments in the following sectors are described: energy, industry, transport, buildings, agriculture and waste. Figure 2.1 provides an overview of historical and projected developments within each sector, and the note explains how the sectors are defined. Selected details from the figure are also analysed in the subsequent paragraphs.

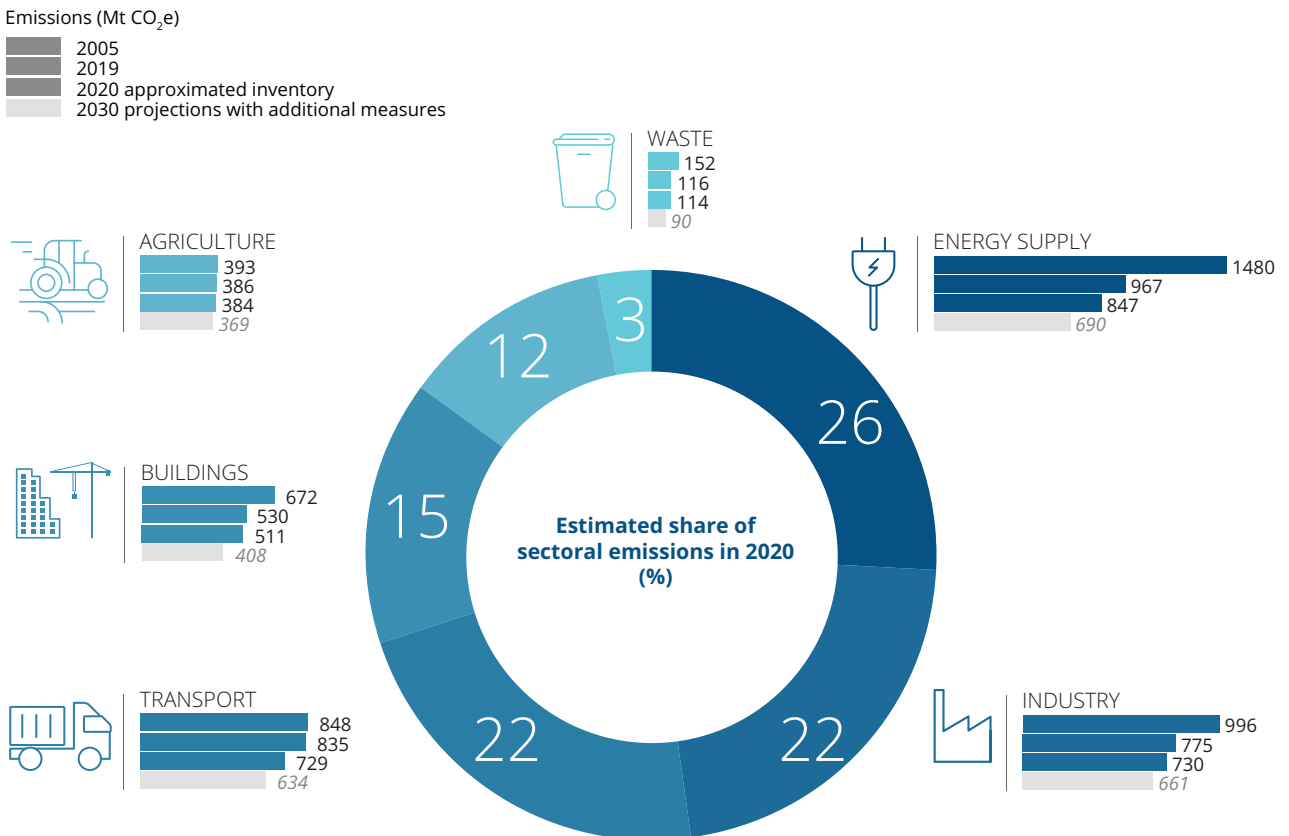
This section also highlights significant sectoral developments in individual EU Member States, many of which are observed in smaller Member States. Greater percentage changes in smaller countries are important to note, even if they may not translate into large absolute values. They can, however, highlight significant individual efforts made to bring about national progress.

In 2020, the greatest sectoral share of emissions in the EU-27 occurred in the **energy supply** sector (e.g., power

and heat production, oil and gas extraction and refining and coal mining), despite the fact that total emissions in this sector had fallen by about 43 % since 2005 according to preliminary estimates. These estimates also indicate that emissions decreased by 8 % between 2019 and 2020, only partly due to pandemic effects. The reductions since 2005 are mainly due to the reduced carbon intensity of fuels, and especially the increased use of renewable energy sources. The EEA has also demonstrated that further co-benefits of this transition have been seen in a reduction in air pollutants, depending on the type of renewable technology deployed (EEA, 2019).

Between 2005 and 2020, the share of electricity from renewable sources consumed in the EU-27 grew from 16 % to 37 %, which corresponds to an average increase of 1.4 percentage points per year. In 2019, the share was 34 %, with roughly half of all renewable electricity generated by variable sources (wind and solar power).

Figure 2.1 Sectoral trends and progress towards achieving the 2020 and 2030 targets in the EU-27



Notes: The energy supply sector covers GHG inventory categories 1.A.1 and 1.B; industry covers categories 1.A.2 and 2; transport covers category 1.A.3; buildings covers categories 1.A.4 and 1.A.5; agriculture covers category 3; waste covers category 5; international transport is reported under memo items; and land use, land use change and forestry (LULUCF) is reported under category 4. MS, Member State; WAM, with additional measures; WEM, with existing measures.

Sources: EEA (2021b, 2021d, forthcoming_b); authors' own calculation.

The energy supply sector is the largest of the sectors covered under the EU Emissions Trading System (ETS), where a price on carbon dioxide (CO₂) emissions has applied since 2005. Aside from subsidies for electricity production from renewable energy sources, this price has been an important driver of declining GHG emissions, especially as the price has risen in recent years from around EUR 5/t CO₂ in 2017 to EUR 25/t CO₂ in 2020, climbing to more than EUR above 60/t CO₂ in 2021 (EC, 2020e; Ember, 2021; ETC/CME, forthcoming).

In the energy supply sector, emission reductions are projected, with current policies and measures, to deliver a reduction of 8 % by 2030 compared with projected levels for 2020, which are considerably higher than those from preliminary estimates. Additional national policies and measures are projected to nearly double reductions in energy supply emissions. While these emission reductions are anticipated, electricity demand in many Member States is expected to increase as a result of developments in other sectors. With a strong trend towards electrification in the transport and buildings sectors, as well as additional electricity demand expected from industry and for the production of hydrogen, the need for additional renewable energy capacities is growing in parallel.

At country level, the greatest emission reductions from the energy supply sector since 2005 have been observed in Luxembourg; the decrease of 80 % is mainly an effect of Luxembourg's already very low emission level in this sector as a result of its large share of energy imports and the closure of one power plant (Luxembourg, 2020; industri.lu, 2021). The most modest energy supply-related emission reductions have occurred in Cyprus, where a 13 % decline has been observed. In Cyprus, the growth in renewable electricity production has not been able to cover increasing electricity demand. With preliminary estimates for 2020, both Luxembourg and Cyprus have shares of renewables in electricity consumption that are well below the EU average at 14 % and 13 %, respectively.

In 2020, one fifth of the total GHG emissions in the EU-27 were attributed to **industrial** activities, which exclude energy generation. These emissions aggregate both the energy needs of various industries (manufacturing, construction, cement production, etc.) and their process-related emissions. Total emissions from industry fell by 27 % between 2005 and 2020, with the greatest reduction of 58 % being observed in Estonia. This includes a substantial drop in 2020 related to the effects of pandemic restrictions and particularly mild winter conditions, paired with a continued decline in the country's oil shale sector because of high carbon prices (Eesti Energia, 2021). Meanwhile, a notable increase in emissions occurred in Malta's

industry sector, mainly due to the use of hydrofluorocarbons in refrigeration and air conditioning (Malta, 2021).

Projections of industrial emissions show a moderate expected decrease of 6-8 % between levels projected for 2020 and projections to 2030. About 75 % of emissions in this sector are covered under the EU ETS, but, due to the free allocation of allowances to avoid carbon leakage, the effect of the system's price for CO₂ is lower in the industry sector than in the energy sector.

The **transport** sector is the second largest source of emissions in the EU-27 and its emissions are almost completely covered by national emissions targets. For 2020, estimated transport emissions show a decrease of 14 % compared with 2005. Only resolute efforts will be able to sustain this as a trend, as this drop is mainly related to lower passenger road transport activity as a result of the pandemic situation in 2020. Up until 2019, the increasing transport demand could not be outweighed by the increasing efficiency of vehicles, and as a result, transport emissions in 2019 closely resembled those observed in 2005 (EEA, 2020). In addition, there was an increase in CO₂ emissions from new passenger cars between 2017 and 2019 due to the growth in the number of sport utility vehicles (EEA, 2021a). With limited emission reductions overall in this sector over the past 15 years, considerable efforts will be critical if the sector is to contribute adequately to Europe's overall emissions reduction target.

Similar to the energy supply sector, there is an important difference between estimated emissions for 2020 and the levels of emissions in 2020 that many Member States had projected, as not all projections submitted in March 2021 reflect the effects of the COVID-19 pandemic. Member States project that existing policies and measures will keep transport-related emissions in 2030 at nearly the same level that they have projected for 2020. Emission reductions are projected only if policies and measures additional to those in place today are implemented. With these, emissions from transport in 2030 could fall to 14 % below projected 2020 levels.

To support even greater emission reductions by 2030, the European Commission has proposed more stringent emissions standards for cars and vans that would require, inter alia, average emissions from new cars to fall by 55 % by 2030 (compared with 2021 levels). According to the proposal, all new cars registered in the EU as of 2035 would be zero-emission vehicles. The result of these measures should be a clear downwards trend in emissions from the transport system to reach the necessary reductions levels by 2050.



According to preliminary estimates, renewable energy sources in the transport sector accounted for 10.1 % of the sector's gross final energy consumption in 2020, very close to the 10 % EU target for this sector. This proportion was 8.9 % in 2019, and the strong increase between 2019 and 2020 is related to the drop in demand for transport. In Sweden and Finland, a high share of renewable energy used in transport in 2020 (estimated at 29 % in Sweden, thanks to strong progress in the electrification of the transport infrastructure and the use of biofuels, and estimated at 21 % in Finland) contributed to these countries' emission reductions of 26 % and 19 %, respectively, between 2005 and 2020. At the same time, transport emissions increased by 76 % in Poland, as emissions from cars, heavy-duty trucks and buses increased.

Across Europe, blended biofuels and electromobility have proven to be important options for reducing the emissions from and renewable energy share used in transport. However, increasing reliance on biofuels and electromobility also puts pressure on agriculture, energy supply sectors, land use, land use change and forestry (LULUCF), as these sectors' resources are also needed elsewhere — including to support increases in Europe's carbon sink and providing renewable energy for other sectors. This underlines the need for an integrated, systemic approach to policymaking.

Emissions from **international aviation and international shipping**, as reported in GHG inventories, cover emissions from voyages that depart in one EU Member State and arrive in any other EU or non-EU country. For international aviation, these emissions grew by 38 % between 2005 and 2019 and are projected to increase further, albeit at a slower pace. This sector has been hard hit by the COVID-19 pandemic, and in 2020 emissions are estimated to have fallen substantially — even far below the level in 2005 — which is contrary to the trends of the past decade. Projections, which largely did not consider the full pandemic effects, show a further expected increase of emissions from international aviation of 42 % between projected 2020 and 2030 levels with additional measures. Emissions from domestic and international flights between airports within the European Economic Area are covered under the EU ETS. Emissions from international flights increased in all Member States between 2005 and 2019, with the lowest increase of 3 % in Hungary. Intra-EU aviation emissions tripled in Poland in the same timeframe, mainly due to the substantial increase in low-cost carriers' flights within the European Economic Area since Poland joined the EU in 2004.

At the EU level, shipping-related international emissions fell by 10 % between 2005 and 2019, which is still considerably greater than the 1990 level. The projected emissions from this sector are estimated to increase by 8 % with existing measures up until 2030 compared with the projected 2020 level, and by only a small further reduction of 1 percentage point with additional measures.

Among Member States, the most notable drops in shipping emissions were observed in Germany, where mainly fuel price effects are responsible for the halving of emissions between 2005 and 2019. Slovakia displays a large increase, however, mainly due to the very small shipping-related emissions in that country. Reported emissions are based on fuels sold and may not be directly linked to transport activities. The European Commission's proposal of July 2021 in part includes international shipping under the EU ETS.

Direct emissions from the **buildings** sector accounted for 15 % of the EU-27's total emissions in 2020. From preliminary estimates, emissions in this sector have fallen by 24 % since 2005. Emissions from district heating and electricity consumption in buildings are not allocated to the buildings sector but rather are reported under the energy sector. Remaining emissions in the buildings sector are mainly covered by the national emission targets under the Effort Sharing Regulation ((EU) 2018/842).

The demand for energy for heating and cooling buildings is strongly related to climatic conditions and their annual variations. This demand is measured through indicators on 'heating degree days' and 'cooling degree days', which are derived from measurements of the outside air temperature above or below which buildings need no heating or cooling. In 2020, heating degree days for the EU-27 were the lowest since 1979, when they started being reported to Eurostat. Heating and cooling, as defined under the Renewable Energy Directive (2018/2001/EU), includes the production of renewable district heating and cooling and all final consumption of renewable energy, except transport and electricity. The use of renewable sources for heating and cooling is only slowly increasing; between 2005 and 2020, the share of renewable contributions across the EU-27 grew on average by 0.7 percentage points per year. According to preliminary EEA estimates, the share of energy from renewable sources used in this sector increased to 23 % in 2020. The uptake of heat pumps is positively affecting renewables in the buildings sector, but their share in the gross final energy consumption of the EU-27 was less than 3 % in 2019; biomass fuels (excluding municipal solid waste) accounted for about 18 % of all fuels used for heating and cooling in the building sector (Eurostat, 2021b).

The highest GHG emission reductions in the buildings sector have been observed in Greece, where a reduction of 62 % was observed between 2005 and 2020. This results from an overall decrease in the consumption of all fuels used for heating and cooling, while the use of renewable energy, including that from heat pumps, increased. Sweden has also made major emission reductions in this sector, of more than 50 % in the same timeframe. One reason for this is Sweden's high share of renewables in the heating and cooling sector under the Renewable Energy Directive, which accounted for 66 % in 2019 and increased to 69 % in 2020, according to preliminary estimates. Sweden is also one of the three Member States

with the highest shares of energy supplied by heat pumps, with a 2019 total of 10 % of gross final energy consumption for heating and cooling. At the other end of the spectrum, buildings emissions in Lithuania in 2020 were at the same level as in 2005, according to preliminary estimates.

Looking towards 2030, significant emission reductions in the buildings sector are projected, even just from existing policies and measures, to lead to a 10 % reduction compared with the projected 2020 level. Additional policies and measures would result in an emission reduction of 18 % in 2030. To achieve the new climate targets, the European Commission has proposed to introduce a price signal on CO₂ that would cover the buildings sector, as well as to revise the Energy Efficiency Directive, the Renewable Energy Directive and the Energy Performance of Buildings Directive (EC, 2021d). See Chapter 4 for more information.

GHG emissions from **agriculture** account for about 12 % of EU-27 emissions and are entirely covered by national emissions targets under the Effort Sharing legislation. Similar to the transport sector, agricultural sector emissions in 2019 and 2020 were at about the same level as in 2005; more notable reductions in this sector predate 2005. The greatest emission reductions in this sector since 2005 in percentage terms have been achieved by Malta, in large part due to declining livestock emissions (EEA, 2021b). At the same time, emissions from agricultural soils grew most in Estonia during the same period and resulted in an overall increase in this sector of 27 % in 2019 and an estimated 29 % in 2020. Accession to the EU played an important role in Estonia's agricultural sector emissions and led to a turnaround in the country's otherwise downwards trend in agricultural emissions that started in 1990 (Estonia, 2021).

Projections based on existing policies and measures across the EU show low emission reductions of 1 % in agriculture until 2030, with additional policies and measures expected to increase the reductions to 4 %. It will be particularly important to tackle emissions from livestock to bring the agricultural sector into line with the EU's emission reduction targets.

The **waste** sector accounted for only 3 % of GHG emissions in 2020 and is included in national emissions targets under the Effort Sharing legislation. Waste-related emissions have been considerably reduced since 2005, amounting to a 25 % reduction in 2020. It is estimated that further reductions of 15 % up to 2030 (compared with the projected 2020 level) will be achieved mainly through existing policies and measures.

Among EU countries, the greatest waste-related emissions reduction has been observed in Sweden, which achieved a 62 % drop between 2005 and 2020. This is mostly due to the diversion of materials from the waste stream through recycling and using the remaining waste to generate energy. Meanwhile, emissions in this sector increased in Czechia by 41 %, mainly from waste disposal.

As described in Chapter 2, the **LULUCF** sector is a net sink at EU level, but the sink was reduced by about one fifth between 2005 and 2020. Projections indicate that a decrease in the net sink is expected to continue, although the effects of additional policies and measures are expected to stop this trend and will lead to roughly the same level of removals in 2030 as the projected 2020 level.

Net emissions of up to 225 Mt CO₂e are included in the EU target for 2030, though national LULUCF targets as proposed in a revision of the LULUCF Regulation ((EU) 2018/841) are expected to achieve a sink of 310 Mt CO₂e. To reach this level of removals from the LULUCF sector, urgent action is needed, as the lead times are particularly high.

Further reading

EEA indicators:

- [Greenhouse gas emissions from transport in Europe](#)
- [CO₂ performance of new passenger cars in Europe](#)
- [CO₂ performance of new vans in Europe](#)
- [New registrations of electric vehicles in Europe](#)
- [Emissions of air pollutants from transport](#)
- [Emissions and energy use in large combustion plants in Europe](#)
- [Use of renewable energy for transport in Europe](#)
- [Heating and cooling degree days](#)
- [Greenhouse gas emissions from energy use in buildings in Europe](#)
- [Greenhouse gas emissions from agriculture in Europe](#)

Other sources:

- [EU Emissions Trading System \(ETS\) data viewer](#)
- [Greenhouse gas emissions \(GHG\) data viewer](#)
- [EU renewable electricity has reduced environmental pressures; targeted actions help further re-duce impacts](#)
- [Global Energy and Climate Outlook 2020: A New Normal Beyond Covid-19, JRC, 2021](#)

2.2 Interactions between sectors

Achieving climate neutrality will require legislation that effectively targets the emissions of all emitting sectors while preserving carbon sinks. The way these sectors interact with each other and the possible displacement of emissions from one sector to another also need to be taken into account in a coherent policy framework. New types of energy flows between users and producers will require a more integrated EU energy system (EC, 2020d).

For instance, decarbonising the buildings, industry and transport sectors by increasingly relying on electricity as an energy carrier will require an increase in the use of renewable energy sources to generate the additional electricity needed to satisfy demand. Otherwise, this additional demand will generate additional emissions.

The continued electrification of end use sectors also means that, as the energy source changes (e.g., from direct combustion to electricity), emissions related to the same end use can shift from one category of policy instruments (e.g., standards and regulations to achieve national emission targets under the Effort Sharing Regulation) to another (economic tools such as the EU-wide ETS).

To monitor progress towards achieving the climate neutrality objectives, further integration of the EU energy system will require that emissions trends in various sectors are considered in an aggregated way rather than individually. This is because of the way emission reductions are estimated and accounted for, and in particular because emissions associated with electricity generation are attributed to the power sector rather than to electricity end use sectors.

As a result of how emissions are accounted for, which is different from how economic sectors are traditionally delineated, investments made in one sector may not be visible in national GHG inventories as emission changes in that same sector. Certain sectors may see their emissions fall because of actions undertaken in other sectors, e.g., reduced emissions in the power sector due to the generation and use of biogas triggered by investments made in the agricultural sector, or reduced emissions in the transport sector due to the use of agricultural or forest residues as transport fuels. The projected emission reduction of 14 % between 2020 and 2030 in the transport sector, which is based on additional policies

and measures, is mainly due to continued electrification but comes with increased electricity demand. If projections were conducted in an integrated way, these changes would already be reflected in the energy supply sector.

Certain hard-to-electrify sectors, such as heavy industry and heavy-duty and long-distance transport such as shipping or aviation, will also require a cleaner fuel system. For instance, renewable hydrogen, a carrier of renewable energy that is energy intensive to produce, will mainly represent an option for areas that are difficult to decarbonise through direct electrification. Other sectors have also expressed a desire for renewable hydrogen, where other and more affordable options are often available and where a continued use of gas, for example if renewable hydrogen is blended into natural gas networks, may delay changes in infrastructure.

Furthermore, the emission mitigation possibilities in sectors partly overlap, and this can lead to new **competing uses of resources** in the short term. For example, sustainable use of biomass is an important ingredient for successful decarbonisation and, in several Member States, for achieving their national objectives on renewable energy use. But biomass can also be used for other purposes — in wood products and in construction, for example. While the use of biomass for energy supply generates immediate emissions, wood products and construction conserve biomass and keep the embedded carbon out of circulation for extended periods. At the same time, sustainably sourcing woody biomass limits its availability and raises competition. This calls for cascading biomass use and prioritising which woody biomass should be used and for what purposes (BTG Biomass Technology Group et al., 2016; JRC, 2021b).

To consider sector coupling and upcoming competition challenges, a more **integrated approach** to sectors and energy carriers would contribute to ensuring that change can happen at the necessary pace. Steps in this direction have already been made. An EU strategy for energy system integration was presented on 8 July 2020 and recognises the need for coupling energy carriers with each other and with end use sectors, as well as the importance of creating a level playing field (EC, 2020b). Taking a holistic view on integration requires several characteristics of the climate and energy area to be considered in parallel and interdependently — namely **coupling, challenging shifts and competition coherently**.

Further reading

EEA indicators:

- [New registrations of electric vehicles in Europe](#)
- [Greenhouse gas emission intensity of fuels and biofuels for road transport](#)
- [CO₂ performance of new passenger cars in Europe](#)
- [CO₂ performance of new vans in Europe](#)
- [Share of energy consumption from renewable sources in Europe](#)
- [Greenhouse gas emissions from agriculture in Europe](#)
- [Greenhouse gas emissions from LULUCF in Europe](#)

Other sources:

- [CASCADES: Study on the optimised cascading use of wood](#)
- [The use of woody biomass for energy production in the EU, JRC, 2020](#)
- [Powering a climate-neutral economy: an EU strategy for energy system integration](#)
- [New European Bauhaus: Commission launches design phase](#)
- [Green hydrogen, IRENA, 2020](#)

3

Greenhouse gas emissions and energy trends in European countries

Key messages

- While the 2020 targets appear to have been met at EU level, several countries' particularly strong **overachievements** were enough to make up for a lack of achievement in others. In total, 11 countries (Croatia, Czechia, Denmark, Estonia, Greece, Italy, Latvia, Luxembourg, Portugal, Spain and Sweden) performed well across all target areas and stayed within their 2020 greenhouse gas (GHG) emissions and energy consumption limits, while also meeting or exceeding their 2020 renewable energy share target.
 - In 2020, total GHG emissions decreased in all Member States compared with 2019, according to approximated data. A total of 21 EU countries (all except Bulgaria, Cyprus, Finland, Germany, Ireland and Malta) reported approximated **GHG emissions** in 2020 that were below their national targets under the Effort Sharing legislation. Some Member States (Bulgaria, Czechia and Romania) appeared to have higher emissions in 2020 under the Effort Sharing legislation than in 2019 due to emissions from the energy and industry sector that are not covered under the EU Emissions Trading System.
 - Estimates indicate that a total of 22 countries met or exceeded their 2020 **renewable energy share** target without the use of statistical transfers. The remaining five countries (Belgium, France, Poland, Romania and Slovenia) failed to meet their target shares of renewables in 2020. Several of these Member States have agreed on statistical transfers with other Member States that have a renewables surplus; these are not reflected here.
 - In the area of energy efficiency, estimates show that 20 Member States reduced their **final energy consumption** enough to reach levels below their 2020 indicative targets. Austria, Belgium, Bulgaria, Germany, Hungary, Lithuania and Slovakia appear not to have achieved their 2020 indicative targets, even given the effect of the COVID-19 pandemic.
 - While no countries failed to achieve any of their 2020 targets, two countries appear to have **underperformed** on three of their four 2020 targets. Preliminary data show that Belgium and Bulgaria achieved only one 2020 target: GHG emission reductions in Belgium and renewable energy share in Bulgaria.
- Looking towards 2030, continued and greater efforts will be needed by the majority of European countries. Some have already demonstrated preliminary 2020 emission levels that meet their 2030 target levels:
 - Croatia, Greece, Portugal, Slovakia and Slovenia already have **GHG emissions** levels that are below their current Effort Sharing legislation emission limits for 2030.
 - Belgium, Bulgaria, Cyprus, Denmark, Estonia, Finland, Greece, Hungary, Malta, Romania and Slovenia have **final energy consumption** levels below those envisaged for 2030.
 - Austria, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, Greece, Hungary, Ireland, Malta, Portugal, Romania, Slovakia and Slovenia had primary energy levels that were below the level foreseen for 2030.
 - No country has **renewable energy** shares at or above the contribution levels that they have set for 2030.

These countries will need to maintain their progress throughout the coming decade as they work to reach their national targets for 2030 — and also during their recovery from the COVID-19 pandemic.



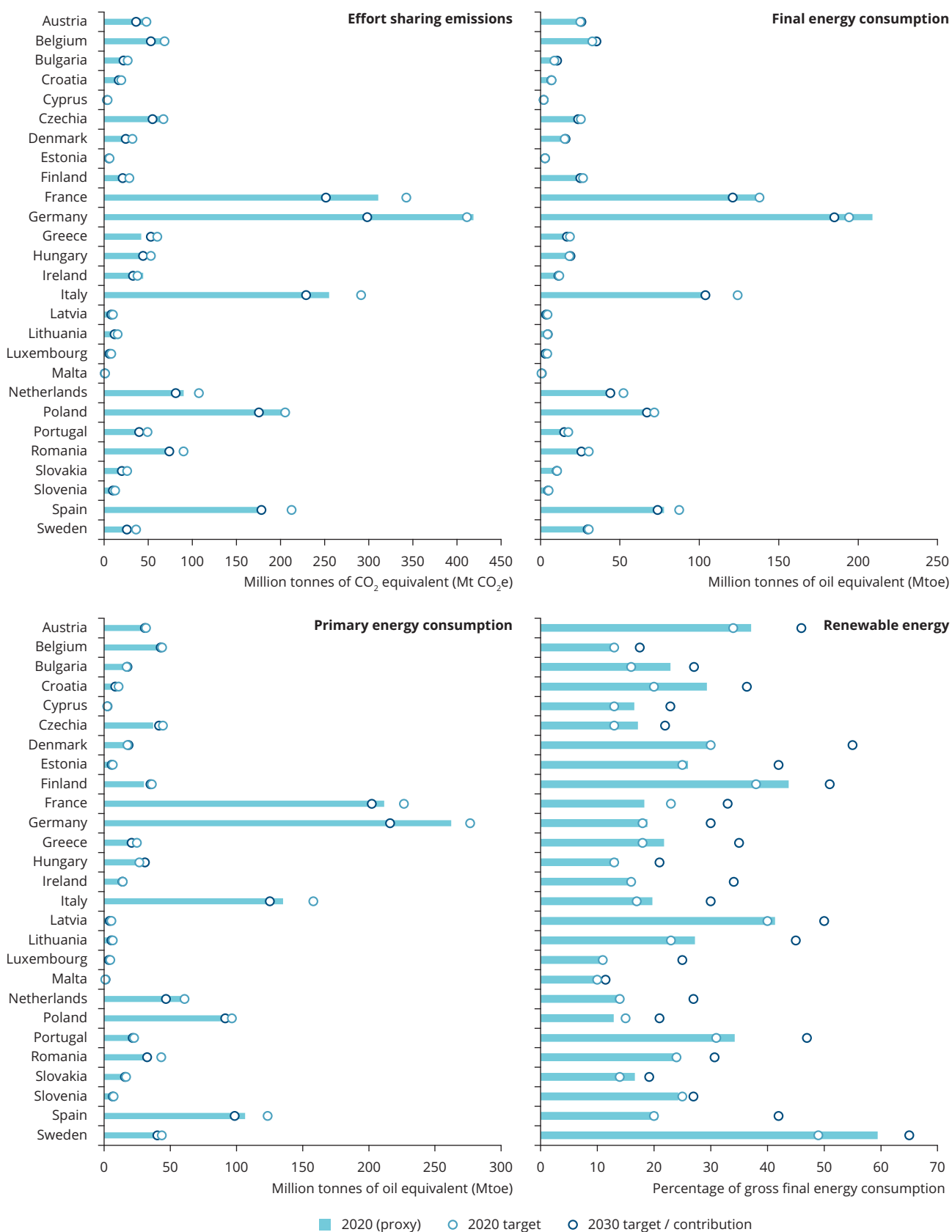
While Chapter 2 reviewed progress in individual sectors and highlighted substantial sectoral shifts in selected European countries, this chapter looks more broadly at progress in all the EU countries.

Figure 3.1 shows how EU countries fare today with respect to their 2020 and 2030 targets and contributions in the areas of Effort Sharing legislation emissions, renewable energy shares, and energy efficiency targets for final and primary energy consumption. Under the Energy Efficiency Directive, countries set their own national, non-binding targets based on primary or final energy consumption, on primary or final energy savings, or on energy intensity. The directive requires that Member States also express those targets in terms of absolute levels of primary and final energy consumption, which are both presented in Figure 3.1.

In Figure 3.1, for Effort Sharing legislation emissions and energy efficiency, the target or contribution is considered to be met when the coloured bar is at or below the target or contribution. For renewable energy, the target is met when the bar exceeds the indicated target or contribution.

The following sections briefly review trends at the Member State level in each of the areas of greenhouse gas (GHG) emissions, renewable energy and energy efficiency, and analyse national progress towards each set of targets.

Figure 3.1 Current progress to 2020 and 2030 targets and contributions



Note: The current 2030 limitation targets are shown for Effort Sharing legislation emissions, rather than the proposed revised targets for the increased EU ambition for 2030. The Effort Sharing Regulation (ESR) targets for 2030 have been published using global warming potentials from the Fifth Assessment Report. To allow a comparison with reported greenhouse gas projections and historical inventory numbers, we estimated annual emission allocations for 2021-2030 using Global Warming potentials from the Fourth Assessment Report.

Sources: EC (2020c), EEA (forthcoming_a, 2021b, forthcoming_b, forthcoming_c), Eurostat (2021c, 2021d).

3.1 National greenhouse gas emissions

EU Member States need to limit a share of their GHG **emissions** (those currently not covered by the EU Emissions Trading System) in accordance with national targets set in the Effort Sharing legislation and spelled out in annual emission allocations. These national annual allocations comprise an annual emission target for each Member State for each year from 2013 to 2020 and from 2021 to 2030.

In 2019, 17 countries (Bulgaria, Croatia, Czechia, Denmark, France, Greece, Hungary, Italy, Latvia, Lithuania, the Netherlands, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden) exhibited Effort Sharing emissions that were below their emission target for that year.

Preliminary data for 2020 indicate that 21 EU countries (all except Bulgaria, Cyprus, Finland, Germany, Ireland and Malta) had 2020 Effort Sharing legislation emissions that were below their 2020 national emission targets. This means that, despite the effects of the COVID-19 crisis, these six Member States still failed to reduce or limit their emissions below their 2020 target levels.

The original EU-wide 2030 target of 40 %, compared with 1990 levels, was translated into a reduction in Effort Sharing

emissions of 30 % in 2030 compared with 2005. In 2021, the European Climate Law raised the overall EU ambition for 2030, and an amended Effort Sharing Regulation is proposed to help deliver on this ambition through a total reduction in Effort Sharing emissions of 40 % by 2030 compared with 2005.

The current national 2030 Effort Sharing legislation targets range from 0 % (Bulgaria) to -40 % (Luxembourg and Sweden) compared with the base-year levels in 2005. No country has a target that would permit an increase in emission levels. In 2019, the gaps ⁽⁴⁾ between the national 2030 Effort Sharing targets and actual emission levels ranged from 76 % above the national target (Malta) to 15 % below the national target (Greece). In addition, Croatia's emissions were already lower in 2019, by 3 %, than their national 2030 targets.

On 14 July 2021, the European Commission proposed a revision of national Effort Sharing legislation targets and annual emission allocations for the period 2021-2030 to reflect the increased ambition for 2030 and to continue to recognise Member States' different capacities to take action. The proposed national targets range from 10 % to 50 % below 2005 levels.

Further reading

EEA indicators:

- [Progress to national greenhouse gas emission targets in Europe](#)

Other sources:

- [Delivering the European Green Deal](#)
- [Proposal to revise the Effort Sharing legislation](#)

(4) The gaps were calculated according to the following formula: (2030 ESR target - 2019 ESR emissions) / 2030 ESR target, where ESR is Effort Sharing Regulation.

3.2 National renewable energy shares

For the period up to 2020, national, binding targets for shares of energy from renewable sources — known as 'RES shares' — were set in the Renewable Energy Directive (RED). European Member States also anticipated their respective RES share paths to 2020 in their national renewable energy action plans (NREAPs).

For 2030, the national energy and climate plans (NECPs) indicate how Member States intend to contribute to the EU-wide RES target. The European Commission's assessment of the NECPs finds that, at EU level, the combined commitments of the Member States will lead to a total RES share in 2030 of between 33.1 % and 33.7 %, which is consistent with the 32 % target (EC, 2020c).

In most of the European Member States, as well as Iceland and Norway, RES shares increased, albeit at different speeds, between 2005 and 2019. Differences between RES shares and targets presented in Figure 3.1 highlight the need for statistical transfers, which need to be conducted for compliance with the RED for the year 2020 if countries' RES shares are lower than targets. The following two examples show how these developments can vary.

Hungary exhibited its greatest RES share in 2013, with a total of 16.2 %. Since then, Hungary's RES share has decreased steadily and stood at 12.6 % in 2019. The reason for this decline can be found in Hungary's growth in energy consumption, which has outpaced its growth in renewables. Although Hungary's share of renewables increased in the electricity sector, its RES share for heating and cooling declined, and the net result is a decline in the total RES share.

Slovakia increased its RES share by a full 5 percentage points between 2018 and 2019. In this period, Slovakia's renewable energy consumption in heating and cooling nearly doubled, mainly due to the increased use of biomass, following changes in the national method for collecting data on energy consumption of biomass. 2019 was also the first year in which heat pumps were accounted for, although this technology had been used in Slovakia before then. Overall, this shift in accounting method gave the country's RES share a one-time statistical boost and a remarkable 5 percentage point increase in a single year.

Across Europe, the use of biomass as a renewable source for heating and cooling purposes as defined by the RED is

widespread, comprising 16 % of gross final energy consumption for heating and cooling in 2019 in the 27 EU Member States. As the potential for using biomass is restricted in the EU and Land Use, Land Use Change and Forestry (LULUCF) Regulation targets need to be achieved, there are limits on any further large increases in this sector. In 2019, more than 35 % of gross final energy consumption for heating and cooling came from biomass in Latvia (42 %), Finland (41 %) and Sweden (35 %) (Eurostat, 2021c). The sustainability requirements for biomass in the recast Renewable Energy Directive (RED II) are applicable from July 2021 and aim to ensure an overall balance in the use of this resource for energy purposes.

In contrast, the use of heat pumps started from low levels in 2005, and several Member States have increased their uptake of heat pumps continually and significantly since then. The three countries with highest shares of energy from heat pumps in gross final energy consumption for heating and cooling in 2019 are Malta (16 %), Portugal (11 %) and Sweden (10 %).

In terms of progress to targets, 14 EU countries (Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, Greece, Italy, Latvia, Lithuania, Romania, Slovakia and Sweden), as well as Iceland and Norway, achieved national RES shares in 2019 that surpassed their 2020 national targets in the RED. In all EU countries except five (Belgium, France, Poland, Romania and Slovenia), the estimated national RES share in 2020 had progressed above the national 2020 target set in the RED.

Meanwhile, according to national trajectories set in the NREAPs, 14 EU countries (Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, Greece, Italy, Latvia, Lithuania, Romania, Slovakia and Sweden), as well as Iceland and Norway, reached or exceeded their anticipated RES levels in 2019. In 2020, 17 countries (Austria, Bulgaria, Croatia, Cyprus, Czechia, Estonia, Finland, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Portugal, Slovakia and Sweden), as well as Iceland and Norway, reached or exceeded the anticipated 2020 RES level stated in their NREAP.

Yet, there is still a long way to go to achieve the RES contributions set by countries for 2030 in their NECPs, which indicates that sources of renewable energy need to increase significantly this decade. Distances from the RES contributions for 2030 range from 24 percentage points above the 2019 RES share (in Spain, whose 2030 contribution is a 42.0 % RES share) to only 2 percentage points above the 2019 RES share (in Slovakia, whose 2030 contribution is a 19.2 % RES share)⁽⁵⁾.

⁽⁵⁾ Compared with 2020 RES share estimates, distances from the 2030 national RES share contributions range from +25 percentage points (Denmark, whose 2030 contribution is a 55 % RES shares) to +1 percentage point (Malta, whose 2030 contribution is 12 %).

Further reading**EEA indicators:**

- [Share of energy consumption from renewable sources in Europe](#)

Other sources:

- [An EU-wide assessment of national energy and climate plans](#)
- [Renewable Energy Directive](#)
- [Delivering the European Green Deal](#)

3.3 National energy consumption levels

Between 2005 and 2019, final energy consumption decreased in 19 EU countries and increased in eight (Austria, Cyprus, Estonia, Finland, Latvia, Lithuania, Malta and Poland). The greatest increases were observed in Malta (+50.6 %) and Poland (+21.3 %) and are largely explained by the strong growth in transport demand in both countries (+53 % in Malta and +86 % in Poland) and in the services sector in Malta (+105 % between 2005 and 2019) (Eurostat, 2021a).

Under the Energy Efficiency Directive (EED), EU-27 countries set their own national, non-binding targets for energy efficiency for 2020. These targets could be based on primary or final energy consumption, on primary or final energy savings, or on energy intensity. National indicative 2020 targets for final energy consumption set by Member States range from -14.8 % (Bulgaria) to +36.5 % (Malta), compared with 2005 levels (EC, 2021c). A total of 21 countries set targets to decrease their final energy consumption, while six countries (Cyprus, Finland, Latvia, Malta, Poland and Romania) set targets that are higher than their 2005 final consumption levels. Countries' frequent revisions of their voluntary targets for 2020, especially in recent years, created challenges for the transparent and consistent evaluation of national and EU progress towards the 2020 targets.

As of 2019, 14 Member States were in line with or below their 2020 indicative targets for final energy consumption (see Figure 3.1). However, the remaining 13 (Austria, Belgium, Bulgaria, Estonia, France, Germany, Hungary, Ireland, Lithuania, Luxembourg, Malta, Slovakia and Sweden) had not reduced

their final energy consumption enough to reach levels below their 2020 indicative targets.

Based on the preliminary data for 2020, a combination of factors, and the effects of the COVID-19 pandemic in particular, indicates that the aforementioned 14 Member States, as well as five additional (Estonia, France, Ireland, Luxembourg and Sweden), are expected to have reached their final energy consumption targets in 2020.

In 2019, 15 Member States were in line with or below their 2020 indicative targets for primary energy consumption; this was not the case in Austria, Belgium, Bulgaria, Cyprus, France, Germany, Ireland, Luxembourg, Malta, the Netherlands, Poland and Sweden⁽⁶⁾. In 2020, based on preliminary data, nine additional countries were estimated to be in line with or below their 2020 target (Austria, Cyprus, France, Germany, Ireland, Luxembourg, Malta, Poland and Sweden.)

Similar to the 2020 targets, EU-27 countries set their own national, non-binding contributions for energy efficiency in 2030 in their NECPs (EC, 2020c). Together, their intended contributions to the 2030 energy efficiency targets total 1 176 million tonnes of oil equivalent (Mtoe) for primary energy consumption and 885 Mtoe for final energy consumption, in comparison with the current EU 2030 targets of 1 128 Mtoe for primary energy and 846 Mtoe for final energy consumption. This collective effort to reduce energy consumption is not sufficient to reach the EU's 2030 target of reducing energy consumption by at least 32.5 % — a target that has not yet been adjusted to account for the increased ambition for 2030 emission reductions.

⁽⁶⁾ Sweden has opted for an energy intensity target in which the assumed levels of growth in both gross domestic product (GDP) and energy consumption impacts the target level. The country may still reach its 2020 target, subject to final official figures for energy consumption and GDP.

Twenty Member States intend to reduce their national final energy consumption levels compared with 2019, with reductions ranging from 0.9 % (Croatia) to 30.3 % (Luxembourg). The remaining seven Member States had final energy consumption levels in 2019 that were below their contributions to final energy consumption in 2030 (Bulgaria, Cyprus, Denmark, Greece, Hungary, Malta and Romania). For primary

energy, the 2030 contributions result in decreases in consumption compared with 2019 levels in 19 Member States, ranging from 1.8 % (Slovakia) to 26.6 % (the Netherlands). Eight Member States had primary energy consumption levels in 2019 that were below their respective 2030 contributions (Croatia, Czechia, Denmark, Estonia, Finland, Hungary, Malta and Romania).

Further reading**Related indicators:**

- [Primary and final energy consumption in Europe](#)
- [Share of energy consumption from renewable sources in Europe](#)

Other sources:

- [An EU-wide assessment of national energy and climate plans](#)
- [Effort sharing: Member States' emission targets](#)
- [Energy Efficiency Directive](#)
- [Renewable Energy Directive](#)
- [Delivering the European Green Deal](#)



4

Increasing the ambition of the 2030 targets

The analysis of progress towards achieving the 2030 targets presented in this report is based on the targets for the EU Emissions Trading System (ETS), greenhouse gas (GHG) emissions under the Effort Sharing legislation, and renewable energy and energy efficiency that were set to support a 40 % reduction in total emissions by 2030. Total emission levels, however, are aligned with the new net 55 % reduction target adopted in 2021 under the European Climate Law. The increased ambition of a net 55 % reduction requires a review of the current legislation and agreement on new targets for 2030 in individual sectors and new target for renewable energy and energy efficiency.

To this end, the European Commission published a package of proposals and accompanying impact assessments in July 2021 (EC, 2021a). The proposed changes include:

- an increase in emission reductions in the EU ETS from 43 % to 62 %, inclusion of emissions from maritime transport between EU countries and 50 % of emissions from voyages to and from the EU, and establishment of a second ETS for road transport and buildings as of 2026, with 25 % of the revenues flowing into a new social climate fund;
- an increase in emission reductions under the Effort Sharing Regulation from 30 % to 40 %, with a revision of Member State targets;
- the setting of an EU-wide target of a land use, land use change and forestry (LULUCF) sink of 310 Mt carbon dioxide equivalent (CO₂e) in 2030, which is divided into national targets, allocating targeted net emission levels for each Member State;
- the implementation of a Carbon Border Adjustment Mechanism (CBAM), initially covering cement, iron, steel, aluminium, fertiliser and electricity;
- stronger CO₂ emission standards for cars and vans, requiring average emissions of new cars to fall by 55 % from

2030 and 100 % from 2035 compared with 2021 levels, and all new cars registered as of 2035 to have zero emissions; and

- a portfolio of measures to address aviation emissions, including phasing out of free allocation under the EU ETS, quotas for sustainable aviation fuels to be achieved at single airports, and a minimum tax on kerosene.

With the higher level of ambition for GHG targets, energy targets will have to be adapted too. This could result in an increase in the aggregated EU target for energy from renewable sources from 32 % to 40 % without setting binding targets for Member States. Like renewable energy targets, energy efficiency targets will become binding at EU level. A decrease in energy consumption of 36-39 % in 2030 compared with the baseline projection for 2007, is proposed to replace the current target of 32.5 % (EC, 2021b). It is further proposed to put in place a formula for indicative energy efficiency targets for Member States and to implement a gap-filling mechanism if the EU target is at risk of not being achieved. Additional revisions of relevant regulations and directives should support these overarching targets, such as the upcoming revision of the Energy Performance Buildings Directive.

To better align the climate mitigation and energy targets with energy sources, subsidies for fossil fuels are scheduled to be discontinued (OECD, 2021). The proposed revision the Energy Taxation Directive and the EU taxonomy for sustainable activities, which is intended to facilitate more sustainable investment in Europe, could contribute to this (EU, 2020).

Under the Regulation on the Governance of the Energy Union and Climate Action, Member States are set to update their national energy and climate plans in 2023 and 2024, which will provide an opportunity to set new national targets and define new national contributions for 2030. This will help to ensure broad alignment with the more rapid pace of change in emissions and developments in renewable energy and energy efficiency that the more ambitious 2030 targets will require.

Abbreviations

CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
EEA	European Environment Agency
EED	Energy Efficiency Directive
ESR	Effort Sharing Regulation
ETC/CME	European Topic Centre on Climate Change Mitigation and Energy
ETS	Emissions Trading System
EU	European Union
EU-27	The 27 EU Member States (post-Brexit)
FEC	Final energy consumption
GHG	Greenhouse gas
GWP	Global warming potential
IPCC	Intergovernmental Panel on Climate Change
LULUCF	Land use, land use change and forestry
Mt	Million tonnes
Mtoe	Million tonnes of oil equivalent
NECP	National energy and climate plan
NREAP	National renewable energy action plan
PEC	Primary energy consumption
RED	Renewable Energy Directive
RED II	Recast Renewable Energy Directive
RES	Renewable energy sources
WAM	With additional policies and measures
WEM	With existing policies and measures

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