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Technical information

Accompanying the document

Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions

Accelerating the transition to climate neutrality for Europe's security and prosperity

EU Climate Action Progress Report 2022

{COM(2022) 514 final}

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1. OVERVIEW OF EU CLIMATE TARGETS

Table 1: Overview of existing and Commission’s proposed new climate targets (in the “Delivering the European Green Deal” package - July 2021)

	International commitments		EU domestic legislation				
	The EU’s commitment under the Kyoto Protocol (KP)	The EU’s commitment under the Paris Agreement	2020 Climate and Energy Package		2030 Climate and Energy Framework		
			EU ETS	Effort Sharing Decision (ESD)	EU ETS	Effort Sharing Regulation (ESR)	LULUCF
Target year of period	Second commitment period (2013-2020)	Already in force – covers the period post 2020	2013-2020	2013-2020	2021-2030	2021-2030	2021-2030
Emission reduction target	-20%	at least -55% net emissions in 2030	-21% in 2020 compared to 2005 for ETS emissions	-10% in 2020 compared to 2005 for non-ETS emissions Annual targets by MS.	-43% in 2030 compared to 2005 for ETS emissions <u>Proposed new target</u> : -61%	Annual targets by MS. In 2030 -30% compared to 2005 for non-ETS emissions <u>Proposed new target</u> : -40%	No-debit target based on accounting rules <u>Proposed new targets</u> : - For 2030 the EU target is -310 MT CO ₂ -eq - For 2035 the EU target is a climate neutral land sector (combining LULUCF and emission from agriculture non-CO ₂).
			Overall target: -20% GHG emissions reduction vs 1990		<u>Overall target</u> : at least -55% net domestic reduction vs 1990		

Further targets	-	<ul style="list-style-type: none"> • limiting global warming to well below 2°C.; • every 5 years to set more ambitious targets as required by science; • report on implementation/ track progress towards the long-term goal through a robust transparency and accountability system. • balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century. 					
Base year	1990, but subject to flexibility rules. 1995 or 2000 may be used as its base year for Nitrogen trifluoride (NF3)	1990	2005	2005	2005	2005	Subject to accounting rules
			1990 for overall emission reduction target		1990 for overall emission reduction target		

LULUCF	Included: afforestation, reforestation and deforestation and forest management, other activities if elected (new accounting rules)	Included: Contributes to the commitment of decreasing emissions by at least -55%.	Excluded from target, but reported in inventories.		Included: Contributes to the commitment of decreasing emissions by at least -55%. In order to ensure that sufficient mitigation efforts are deployed up to 2030, the <u>Climate Law</u> limits the contribution of net removals to the Union 2030 climate target to 225 million tonnes of CO ₂ equivalent, and provides that the Union shall aim to achieve a higher volume of its net carbon sink in 2030		
Aviation¹	Domestic aviation included. International aviation not attributed.	Civil aviation included: outgoing flights that start in the EU (emissions calculated on the basis of fuels sold in the EU).	EU ETS: Domestic (national) and intra-EEA international aviation included.	ESD: CO ₂ from domestic aviation excluded	EU ETS: Domestic and intra-EEA international aviation and departing flights to UK and CH included.	ESR: CO ₂ from domestic aviation excluded. Aviation generally excluded.	
Use of international credits	Use of KP flexible mechanisms subject to KP rules	The EU will not use international credits (according to its NDC)	Upper limit for credit use for period 2008-2020 at a maximum of 50% of the reduction effort below 2005 levels.	Annual use of carbon credits is limited to up to 3% of each Member State's ESD emissions in 2005	No ²	No	No

¹ May be reviewed in the light of the implementation of ICAO's global measure and the EU's enhanced target.

² A link with the permit system in Switzerland has been ratified.

Carry-over of units from preceding periods³	Subject to KP rules including those agreed in the Doha Amendment		No	EU ETS allowances can be banked into subsequent ETS trading periods since the second trading period.	No carry over from previous period.	Indefinite validity of allowances not limited to trading periods, no need to carry over.	No	No
Gases covered	CO ₂ , CH ₄ , N ₂ O, HFCs ⁴ , PFCs, SF ₆ , NF ₃		CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs, SF ₆ , NF ₃	CO ₂ , N ₂ O, PFCs,	CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs, SF ₆	CO ₂ , N ₂ O, PFCs,	CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs, SF ₆ , NF ₃	CO ₂ , CH ₄ , N ₂ O
Sectors included	Energy, IPPU, agriculture, waste, LULUCF	Energy, IPPU, agriculture, waste, LULUCF	Energy, IPPU, agriculture, waste, LULUCF	Power & heat generation, energy-intensive industry sectors, aviation	Transport (except aviation), buildings, non-ETS industry, agriculture (non-CO ₂) and waste	Power & heat generation, energy-intensive industry sectors, aviation	Transport (except aviation), buildings, non-ETS industry, agriculture (non-CO ₂) and waste	Land use, land use change and forestry
Global Warming Potentials used	IPCC SAR	IPCC AR4	IPCC AR5	IPCC AR4	IPCC AR5			

³ For the CP2 it refers to carry over from CP1. For the ETS it refers to carry-over from previous trading period under the scheme itself.

⁴ HFCs are also covered by the Kigali Amendment to the Montreal Protocol, which entered into force on the 1st of January 2019.

Applicable to number of MS	15 (additional KP targets for single MS)	EU-27, UK and Iceland	EU-27	EU-27 ⁵	EU-27 ⁶
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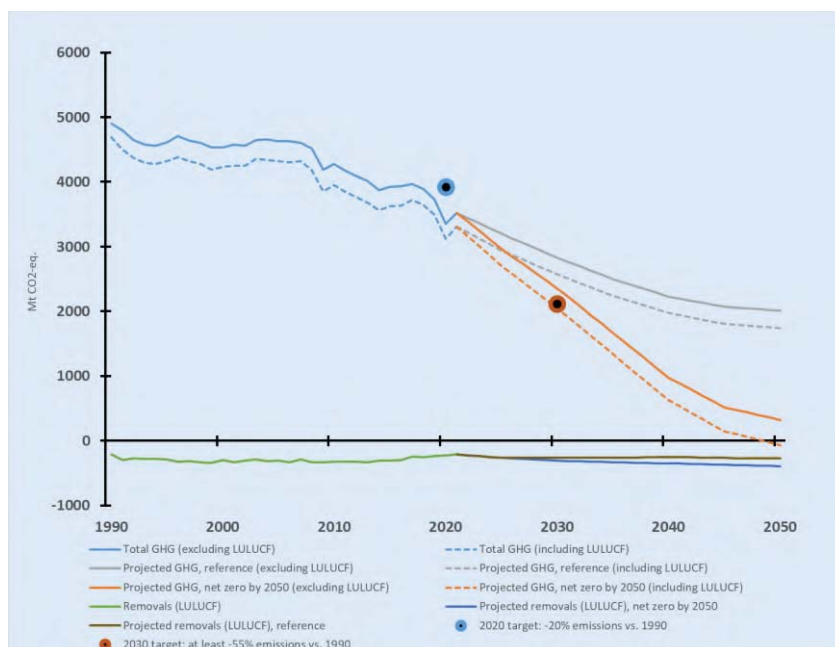
⁵ In addition to the 27 Member States, Northern Ireland, Iceland, Liechtenstein and Norway are also covered under the EU-ETS.

⁶ Within the Agreement on the European Economic Area, Iceland and Norway cooperate with the EU-27 towards achieving the 2030 targets in the LULUCF and Effort Sharing sectors.

2. EU's GREENHOUSE GAS EMISSIONS: TRENDS AND PROJECTIONS

In 2021, EU greenhouse gas emissions continued the 30-years descending trend. EU-27 domestic greenhouse gas (GHG) emissions, including international aviation,⁷ amounted to 3525 MtCO₂-eq, below the 2019 level of 3735 MtCO₂-eq, despite the strong rebound in emissions following the unprecedented fall in 2020 due to the pandemic (see Figure 1). This translates into a reduction in GHG emissions of 28.1% compared to the 1990 base year (or 28.7% when international aviation is excluded). Hence, overall GHG emissions remain on a downward trend, although more effort is needed to reach the EU's long-term climate targets. The annual average reduction in domestic GHG emissions observed over the last decade (i.e. 2011-2021) has to more than double in order to achieve the 2030 target of -55% and keep up the pace beyond 2030 to reach climate neutrality by 2050.⁸

Figure 1: Total EU-27 GHG emissions (including international aviation) and removals 1990-2021, targets, model-based projected emissions and removals 2022–2050⁹



⁷ All departures of flights from EU airports.

⁸ These figures assume a quite significant improvement of LULUCF in absorbing the remaining emissions, therefore clear actions are expected for the sector to revert recent trends.

⁹ Notes: (1) Historical GHG emissions and removals (1990-2021) are based on European Environment Agency's 2022 GHG Inventory. (2) Projected emissions and removals (2022-2050) are based on the EU Reference Scenario 2020 ('reference'; grey lines) and the MIX Policy Scenario (orange lines) supporting the "Delivering the European Green Deal" policy initiatives. (3) GHG emissions and projections use global warming potentials of the 4th Assessment Report of the IPCC to convert non-CO₂ emissions into CO₂-equivalent emissions. (4) The 2030 target (EU Climate Law) is defined as: 'the net GHG emissions, i.e. emissions after the deduction of removals, are reduced economy-wide and domestically by at least 55% compared to 1990 levels'. For comparability, the '2030 target' dot is represented at -55% of the net GHG emissions level in 1990.

The main driver of emission reductions over the past three decades was a significant decline in energy intensity (i.e. the quantity of energy consumed to produce one unit of GDP) and to a lesser extent in emission intensity (i.e. the amount of GHG emissions per unit of energy production), with an annual average decline over 1990-2020 of 1.3% and 0.8%, respectively.¹⁰ However, emission intensity of power generation has decreased drastically over the last three decades. In 2020, the EU electricity sector was 54% less GHG intensive than in 1990 (an annual average decline of 1.8%).¹¹

Policies promoting a more efficient energy use in different sectors of the economy, a growing deployment of renewable energy supply and the use of less carbon intensive fossil fuels have been playing a key role in driving the decarbonisation process. This has allowed the continued decoupling between emissions and economic growth with the GHG emission intensity of the economy, defined as the ratio between emissions and GDP, falling to 268 gCO₂-eq/EUR in 2020, less than half the 1990 level.

Table 2: Change in EU's GHG emissions over 1990-2020: a sectoral perspective.

EU-27	% rate of change			annual average % rate of change		
	1990-2020	1990-2010	2010-2020	1990-2020	1990-2010	2010-2020
1 - Energy	-33.2	-11.5	-24.5	-1.1	-0.5	-2.2
1.A.1 - Energy Industries	-45.7	-12.7	-37.8	-1.5	-0.6	-3.4
of which:						
1.A.1.a - Public Electricity and Heat Production	-46.8	-12.1	-39.5	-1.5	-0.6	-3.6
1.A.2 - Manufacturing Industries and Construction	-44.2	-33.9	-15.6	-1.4	-1.6	-1.4
of which:						
1.A.2.a - Iron and Steel	-54.1	-38.6	-25.3	-1.7	-1.8	-2.3
1.A.3 - Transport	7.2	21.6	-11.8	0.2	1.0	-1.1
of which:						
1.A.3.b - Road Transportation	11.2	24.4	-10.6	0.4	1.2	-1.0
1.A.4 - Other Sectors	-28.1	-8.2	-21.7	-0.9	-0.4	-2.0
1.A.4.a - Commercial/Institutional	-31.9	-5.0	-28.3	-1.0	-0.2	-2.6
1.A.4.b - Residential	-29.2	-8.6	-22.5	-0.9	-0.4	-2.0
1.A.4.c - Agriculture/Forestry/Fishing	-15.6	-12.2	-3.8	-0.5	-0.6	-0.3
2 - Industrial Processes and Product Use	-32.1	-21.4	-13.6	-1.0	-1.0	-1.2
2.A - Mineral Industry	-26.3	-17.9	-10.2	-0.8	-0.9	-0.9
2.B - Chemical Industry	-67.2	-57.8	-22.4	-2.2	-2.8	-2.0
2.C - Metal Industry	-52.6	-42.7	-17.3	-1.7	-2.0	-1.6
2.D - Non-energy Products from Fuels and Solvent Use	-27.6	-18.1	-11.5	-0.9	-0.9	-1.0
2.E - Electronics Industry	-9.1	56.3	-41.9	-0.3	2.7	-3.8
2.F - Product Uses as Substitutes for ODS	-	-	-8.2	-	-	-0.7
2.G - Other Product Manufacture and Use	-29.5	-26.6	-4.0	-1.0	-1.3	-0.4
2.H - Other Industrial Process and Product Use	-34.0	7.5	-38.6	-1.1	0.4	-3.5
3 - Agriculture	-20.8	-22.0	1.5	-0.7	-1.0	0.1
of which:						
3.1 - Livestock	-22.2	-22.0	-0.3	-0.7	-1.0	0.0
4 - Land Use, Land-Use Change and Forestry	7.7	51.2	-28.8	0.2	2.4	-2.6
5 - Waste management	-34.9	-20.8	-17.8	-1.1	-1.0	-1.6
Total emissions (UNFCCC)	-31.9	-13.8	-21.0	-1.0	-0.7	-1.9
Total emissions with international aviation (EU 2020)	-31.6	-12.7	-21.6	-1.0	-0.6	-2.0
Total net emissions (UNFCCC)	-33.8	-16.8	-20.4	-1.1	-0.8	-1.9
Total net emissions with international aviation (EU NDC)	-33.3	-15.6	-21.0	-1.1	-0.7	-1.9

¹⁰ This decomposition of total CO₂ emissions in different factors follows the well-known 'Kaya Identity'. In this case, we use the primary energy consumption as an indicator of the energy demand. <https://ourworldindata.org/emissions-drivers>

¹¹ <https://www.eea.europa.eu/ims/greenhouse-gas-emission-intensity-of-1>

In terms of sectors (Table 2), emission reductions in the last three decades were significant in the energy industry (e.g. electricity and heat production, -47%), in the manufacturing industry and construction (e.g. iron and steel production, -54%) and in the industrial processes and product use industries (e.g. chemical industry, -67%; metal industry, -53%). Conversely, emissions in the transport sector have increased, especially in road transportation (+11%) although they have been decreasing in the last ten years.¹² Emission reduction in the agriculture sector (excluding fuel combustion) has somewhat halted at the half-way, showing even a moderate increase since 2010.¹³ Finally, the traditional role of natural sink of CO₂ of the land use, land use change, and forestry sector (LULUCF), declined at a worrying speed in the last decade.

¹² Emissions in the refrigeration and air conditioning sector has also increased, although declining in the last few years.

¹³ <https://www.eea.europa.eu/ims/greenhouse-gas-emissions-from-agriculture>

3. GREENHOUSE GAS EMISSIONS COVERED BY THE KYOTO PROTOCOL AND THE CLIMATE AND ENERGY PACKAGE

Table 3 and 4 show progress towards the EU’s 2020 targets as defined under the EU Climate and Energy Package and under the Kyoto Protocol. The main differences between the two approaches are the sectoral coverage, the geographical scope and the time period comparison.

In particular, emissions from international aviation are included in the Climate and Energy Package but excluded under the Kyoto Protocol. The geographical scope of the commitment under the Kyoto protocol includes Iceland, the UK and certain regions not included in the Climate and Energy Package. The Climate and Energy package is based on a year-to-year comparison (2020 vs. 1990) whereas the Kyoto Protocol compares the average of emissions in the period 2013-2020 (second commitment period) with emissions in 1990, the base year.¹⁴

Under the **Climate and Energy package**, the EU, its Member States and the UK committed jointly to achieving a quantified economy-wide greenhouse gas emission reduction target of -20% below the 1990 level by 2020. At UNFCCC level, this translated into ‘the Cancun pledge’.

The 5th Biennial Report to be submitted by 31 December 2022 to the UNFCCC will be the basis for assessing the achievement of the Cancun pledge. The EU National Inventory Report (‘NIR’) submitted to the UNFCCC on 27 May 2022 suggests that the EU-27 overachieved its reduction target under the Convention by reducing emissions by -32% between 2020 and 1990. This means that the EU Member States and the UK have also met their emission reduction targets.

Table 3: Emissions covered by the EU Climate and Energy Package 1990, 2020 and 2020 targets (Mt CO₂-eq. and % change from base year emissions)

Climate and energy package:	Base year emissions (Mt CO ₂ -eq.)	1990 emissions (Mt CO ₂ -eq.)	2020 emissions (Mt CO ₂ -eq.)	2020 emissions (% change from base year)	2020 targets (Mt CO ₂ -eq.)	2020 target (% change from base year)
Total GHG Emissions, including international aviation (EU-27, convention scope)	4 901	4 901	3 354	-32%	3 920	-20%

Under the **Kyoto Protocol**, the EU, its Member States, the UK and Iceland committed jointly to reducing greenhouse gas emissions in the second commitment period (2013-2020) by 20% on average in comparison to 1990, the emissions’ base year. Under such framework, the EU, its Member States, the UK and Iceland were assigned Kyoto Protocol units (Assigned Amount Unit, or AAU) for the eight-year second commitment period, based on 80 per cent of

¹⁴ For certain countries and greenhouse gases, the base year may differ, e.g. for Bulgaria it is 1988 instead of 1990; for NF3 it is 1995 for most Member States.

its emissions in the base year. The AAUs reported in Table 4 correspond to million tonnes of CO₂ equivalent.

The EU NIR submitted to the UNFCCC on 27 May 2022, once reviewed, will be the basis for assessing whether the EU, its Member States, the UK and Iceland comply with their joint commitment. The EU NIR suggests that the EU, its Member States, the UK and Iceland overachieved their reduction target in the second commitment period of the Kyoto Protocol by reducing emissions by -28%.

Table 4: Emissions covered by the Kyoto Protocol, second commitment period (Mt CO₂-eq. and % change from base year emissions)

Kyoto Protocol:	Base year emissions (Mt CO ₂ -eq.)	2013 - 2020 emission reduction target (% change from base year)	Assigned Amount Units in Mt CO ₂ -eq. (2013-2020)	Emissions in Mt CO ₂ -eq. (2013 - 2020)	Over (+) / Under (-) achievement	2013 - 2020 emission reduction (% change from base year)
Total GHG emissions, excluding international aviation (EU-27+IS+UK, KP scope)	5 876	-20%	37 604	33 699	3 905	-28%

Under the Kyoto Protocol, Member States also need to account for emissions and removals from certain activities of land use, land use change and forestry (LULUCF) by applying the accounting rules of the Kyoto Protocol. Table 4 does not include emissions and removals from LULUCF. For the EU as a whole, the LULUCF sector has been a net accounted sink in 2013-2020, thereby also contributing to achieving the commitment.

The EU and its Member States have implemented mitigation policies and measures, which contributed successfully to the reduction of greenhouse gas emissions. These include the EU Emissions Trading System (EU ETS), the Effort Sharing Decision (ESD) and a wide range of policies and measures addressing all sectors of the economy. As more action is urgently needed, the EU is enhancing and extending its climate change policies and measures – to deliver on the European Green Deal, the Paris Agreement and to ensure that the EU and its Member States achieve their updated Nationally Determined Contribution (NDC) target of an economy-wide net domestic emission reduction of at least 55% by 2030 compared to 1990.

4. SUMMARY OF EU'S RESPONSES TO THE SURGE OF ENERGY PRICES AND THE RUSSIAN AGGRESSION TO UKRAINE

As part of the response to the surge in energy price and the climate of uncertainty created by Russia's invasion of Ukraine, the European Commission outlined a number of measures to address undesirable negative impacts of higher energy prices on households and businesses.

In October 2021, the Commission adopted a first Communication on 'Tackling rising energy price',¹⁵ which included a toolbox that the EU and its Member State could use to address the immediate impact of price increases, and further strengthen resilience against future shocks. Short-term national measures included emergency income support to households, state aid for companies, and targeted tax reductions. Medium-term measures aimed at accelerating the transition toward a decarbonised and resilient energy system.

In March 2022, the Commission adopted a second Communication proposing collective European actions to address the root causes of the problem in the gas market with a view to ensuring security of supply at reasonable prices for next winter and beyond.¹⁶ The Communication analysed possible options for Member States interventions in the gas and the electricity market and exceptional EU measures in case of full disruption of gas supplies. It also included the creation of a Task Force on common gas purchases at EU level, to facilitate and strengthen the EU's international outreach to suppliers and proposed a mandatory minimum level in EU underground gas storage¹⁷ to protect against potential interruptions to supply. This last measure already reached political agreement between the European Parliament and EU Member States and already this year, the Member States will need to reach a minimum 80% gas storage level by 1 November.

In July 2022, in light of the persisting uncertainty in the energy market and in preparation for possible further disruptions of gas supply, the Commission adopted the Communication 'Save gas for a safe winter', a plan for a voluntary gas demand reduction target of 15% from 1 August 2022 to 31 March 2023. To reach that target, the plan outlines various measures whereby Member States can encourage a decrease in gas demand and consumption by the public sector, by companies, but also by households, where possible. The Commission also adopted a proposal for a new Regulation on coordinated demand reduction measures for gas. The proposal also gives the Commission the possibility to declare a 'Union alert' on security of supply. In such a case, the Council can impose a mandatory gas demand reduction on all Member States, based on a proposal of the Commission.

¹⁵ COM(2021) 660 final

¹⁶ COM(2022) 138 final

¹⁷ COM/2022/135 final

5. COMMISSION'S ASSESSMENT OF NATIONAL LONG-TERM STRATEGIES

Stable and reliable long-term strategies are essential to help **coordinate a cost-effective move towards the long-term goal set by the Paris Agreement**, as well as to promote awareness and ownership of the transformation needed.

Since October 2021, three additional Member States have submitted their long-term strategies to the Commission: Luxembourg, which set a legally binding climate neutrality target by 2050, Malta and Cyprus that outlined a feasible set of trajectories and measures aimed at achieving target reductions in GHG emissions. Overall, by October 2022, 23 Member States¹⁸ have submitted their long-term strategies required by the Governance Regulation.¹⁹ Of these, 14 Member States²⁰ clearly expressed their aim to achieve climate neutrality or carbon neutrality²¹ by 2050 or before.²² Others aim to be largely climate neutral²³ or to achieve reductions of 80-95% by 2050.

Table 5: Summary of the long-term strategies' main features submitted by the EU Member States

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

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

Two third of the strategies have been supported by quantitative projections based on different modelling scenarios. The national long-term strategies also provide useful information at sectoral level, which allow strengths and remaining challenges to be identified and recognised, although coverage varies significantly across Member States or lack details on the precise scope, notably the expected role of land use and removals (see Table 5). In this respect, it is worth mentioning that the current land use and forestry EU regulation provides that Member State may use the managed forest land flexibility only if their long-term strategy

¹⁸ BE, CZ, DK, DE, EE, EL, ES, FR, HR, IT, CY LV, LT, LU, HU, MT, NL, AT, PT, SI, SK, FI, SE. LT and HU submitted an update of their initial strategies in July and September 2021, respectively.

¹⁹ Article 15 of Regulation (EU) 2018/1999 stating that MS should submit their LTS by January 2020.

²⁰ AT, DK, ES, FI, FR, HU, IT, LT, LV, LU, PT, SE, SI, SK.

²¹ While neutrality means by definition that residual emissions are compensated by removals, not all Member States provided the respective share of emission reductions and removals and the level of ambition for actual reductions varies.

²² FI by 2035 and SE by 2045.

²³ DE - it should be noted, however, that the German long-term strategy, as submitted to the Commission in January 2020, was prepared in 2016. According to the Climate Change Act, as amended in July 2021, Germany now aims at achieving climate neutrality by 2045.

has included ongoing or planned specific measures to ensure the conservation or enhancement of forest sinks and reservoirs.²⁴

The inclusion of the recommended contents²⁵ also varies across Member States, with gaps in needs for research, development and innovation, estimated long-term investments, CO₂ intensity of GDP and, to a lesser extent, on the expected contributions of renewable energy, energy efficiency, and agriculture-specific emission reductions (see Table 5). Some of the submitted projections appear not to be in line with the stated ambitions. Finally, less than half of the long-term objectives have been enshrined into national law.

Whereas most of the national strategies received to date reflect the ambition to be climate neutral by 2050, they do not yet allow to conclude that the long-term strategies are adequate for the collective achievement of the objectives and targets of the Energy Union. Providing information on any remaining collective gap would have required a more complete and detailed set of strategies. This underlines the importance to continue developing policies to increase and meet ambition over time. Member States are therefore encouraged to consider updating and, where possible, to increase the ambition of their national long-term strategies.²⁶

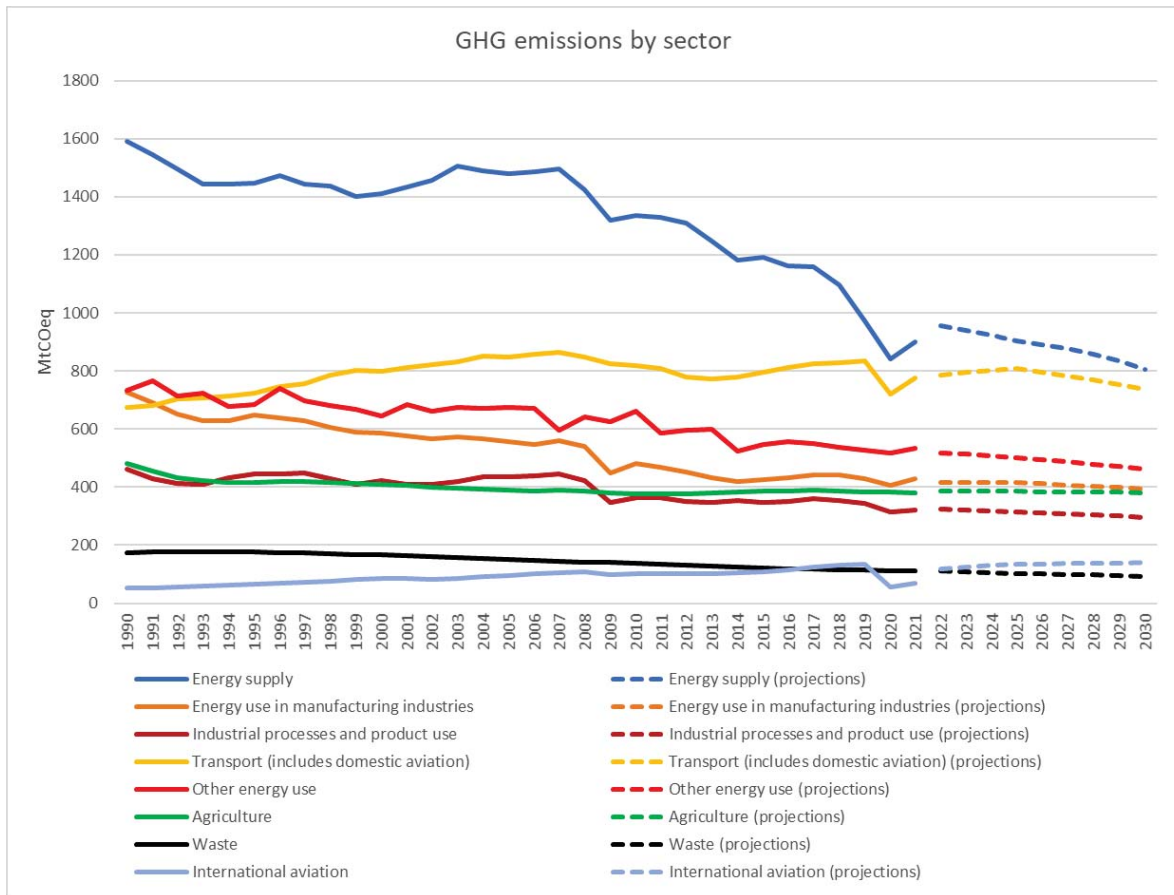
²⁴ Article 13.2.(a) and 8.1 of the Regulation (EU) 2018/841.

²⁵ See Annex IV of Regulation (EU) 2018/1999.

²⁶ For a more detailed assessment of the long-term strategies submitted by Member States, please refer to the DG CLIMA dedicated website: https://ec.europa.eu/info/energy-climate-change-environment/implementation-eu-countries/energy-and-climate-governance-and-reporting/national-long-term-strategies_en

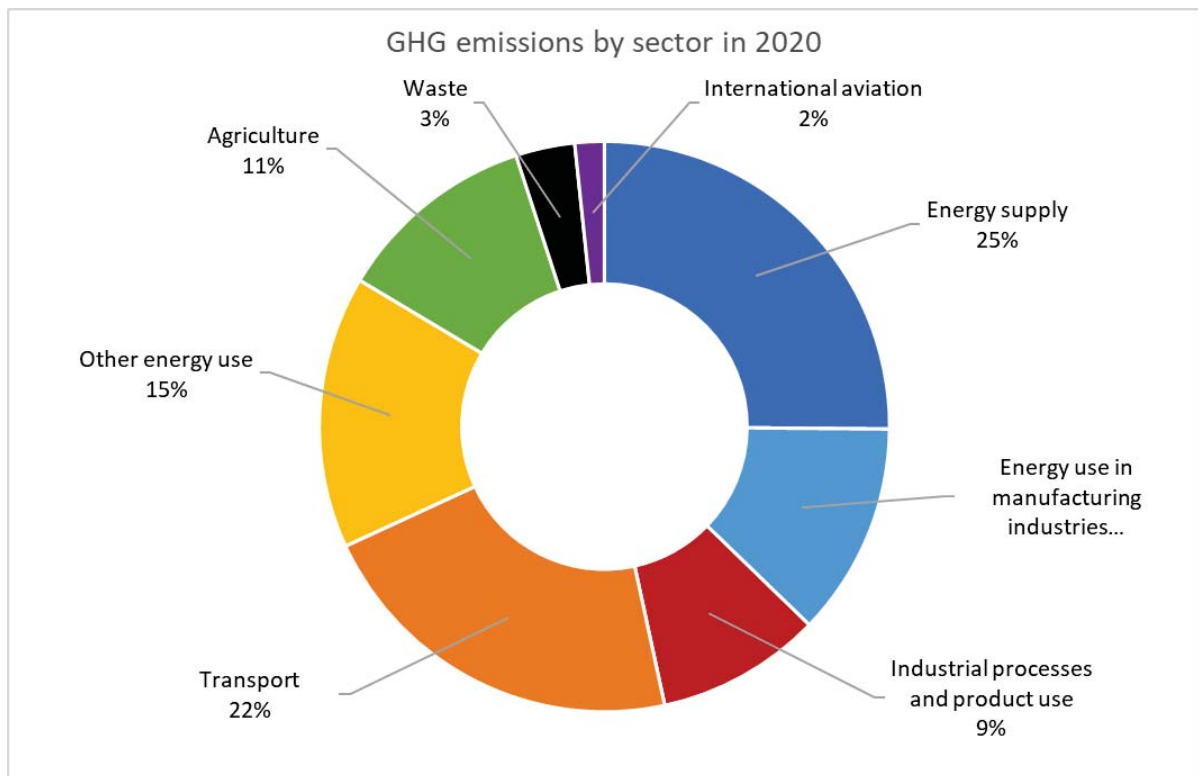
6. EU GREENHOUSE GAS EMISSIONS BY SECTOR

Figure 2: EU-27 GHG emissions by sector, historical data (1990-2021) and projections (2022-2030).²⁷



²⁷ Sources: EU greenhouse gas inventory 1990-2020. EU approximated greenhouse gas inventory 2021 (EEA). Member States projections with 'existing measures' reviewed by EEA (2022).

Figure 3: EU-27 greenhouse gas emissions by sector 2020 (in % of total emissions).²⁸



The sectors used in Figure 2 and Figure 3 correspond to the following IPCC sectors²⁹:

- Energy supply: 1A1, 1B and 1C,
- Energy use in manufacturing industries: 1A2,
- Industrial processes and product use: 2,
- Transport (includes domestic aviation) : 1A3,
- Other energy use: 1A4, 1A5 and 6,
- Agriculture: 3,
- Waste: 5,
- International aviation: 1.D.1.A

²⁸ EU greenhouse gas inventory 1990-2020.

²⁹ Source: EEA greenhouse gases - data viewer, European Environment Agency.

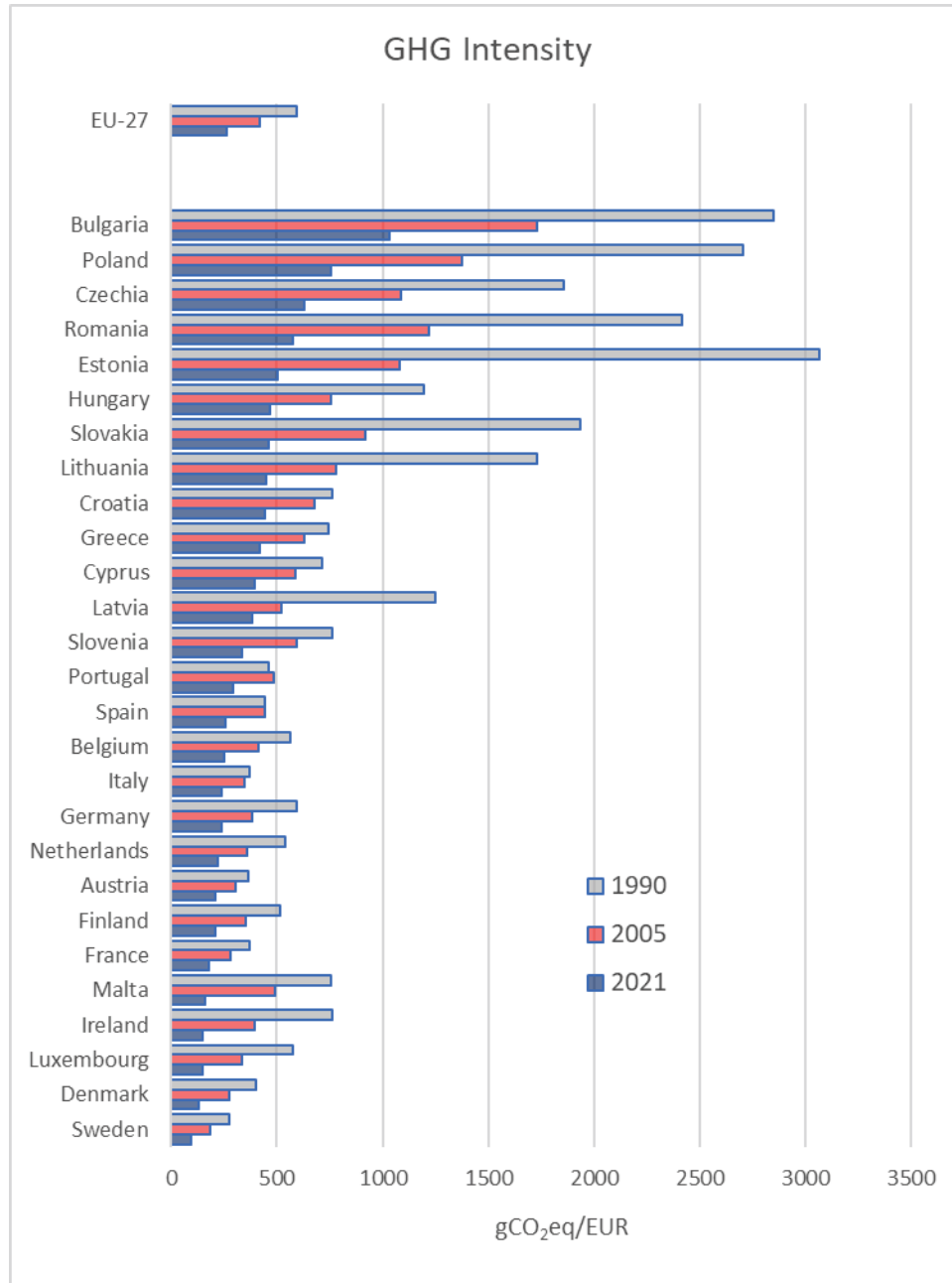
7. TOTAL GHG EMISSIONS PER MEMBER STATE

Table 6: Total GHG Emissions 2020, excl. LULUCF, including international aviation (Mt CO₂-eq. and % change from 1990 and 2005).

	1990	2005	2021	2021/1990	2021/2005
EU-27	4901	4633	3525	-28%	-24%
Austria	79	94	78	-1%	-17%
Belgium	149	149	115	-23%	-23%
Bulgaria	99	63	55	-45%	-12%
Croatia	32	30	23	-27%	-22%
Cyprus	6	10	9	47%	-8%
Czechia	200	150	120	-40%	-20%
Denmark	73	70	42	-42%	-39%
Estonia	40	19	13	-67%	-32%
Finland	72	71	49	-33%	-32%
France	553	567	427	-23%	-25%
Germany	1254	1010	780	-38%	-23%
Greece	106	139	78	-27%	-44%
Hungary	95	78	64	-33%	-17%
Ireland	55	73	62	11%	-15%
Italy	524	599	410	-22%	-32%
Latvia	26	11	11	-58%	-2%
Lithuania	48	23	21	-57%	-9%
Luxembourg	13	14	11	-14%	-21%
Malta	3	3	2	-16%	-28%
Netherlands	225	224	174	-23%	-22%
Poland	477	406	403	-16%	-1%
Portugal	60	88	59	-2%	-33%
Romania	250	147	115	-54%	-22%
Slovakia	74	51	41	-44%	-19%
Slovenia	19	21	16	-16%	-24%
Spain	295	454	298	1%	-34%
Sweden	73	69	49	-33%	-29%

8. GREENHOUSE GAS INTENSITY IN THE EU AND ITS MEMBER STATES

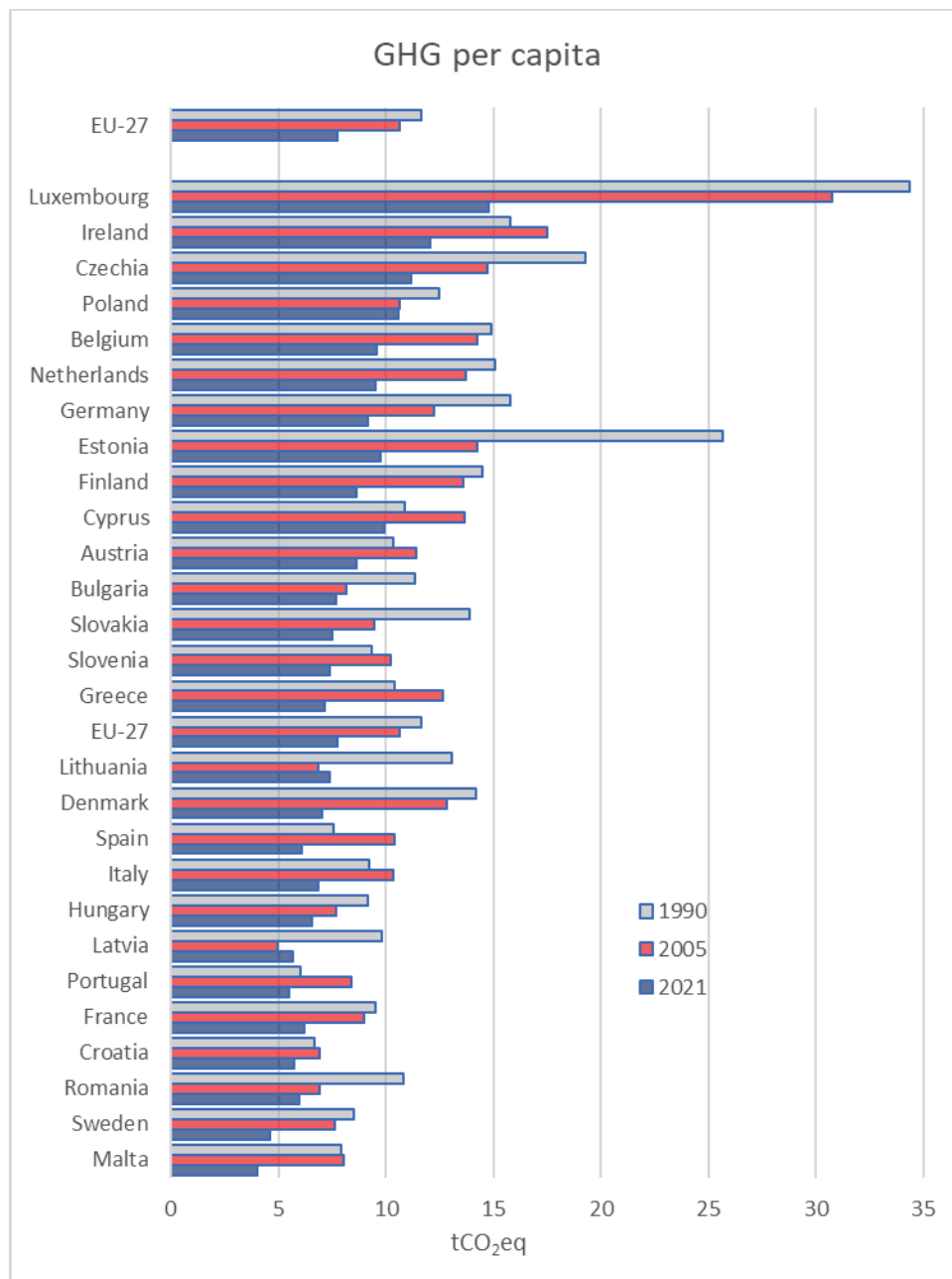
Figure 4: Greenhouse gas emissions intensity (i.e. the ratio between emissions and GDP) in the EU and its Member States 1990, 2005 and 2021 (g CO₂-eq./ EUR2015).³⁰



³⁰ Sources: EU greenhouse gas inventory 1990-2020, EU approximated greenhouse gas inventory 2021 (EEA). GDP in 2015-prices, data from Ameco database (European Commission, DG ECFIN) gap-filled by EEA.

9. GREENHOUSE GAS EMISSIONS PER CAPITA IN THE EU AND ITS MEMBER STATES

Figure 5: Greenhouse gas emissions per capita in the EU and its Member States 1990, 2005 and 2021 (tonnes CO₂-eq. per capita).³¹



³¹ Sources: EU greenhouse gas inventory 1990-2019, EU approximated greenhouse gas inventory 2020 (EEA). Average population (total) (Eurostat).

10. EU ETS EMISSIONS

The EU Emissions Trading System (ETS) is a cornerstone of the EU's policy to tackle climate change. It currently covers around 36% of the EU's total GHG emissions, including close to 9500 power stations and manufacturing plants (i.e. stationary installations) and flights within the European Economic Area (EEA).³²

Table 7: Verified ETS emissions from stationary installations up to 2021 (Mt CO₂-eq. and percentage change from year X-1).

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021*
Verified total emissions from stationary installations	1 904	1 867	1 908	1 814	1 803	1 751	1 755	1 683	1 530	1 356	1 335
Change from year x-1		-2.0%	2.2%	-4.9%	-0.6%	-2.9%	0.2%	-4.1%	-9.1%	-11.4%	6.6%
Verified emissions from electricity and heat generation	1 261	1 254	1 191	1 100	1 091	1 046	1 036	964	822	696	707
Change from year x-1		-0.5%	-5.0%	-7.7%	-0.8%	-4.1%	-1.0%	-7.0%	-14.7%	-15.3%	8.4%
Verified emissions from industrial installations	643	613	717	714	712	705	719	719	708	659	631
Change from year x-1		-4.7%	17.0%	-0.4%	-0.3%	-1.0%	2.0%	0.1%	-1.6%	-6.9%	4.6%

*As of 2021, the UK is no longer part of the EU ETS. Verified emissions data for 2021 do not cover the UK, only power plants in Northern Ireland. To determine the year-on-year comparison, an adjusted value of 2020 verified emissions was used, with the scope reduced in the same way.

Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021**
Verified total emissions from aviation	84	53.5	54.8	57.1	61.5	64.4	67.5	68.2	25.2	27.9
Change from year x-1		-	2.5%	4.1%	7.7%	4.8%	4.8%	1%	-63%	30%

**As of 2021, the UK is no longer part of the EU ETS. Verified emissions data for 2021 cover flights within the EEA as well as the outgoing flights to Switzerland and to the UK. To determine the year-on-year comparison, an adjusted value of 2020 verified emissions was used, with the scope reduced in the same way.

³² Including outgoing flights from the EEA to Switzerland and to the UK.

11. EMISSIONS COVERED BY THE EFFORT SHARING LEGISLATION

Emissions from sectors not included in the current EU ETS, such as emissions from buildings, road transport, agriculture, waste, domestic navigation and small industry, account for almost 60% of total domestic EU emissions. These emissions are covered by the EU effort sharing legislation that sets national targets. The Effort Sharing Decision³³ (ESD) sets national emissions targets for 2020 compared to 2005 levels and annual emissions allocations (AEAs), which are the emission limits that Member States must stay under for the period 2013-2020.

In 2021, Member States submitted projections in the context of the Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action. In 2022, three Member States (Denmark, Ireland, Latvia) and Iceland updated their projections.

The original data have different metrics: historical and projected emissions, ESD targets and 2005 base year emissions are expressed in the Global Warming Potential (GWP) of IPCC's 4th Assessment Report (AR4), whereas the ESR targets and 2005 base year emissions are in GWP of the 5th Assessment Report. For comparability, the latter have been approximately converted into GWP AR4, preserving the level of ambition as expressed in Commission Implementing Decision (EU) 2020/2126 which sets the annual emission allocations (AEAs) of each Member State for each year in 2012-2030 under the ESR. For these reasons, the distances to targets for 2030 are provided here for illustrative purposes only.

Due to UK's withdrawal from the EU, and the opt-out from the ETS of certain small installations in some Member States the aggregated targets (AEAs) for the 27 Member States, as in Commission Implementing Decision (EU) 2020/2126 (which result in -28.7% for the EU), do not exactly match the current EU-level effort sharing reduction targets expressed in percent (-30%).

³³ Decision No 406/2009/EC.

Table 8: Member States targets, historical and projected emissions under the effort-sharing legislation and distance to targets in percentage change from 2005 base year emissions. ESR base year emissions and targets have been approximately converted into GWP AR4 for comparability. Positive values indicate projected overachievement while negative values indicate projected underachievement. WEM = with existing measures, WAM = with additional measures.

Member State	ESD			ESR	
	2018	2019	2020	2030 (projections WEM)	2030 (projections WAM)
Austria					
Target	-13%	-14%	-18%	-36%	-36%
Emissions	-11%	-11%	-18%	-17%	-27%
Distance to target (pp)	-3%	-3%	0%	-19%	-9%
Belgium					
Target	-13%	-14%	-20%	-35%	-35%
Emissions	-9%	-11%	-20%	-14%	-38%
Distance to target (pp)	-4%	-3%	0%	-20%	3%
Bulgaria					
Target	19%	20%	18%	0%	0%
Emissions	21%	18%	18%	11%	6%
Distance to target (pp)	-1%	2%	0%	-10%	-6%
Croatia					
Target	6%	7%	-7%	-7%	-7%
Emissions	-9%	-10%	-7%	-14%	-19%
Distance to target (pp)	15%	17%	0%	7%	12%
Cyprus					
Target	-2%	-4%	1%	-24%	-24%
Emissions	-1%	4%	1%	-7%	-17%
Distance to target (pp)	-1%	-8%	0%	-17%	-7%
Czechia					
Target	3%	4%	-8%	-14%	-14%
Emissions	-5%	-5%	-8%	-22%	-37%
Distance to target (pp)	8%	9%	0%	8%	23%
Denmark					
Target	-15%	-18%	-23%	-39%	-39%
Emissions	-17%	-20%	-23%	-37%	-37%
Distance to target (pp)	2%	2%	0%	-2%	-2%
Estonia					
Target	-3%	-2%	-3%	-13%	-13%
Emissions	0%	1%	-3%	-12%	-14%
Distance to target (pp)	-3%	-4%	0%	-1%	1%

Finland					
Target	-14%	-15%	-18%	-39%	-39%
Emissions	-13%	-14%	-18%	-31%	-34%
Distance to target (pp)	-1%	-2%	0%	-8%	-5%
France					
Target	-11%	-13%	-23%	-37%	-37%
Emissions	-14%	-16%	-23%	-31%	-31%
Distance to target (pp)	3%	3%	0%	-6%	-6%
Germany					
Target	-12%	-13%	-15%	-38%	-38%
Emissions	-10%	-8%	-15%	-29%	-29%
Distance to target (pp)	-2%	-5%	0%	-8%	-9%
Greece					
Target	-5%	-5%	-32%	-16%	-16%
Emissions	-29%	-29%	-32%	-27%	-36%
Distance to target (pp)	23%	24%	0%	11%	20%
Hungary					
Target	8%	10%	-7%	-7%	-7%
Emissions	-9%	-5%	-7%	-7%	-22%
Distance to target (pp)	16%	15%	0%	1%	15%
Ireland					
Target	-15%	-17%	-5%	-30%	-30%
Emissions	-3%	-3%	-5%	-11%	-30%
Distance to target (pp)	-12%	-15%	0%	-19%	0%
Italy					
Target	-13%	-14%	-25%	-33%	-33%
Emissions	-18%	-19%	-25%	-29%	-40%
Distance to target (pp)	5%	5%	0%	-3%	7%
Latvia					
Target	15%	16%	-1%	-6%	-6%
Emissions	7%	1%	-1%	-10%	-15%
Distance to target (pp)	8%	15%	0%	4%	9%
Lithuania					
Target	13%	16%	9%	-9%	-9%
Emissions	11%	11%	9%	-11%	-23%
Distance to target (pp)	2%	4%	0%	2%	14%
Luxembourg					
Target	-15%	-17%	-24%	-40%	-40%
Emissions	-10%	-8%	-24%	-14%	-53%
Distance to target (pp)	-5%	-9%	0%	-26%	13%
Malta					

Target	17%	17%	31%	-19%	-19%
Emissions	38%	42%	31%	50%	50%
Distance to target (pp)	-21%	-25%	0%	-69%	-69%
Netherlands					
Target	-12%	-14%	-29%	-36%	-36%
Emissions	-21%	-23%	-29%	-31%	-31%
Distance to target (pp)	10%	10%	0%	-5%	-5%
Poland					
Target	7%	8%	9%	-7%	-7%
Emissions	13%	11%	9%	6%	-12%
Distance to target (pp)	-6%	-3%	0%	-13%	5%
Portugal					
Target	1%	2%	-19%	-17%	-17%
Emissions	-15%	-13%	-19%	-39%	-42%
Distance to target (pp)	16%	15%	0%	22%	25%
Romania					
Target	14%	17%	2%	-2%	-2%
Emissions	3%	0%	2%	5%	2%
Distance to target (pp)	11%	17%	0%	-6%	-4%
Slovakia					
Target	11%	13%	-17%	-12%	-12%
Emissions	-7%	-12%	-17%	9%	1%
Distance to target (pp)	19%	24%	0%	-21%	-13%
Slovenia					
Target	5%	6%	-16%	-14%	-14%
Emissions	-5%	-7%	-16%	-9%	-25%
Distance to target (pp)	10%	13%	0%	-5%	11%
Spain					
Target	-10%	-11%	-23%	-26%	-26%
Emissions	-15%	-16%	-23%	-18%	-38%
Distance to target (pp)	6%	5%	0%	-8%	12%
Sweden					
Target	-14%	-15%	-32%	-40%	-40%
Emissions	-27%	-26%	-32%	-39%	-39%
Distance to target (pp)	14%	12%	0%	-1%	-1%
EU 27					
Target	-8%	-8%	-17%	-29%	-29%
Emissions	-11%	-11%	-17%	-22%	-30%
Distance to target (pp)	3%	3%	0%	-6%	1%
Iceland					
Target				-29%	-29%

Emissions	-26%	-26%
Distance to target (pp)	-3%	-3%
Norway		
Target	-40%	-40%
Emissions	-32%	-32%
Distance to target (pp)	-8%	-8%
EU-27 + IS + NO		
Target	-29%	-29%
Emissions	-22%	-30%
Distance to target (pp)	-7%	1%

Table 9: Member States approximated emissions for 2021 under the effort-sharing legislation. ESR annual emission allocations (AEAs) and base-year emissions have been approximately converted into GWP AR4 for comparability. In the case of Iceland and Norway, due to data availability, 2021 approximated emissions have been converted into GWP AR5 to make them directly comparable with the annual emission allocations (AEAs) under the ESR, as adapted by Protocol 31 to the EEA Agreement.

Member state	2021 Emissions (MtCO ₂ -eq)	2021 AEAs (MtCO ₂ -eq)	Difference (MtCO ₂ -eq)	As percent of the base-year
Austria	48.4	48.7	0.3	1%
Belgium	69.5	70.1	0.5	1%
Bulgaria	25.5	27.1	1.6	8%
Cyprus	4.6	4.0	-0.6	-14%
Czechia	61.8	60.9	-0.9	-1%
Germany	405.7	428.8	23.2	5%
Denmark	29.4	31.7	2.3	6%
Estonia	6.1	6.2	0.1	1%
Spain	194.8	197.5	2.7	1%
Finland	27.2	29.0	1.8	5%
France	327.5	334.4	6.9	2%
Greece	42.7	45.8	3.1	5%
Croatia	16.2	17.5	1.2	7%
Hungary	46.1	49.7	3.6	8%
Ireland	45.2	42.6	-2.5	-5%
Italy	271.7	266.6	-5.0	-2%
Lithuania	14.6	16.0	1.3	10%
Luxembourg	8.1	8.4	0.3	3%
Latvia	8.6	10.7	2.0	24%
Malta	1.3	2.1	0.8	76%
Netherlands	92.7	98.2	5.6	4%
Poland	209.7	210.4	0.7	0%
Portugal	40.5	42.3	1.8	4%
Romania	82.3	86.1	3.9	5%
Sweden	29.3	31.2	1.9	4%

Slovenia	9.9	11.1	1.1	10%
Slovakia	20.0	22.8	2.8	12%
Iceland	2.8	2.9	0.1	2%
Norway	26.6	25.2	-1.5	-5%
EU-27	2139.2	2199.9	60.6	2%

Table 10: Annual emissions allocations, historical emissions and distance to targets under the Effort Sharing Decision (Mt. CO₂-eq.) covering the period 2013 - 2020. Positive values indicate overachievement, negative values indicate underachievement. AEA for the years 2017-2020 were revised in 2017 for all Member States to reflect updates in methodologies for reporting of GHG inventories. This recalculation ensures maintaining the originally intended effort of each Member State (in % of 2005 emissions). The values of ‘cumulative surplus of AEA’s are the cumulative annual distances to target and do not take into account cancellations and transfers. 2019 ESD emissions are based on the ‘Final Review Reports’ from the 2022 annual ESD review. For compliance in 2019, Germany used the flexibility to carry forward part of the AEA’s allocated for 2020. As a result, Germany’s AEA’s available for compliance in 2020 are below the allocation set by the legislation.

Member State	2005 base year emissions	2013	2014	2015	2016	2017	2018	2019	2020
Austria									
AEA		52,6	52,1	51,5	51,0	49,5	48,9	48,3	47,8
Emissions	56,8	50,1	48,2	49,3	50,6	51,7	50,3	50,2	46,5
Distance to target		2,5	3,9	2,2	0,4	-2,1	-1,4	-1,9	1,2
Cumulative surplus of AEA’s		2,5	6,4	8,7	9,0	6,9	5,5	3,6	4,8
Belgium									
AEA		78,4	76,9	75,3	73,8	72,5	71,1	69,7	68,2
Emissions	80,3	74,3	70,1	72,7	74,1	70,8	74,3	72,0	64,9
Distance to target		4,1	6,8	2,6	-0,3	1,7	-3,2	-2,4	3,3
Cumulative surplus of AEA’s		4,1	10,9	13,5	13,2	14,9	11,7	9,4	12,7
Bulgaria									
AEA		26,9	27,2	27,5	27,7	25,9	26,1	26,3	26,5
Emissions	22,1	22,2	22,9	25,4	25,6	26,5	26,3	25,8	25,7
Distance to target		4,7	4,3	2,1	2,1	-0,6	-0,2	0,5	0,8
Cumulative surplus of AEA’s		4,7	9,0	11,1	13,3	12,6	12,4	12,9	13,7
Croatia									

AEA		19,6	19,8	20,0	20,2	18,7	18,9	19,1	19,3
Emissions	17,4	15,1	14,7	15,6	16,0	16,7	16,2	16,1	16,5
Distance to target		4,5	5,1	4,4	4,2	2,0	2,7	3,0	2,8
Cumulative surplus of AEA's		4,5	9,6	14,1	18,2	20,3	22,9	26,0	28,8
Cyprus									
AEA		5,9	5,9	5,9	5,9	4,2	4,1	4,0	4,0
Emissions	4,2	3,9	3,9	4,1	4,1	4,3	4,2	4,4	4,2
Distance to target		2,0	2,0	1,9	1,8	-0,1	0,0	-0,3	-0,3
Cumulative surplus of AEA's		2,0	4,0	5,8	7,7	7,6	7,5	7,2	7,0
Czechia									
AEA		62,5	63,2	64,0	64,7	65,2	65,9	66,5	67,2
Emissions	61,7	61,5	57,6	61,3	62,8	62,4	60,6	60,5	58,7
Distance to target		1,0	5,6	2,7	1,9	2,8	5,3	6,0	8,6
Cumulative surplus of AEA's		1,0	6,6	9,3	11,2	14,0	19,2	25,2	33,8
Denmark									
AEA		36,8	35,9	35,0	34,1	34,8	33,9	33,0	32,1
Emissions	40,1	33,7	32,6	32,5	33,1	32,7	33,1	32,1	30,8
Distance to target		3,1	3,3	2,5	1,0	2,1	0,7	0,9	1,2
Cumulative surplus of AEA's		3,1	6,4	8,9	9,9	12,0	12,7	13,6	14,9
Estonia									
AEA		6,3	6,3	6,3	6,4	5,9	6,0	6,0	6,0
Emissions	5,4	5,8	6,1	6,1	6,2	6,2	6,1	6,2	5,9
Distance to target		0,5	0,2	0,2	0,2	-0,3	-0,2	-0,2	0,1

Cumulative surplus of AEAs		0,5	0,8	1,0	1,1	0,9	0,7	0,5	0,6
Finland									
AEA		31,8	31,3	30,8	30,3	30,2	29,6	29,1	28,5
Emissions	33,9	31,6	30,1	29,9	31,4	30,1	29,9	29,6	28,1
Distance to target		0,2	1,1	0,9	-1,0	0,1	-0,3	-0,6	0,4
Cumulative surplus of AEAs		0,2	1,3	2,2	1,2	1,3	1,0	0,4	0,8
France									
AEA		394,1	389,5	384,4	379,4	358,2	352,9	347,7	342,5
Emissions	398,2	366,1	353,5	353,0	351,9	352,8	342,2	336,4	307,8
Distance to target		28,0	35,9	31,4	27,5	5,4	10,7	11,4	34,7
Cumulative surplus of AEAs		28,0	63,9	95,3	122,8	128,2	138,9	150,3	185,0
Germany									
AEA		472,5	465,8	459,1	452,4	432,3	425,2	418,1	410,9
Emissions	477,8	460,2	436,8	444,1	454,2	466,9	434,0	444,3	407,4
Distance to target		12,3	29,0	15,1	-1,7	-34,5	-8,8	-26,2	3,5
Cumulative surplus of AEAs		12,3	41,4	56,4	54,7	20,2	11,3	-14,9	-11,4
Greece									
AEA		59,0	59,3	59,6	59,9	59,1	59,4	59,7	60,0
Emissions	62,6	44,2	44,4	45,4	44,9	45,4	44,7	44,7	42,9
Distance to target		14,8	14,9	14,2	15,0	13,7	14,7	15,0	17,2
Cumulative surplus of AEAs		14,8	29,6	43,8	58,8	72,5	87,3	102,3	119,4
Hungary									
AEA		50,4	51,5	52,6	53,8	50,1	51,0	51,9	52,8
Emissions	48	38,4	38,4	41,4	42,1	43,1	43,2	44,9	43,9

Distance to target		12,0	13,1	11,2	11,7	6,9	7,7	7,0	8,9
Cumulative surplus of AEs		12,0	25,1	36,3	47,9	54,9	62,6	69,6	78,5
Ireland									
AEA		46,9	45,8	44,6	43,5	40,9	39,8	38,7	37,7
Emissions	47,1	42,2	41,7	43,0	43,8	43,8	45,4	45,6	44,7
Distance to target		4,7	4,1	1,6	-0,3	-2,9	-5,6	-6,9	-7,1
Cumulative surplus of AEs		4,7	8,8	10,4	10,1	7,1	1,6	-5,3	-12,4
Italy									
AEA		308,2	306,2	304,2	302,3	298,3	295,8	293,4	291,0
Emissions	334,5	273,3	265,3	273,3	270,7	270,1	278,7	274,9	254,0
Distance to target		34,8	40,9	31,0	31,6	28,1	17,1	18,5	37,0
Cumulative surplus of AEs		34,8	75,7	106,7	138,3	166,4	183,5	202,0	239,0
Latvia									
AEA		9,3	9,4	9,4	9,5	9,7	9,8	9,9	10,0
Emissions	8,5	8,8	9,0	9,0	9,1	9,2	9,1	8,7	8,4
Distance to target		0,5	0,3	0,4	0,4	0,5	0,7	1,3	1,6
Cumulative surplus of AEs		0,5	0,8	1,3	1,7	2,2	2,9	4,1	5,7
Lithuania									
AEA		12,9	13,3	13,7	14,0	14,1	14,5	14,9	15,2
Emissions	13,3	12,4	12,9	13,3	13,9	14,1	14,3	14,3	14,0
Distance to target		0,5	0,4	0,4	0,1	0,0	0,2	0,6	1,2
Cumulative surplus of AEs		0,5	0,9	1,3	1,4	1,4	1,6	2,1	3,3
Luxembourg									
AEA		9,5	9,3	9,1	8,9	8,7	8,5	8,3	8,1

Emissions	10,1	9,4	8,9	8,6	8,5	8,7	9,1	9,2	7,7
Distance to target		0,2	0,5	0,5	0,4	0,0	-0,5	-0,9	0,4
Cumulative surplus of AEA		0,2	0,7	1,2	1,6	1,6	1,1	0,1	0,6
Malta									
AEA		1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,2
Emissions	1,1	1,3	1,3	1,3	1,3	1,4	1,4	1,4	1,3
Distance to target		-0,1	-0,1	-0,1	-0,2	-0,3	-0,2	-0,3	-0,1
Cumulative surplus of AEA		-0,1	-0,2	-0,3	-0,5	-0,8	-1,0	-1,2	-1,4
Netherlands									
AEA		122,9	120,7	118,4	116,1	114,1	111,8	109,6	107,4
Emissions	127,8	108,3	97,9	101,1	101,3	102,3	99,7	97,1	90,2
Distance to target		14,7	22,8	17,3	14,8	11,7	12,1	12,5	17,2
Cumulative surplus of AEA		14,7	37,5	54,8	69,6	81,3	93,4	105,9	123,0
Poland									
AEA		193,6	194,9	196,1	197,4	200,0	201,7	203,4	205,2
Emissions	180	186,1	181,5	186,8	198,7	211,5	213,0	209,1	205,1
Distance to target		7,5	13,3	9,4	-1,3	-11,5	-11,3	-5,6	0,1
Cumulative surplus of AEA		7,5	20,9	30,2	29,0	17,4	6,1	0,5	0,5
Portugal									
AEA		49,3	49,6	49,9	50,1	47,9	48,3	48,7	49,1
Emissions	48,6	38,6	38,8	40,6	41,6	40,2	40,6	41,5	38,5
Distance to target		10,7	10,8	9,2	8,6	7,7	7,7	7,2	10,5
Cumulative surplus of AEA		10,7	21,5	30,7	39,3	47,0	54,7	61,9	72,4
Romania									

AEA		75,6	77,5	79,3	81,1	84,1	86,0	87,9	89,8
Emissions	75,5	72,7	72,5	74,6	73,1	75,4	77,6	75,2	77,1
Distance to target		2,9	4,9	4,7	8,0	8,7	8,3	12,7	12,7
Cumulative surplus of AEA's		2,9	7,8	12,5	20,5	29,2	37,5	50,2	62,9
Slovakia									
AEA		24,0	24,4	24,7	25,1	25,0	25,3	25,6	25,9
Emissions	23	21,1	19,8	20,1	19,8	21,2	21,1	20,1	18,9
Distance to target		2,9	4,6	4,7	5,3	3,8	4,3	5,6	7,1
Cumulative surplus of AEA's		2,9	7,5	12,2	17,5	21,3	25,6	31,2	38,2
Slovenia									
AEA		12,3	12,4	12,4	12,4	12,2	12,2	12,3	12,3
Emissions	11,8	10,9	10,5	10,7	11,2	10,9	11,0	10,8	9,8
Distance to target		1,4	1,9	1,7	1,2	1,3	1,2	1,5	2,6
Cumulative surplus of AEA's		1,4	3,3	4,9	6,1	7,4	8,6	10,1	12,7
Spain									
AEA		227,6	225,6	223,7	221,8	218,3	216,3	214,3	212,4
Emissions	236	200,3	199,8	196,2	198,5	201,1	203,0	201,9	184,2
Distance to target		27,3	25,9	27,6	23,3	17,2	13,3	12,5	28,2
Cumulative surplus of AEA's		27,3	53,2	80,8	104,1	121,3	134,5	147,0	175,2
Sweden									
AEA		41,7	41,0	40,4	39,8	37,8	37,2	36,7	36,1
Emissions	43,5	35,3	34,5	33,9	32,6	32,5	31,4	31,7	29,4
Distance to target		6,4	6,5	6,5	7,2	5,3	5,8	5,0	6,7
Cumulative surplus of AEA's		6,4	12,9	19,4	26,6	31,9	37,7	42,7	49,4

United Kingdom									
AEA		358,7	354,2	349,7	345,2	360,4	357,2	354,1	350,9
Emissions	417,8	339,5	324,4	326,0	333,9	332,1	329,9	329,1	298,9
Distance to target		19,3	29,8	23,7	11,3	28,4	27,4	25,0	52,0
Cumulative surplus of AEs		19,3	49,1	72,7	84,0	112,4	139,7	164,7	216,7

12. USE OF REVENUES FROM AUCTIONING OF ETS ALLOWANCES

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

Figure 6: Auctioning revenues and reported usage, 2013-2021 (€ bn), EU-27

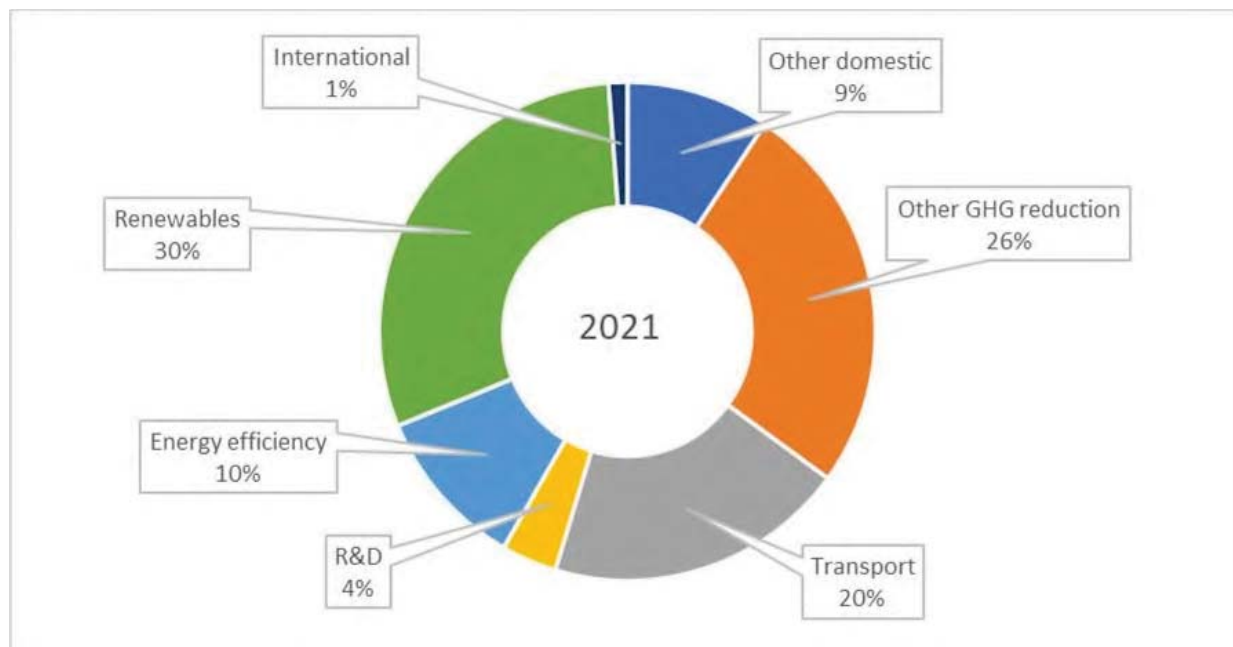


Figure 6 shows how the reported revenues have been spent in 2021 and indicates that renewables support, decarbonisation of transport and other GHG reduction, were the areas where most of the revenues were spent. Compared to previous years, the increasing share of “other” spending appears partly linked to new national measures using ETS revenues to compensate for rising energy prices and mitigate their social impacts.³⁴

Auctions of EU ETS emission allowances for both stationary installations and aircraft operators have provided the EU-27 countries with revenues listed in the Table 11.³⁵ Member States report annually on the use of auctioning revenues for climate change and energy purposes, under Article 17 of Regulation (EU) No 525/2013. It should be noted that annual reporting does not necessarily cover how the revenues of that year are spent, but the spending of revenues during that year, i.e. it can include revenues from earlier years. Member States only report on spending for the purposes of addressing climate change and energy, but this does not mean that the amount not covered in the report is necessarily spent for other purposes: it is also possible that revenues are spent later, or used to fund many projects/activities, only part of which are linked to climate change and energy, or that a certain amount has been set aside for climate and energy but not all of it has yet been formally attributed to specific projects.

³⁴ For instance, between late-2021 and mid-2022 Spain, Italy, Greece, Germany and Estonia announced the direct or indirect use of ETS revenues for such purposes.

³⁵ The table lists annual total revenues of the auctioned allowances on the [EEX](#) platform.

In the latter case, and when Member States have reported having a national minimum set aside for climate and energy, this has been reflected in the “% spent on climate and energy” row.³⁶ Additionally, multiple Member States do not earmark their auction revenues for a specific purpose, but instead attribute part or all of their revenues to a broad budget such as the general budget, that is funded by more than just auctioning revenues, and can be spent on both climate change and energy and other purposes. Often, in such cases example projects funded by the broad budget are reported, but a direct link to auctioning revenues cannot be made. Such country specific contexts are described below. Reported spending can also be higher than the revenues of that year, if either it includes spending of previous years’ revenues or if the reported projects were co-funded with other funds.³⁷

Table 11: Member States' revenues from auctioning of ETS allowances (EUR million), amounts spent on climate and energy purposes (EUR million) and share of the revenues spent on climate and energy purposes (%), 2013-2021.³⁸

Member State	2013	2014	2015	2016	2017	2018	2019	2020	2021
Austria									
Revenues from auctioning	55.8	53.6	78.6	59.5	79.4	210.4	183.8	184.2	311.0
Reported as spent on climate etc.	36.9	54.8	79.8	59.9	79.2	0	0	986.4	311.0
% spent on climate and energy	>100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%
Revenues are not earmarked. National spending on climate and energy is >100% of auctioning revenues. In several years, climate and energy projects financed from the national budget were reported, even though their funding cannot be directly linked to the auctioning revenues.									
Belgium									
Revenues from auctioning	115	97.1	141.6	107.9	144.3	381.5	356.8	356.1	533.2
Reported as spent on climate etc.	0	0	0	37.5	133.1	213.7	357.8	162.6	76.1
% spent on climate and energy	N/A	N/A	N/A	35%	92%	56%	99%	46%	14%
The policy is that 100% of auctioning revenues are spent on energy and climate projects. The revenues for the years 2013-2020 have been divided over the regions and the federal government in shares determined by a cooperation agreement. Work on such an agreement for 2021-2030 is still ongoing. Until completed, revenues are carried over. The amount spent in 2021 came from both 2020 revenues and anticipated 2021 revenues.									
Bulgaria									
Revenues from auctioning	52.6	36.4	121.8	85.3	130.4	368.2	440.3	448.6	832.9

³⁶ Where relevant, the amount resulting from the “% spent on climate and energy” row that is not covered in the row “Reported as spent on climate etc.” has been included in Figure 5 of the Climate Action Progress Report as “Used for climate change and energy, (unspecified)”.

³⁷ For the purposes of Figure 5 of the Climate Action Progress Report and the estimated shares spent on climate and energy, the annual shares have been capped at 100% in order to avoid distortion of the figures.

³⁸ Data in this table is based on the annual reporting by the Member States with some modifications made to ensure consistency across all Member States and over the reporting period. In 2020-2022 the harmonisation, methodology and analysis were conducted by SQ Consult in a study for the European Commission. Proposed modifications have been discussed with the Member States as part of the quality checks. Notes: “N/A” = Not available, “*” = Member States that do not earmark auction revenues, “(*)” = Member States that partially earmark auction revenues.

Reported as spent on climate etc.	51.3	36.2	103.5	94.1	138.2	368.2	440.3	448.6	832.9
% spent on climate and energy	97%	99%	85%	>100%	>100%	100%	100%	100%	100%
Unspent revenues are carried over to later years, therefore in some years spending is higher than the revenues.									
Croatia									
Revenues from auctioning	N/A	N/A	86.9	20.3	27.2	71.5	72.7	72.2	112.2
Reported as spent on climate etc.	N/A	N/A	77.5	46.1	18.9	29	13.4	44	12.3
% spent on climate and energy	N/A	N/A	100%	>100%	100%	100%	100%	100%	100%
Cyprus (*)									
Revenues from auctioning	0.3	0.7	1.4	0.4	6.6	26	26.1	40.1	78.4
Reported as spent on climate etc.	1.9	0.7	2.8	0.3	0.8	6.4	57.5	57.6	75.3
% spent on climate and energy	>100%	100%	>100%	100%	100%	100%	>100%	>100%	100%
The auctioning revenues go to a fund, which different ministries can use for climate and energy projects. This fund also receives money from the general budget, so in practice a higher amount than 100% of revenues is spent on climate and energy overall.									
Czechia *									
Revenues from auctioning	80.7	55.7	111.5	118	199.8	584.4	630.4	719.4	604.0
Reported as spent on climate etc.	73.2	26.9	111.5	118	199.8	367.3	408.4	309.7	296.5
% spent on climate and energy	91%	48%	100%	100%	100%	63%	65%	43%	49%
Revenues are not earmarked. Reported spending represents the amounts allocated for climate change and energy projects in the national budget of each year (if this allocation is higher than 100%, it is reported as 100% of revenues).									
Denmark *									
Revenues from auctioning	56.1	48.1	71.3	53.7	71.7	189.8	166.1	166.5	292.9
Reported as spent on climate etc.	56	48.1	71.3	53.7	71.7	189.8	166.1	166.5	292.9
% spent on climate and energy	100%	100%	100%	100%	100%	100%	100%	100%	100%
Revenues are not earmarked, example projects have been reported up to 100% of revenues each year.									
Estonia (*)									
Revenues from auctioning	18.1	7.4	21.3	23.6	39.4	140	142.8	142.4	248.6
Reported as spent on climate etc.	9	3.6	9.5	12.2	15.9	53.3	64.5	30	43.6
% spent on climate and energy	50%	49%	44%	52%	40%	38%	45%	≥50%	≥50%
50% of the auctioning revenues are earmarked and directed through the four-year State Budget Strategy and spent on climate and energy projects and measures, which may take multiple years. Unspent revenues are carried over to later years and always used for climate and energy projects. The remaining 50% goes to the general budget, which, among others, covers climate and energy investment (not included here).									
Finland *									
Revenues from	67	63.5	93.8	71.2	95.3	251.8	219.9	220.6	409.0

auctioning									
Reported as spent on climate etc.	2	31.1	93.8	71.2	9.5	251.8	219.9	220.6	409.0
% spent on climate and energy	3%	49%	100%	100%	10%	100%	100%	100%	100%
Revenues are not earmarked. National spending on climate and energy is >100% of auctioning revenues. Only a part of actual spending has been reported, in some years covering specific projects, in other years up to 100% of revenues, even though this funding cannot be directly linked to the auctioning revenues.									
France (*)									
Revenues from auctioning	219.2	215.3	312.1	234.7	313.4	829.6	726.5	728.1	1469.1
Reported as spent on climate etc.	219.2	215.3	312.1	234.7	313.4	550	420	728.1	1469.1
% spent on climate and energy	100%	100%	100%	100%	100%	100%	100%	100%	100%
The auctioning revenues co-fund energy efficiency improvements of low-income housing, up to a ceiling of EUR 420 million per year. The remainder is not earmarked but goes to the general budget, which, among others, covers climate and energy investments (not included here).									
Germany									
Revenues from auctioning	791.3	750	1110.2	850.4	1146.8	2581.7	3164	2662.4	5306.2
Reported as spent on climate etc.	790.9	750	1110.2	845.6	1130.8	2563	3147.2	2662.4	5306.2
% spent on climate and energy	100%	100%	100%	98%	99%	99%	99%	100%	100%
100% of revenues is spent on energy and climate projects. All revenues go to a fund for climate and energy projects, which is additionally co-funded from the general budget.									
Greece									
Revenues from auctioning	147.6	131.1	195.2	148.1	198	523.5	509.5	506.7	1014.6
Reported as spent on climate etc.	147.6	131.1	195.2	148.1	198	523.5	509.5	506.7	1014.6
% spent on climate and energy	100%	100%	100%	100%	100%	100%	100%	100%	100%
Revenues are earmarked and fully spent on domestic climate change and energy projects.									
Hungary (*)									
Revenues from auctioning	34.6	56.5	83.3	63.7	85.2	225.4	228	226.3	288.2
Reported as spent on climate etc.	17.3	13.1	32.8	18.5	68.7	65.9	74	71.8	232.9
% spent on climate and energy	50%	50%	39%	29%	81%	50%	50%	50%	81%
50% of the revenues are spent on climate and energy (any revenues not spent are carried over to future years) and the remainder goes to the national general budget. Amounts included in the latter can be spent on climate change and energy are not covered here.									
Ireland *									
Revenues from auctioning	41.7	36	53.5	40.1	53.6	142.1	124.3	124.5	149.2
Reported as spent on climate etc.	41.7	36	53.5	40.1	53.6	142.1	124.3	124.5	149.2
% spent on climate and energy	100%	100%	100%	100%	100%	100%	100%	100%	100%

While ETS auction revenues are not earmarked for specific purposes, amounts spent are equivalent to 100% of these revenue (less ETS administration costs for the Environmental Protection Agency) and are attributed to emission reduction activities in line with the purposes specified in the ETS Directive.									
Italy (*)									
Revenues from auctioning	386	366.5	542.4	411.2	549.7	1453.3	1289	1290.5	2520.9
Reported as spent on climate etc.	N/A	192.8	237.7	118.1	383.7	148.4	148.1	506.6	1260.5
% spent on climate and energy	50%	53%	44%	29%	70%	50%	50%	50%	50%
Italian law guarantees that, 50% of the revenues are used for climate and energy but only after the year has ended, which can cause underreported spending. The remaining 50% was initially used to compensate for the depleted phase 2 of the New Entrants Reserve, and later it was allocated to the general budget, which funds, among others, climate and energy projects (not included here).									
Latvia									
Revenues from auctioning	10.8	10.2	15.3	11.5	15.4	40.7	42.6	42.3	62.4
Reported as spent on climate etc.	0	0.1	0.1	7.4	3.8	12.3	11.4	5.8	62.4
% spent on climate and energy	100%	100%	100%	100%	100%	100%	100%	100%	100%
100% of revenues go to the EAAI, a national green investment scheme aimed at tackling global climate change. Reported spending shows actually disbursed amounts per year, all leftovers are carried over to future years.									
Lithuania									
Revenues from auctioning	20	17.3	28.4	20.8	31.5	80.4	84	86.6	86.2
Reported as spent on climate etc.	20	17.3	28.4	20.8	31.5	80.4	83.7	86.6	86.2
% spent on climate and energy	100%	100%	100%	100%	100%	100%	100%	100%	100%
Revenues are put in a Climate Change fund that is only for climate action and only funded by auctioning revenues, and spent on climate and energy projects									
Luxembourg *									
Revenues from auctioning	5	5.2	6.8	5.1	6.9	18.3	17.1	17	8.1
Reported as spent on climate etc.	2.5	2.9	3.5	2.6	3.5	9.2	17.1	17	8.1
% spent on climate and energy	50%	56%	52%	51%	50%	51%	100%	100%	100%
Revenues are not earmarked, example projects have been reported up to 100% of revenues each year.									
Malta *									
Revenues from auctioning	4.5	3.9	6.2	4.5	6	15.7	15.9	15.8	30.7
Reported as spent on climate etc.	2.9	5.7	12	9.7	6.9	4.9	9.1	47.2	30.7
% spent on climate and energy	100%	100%	>100%	>100%	>100%	100%	100%	>100%	100%
All revenues go to a fund for climate and energy projects, which is additionally co-funded from the general budget.									
Netherlands *									
Revenues from auctioning	134.2	131.1	187.3	142.6	190.7	504.2	440.1	441.4	894.0

Reported as spent on climate etc.	134.2	131.1	187.3	142.6	190.7	504.2	440.1	441.4	0.0
% spent on climate and energy	>100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%
Auctioning revenues go to the national general budget which is used to finance among others climate and energy projects. Amounts spent are higher than 100% of revenues, but it is not possible to link auctioning revenues to specific projects funded.									
Poland*									
Revenues from auctioning	244	78	132.8	136.1	506	1211.6	2548.8	3157.6	5593.6
Reported as spent on climate etc.	128.7	39	68.5	68.1	290.4	609.9	1274.4	1564	2768.3
% spent on climate and energy	53%	50%	52%	50%	57%	50%	50%	50%	49%
Revenues are not earmarked, example projects have been reported for around 50% of revenues each year.									
Portugal									
Revenues from auctioning	72.8	67.1	99.2	75.1	100.3	265.6	257.1	255.8	513.9
Reported as spent on climate etc.	71.4	64.8	83.7	72.8	95.1	201.2	235.3	251.3	513.9
% spent on climate and energy	98%	97%	84%	97%	95%	76%	92%	98%	100%
All revenues from auctioning are channelled to the Environment Fund (alongside other revenues) which is financing environmental projects that may or may not be directly related to climate objectives. The amounts reported as spent represent climate change and energy projects paid by the Environmental Fund.									
Romania (*)									
Revenues from auctioning	122.7	97.9	195.2	194	260.8	719.1	749.8	803.1	483.9
Reported as spent on climate etc.	91.2	97.9	195.2	194	0	160	42.7	165.9	226.6
% spent on climate and energy	74%	100%	100%	100%	0%	22%	6%	17%	47%
50% of revenues is earmarked for climate change and energy purposes and an additional 6% is earmarked for GHG reduction projects (and 15% goes to indirect carbon cost compensation and 29% to the general budget). Part of unspent revenues are carried over to later years.									
Slovakia									
Revenues from auctioning	61.7	57.6	84.5	65	87.1	229.9	244.7	242.1	276.2
Reported as spent on climate etc.	0.1	15.1	30	35.6	40.9	55.6	44.6	27.4	50.9
% spent on climate and energy	0%	26%	36%	55%	47%	24%	18%	11%	18%
All auctioning revenues are earmarked and go to the Environmental Fund, which also receives money from other sources. The values reported as spent represent the funding of climate change and energy projects known at the time of reporting. Part of unspent revenues are carried over to later years.									
Slovenia									
Revenues from auctioning	17.7	16.6	24.4	18.7	25.1	66.3	65.3	65.0	130.1
Reported as spent on climate etc.	4.6	4.0	12.6	25.2	5.4	14.2	40.8	40.4	79.9
% spent on climate and energy	100%	100%	100%	100%	100%	100%	100%	100%	100%

100% of the auctioning revenues are used for climate and energy projects. Some projects receive funding later than in the year in which the auctioning revenues were generated. About EUR 185 million in already received auction revenues will still be spent on climate and energy.

Spain (*)									
Revenues from auctioning	346.1	330.1	489.5	369.5	493.6	1306	1245.2	1240.3	2482.9
Reported as spent on climate etc.	346.1	370.2	387.8	390.8	445.5	788.6	1054.1	1081.5	2035.0
% spent on climate and energy	100%	>100%	79%	>100%	90%	60%	85%	87%	82%
Estimated revenues are earmarked for energy and climate project ahead of each year (up to a cap, which was EUR 500 million up to 2018 and EUR 1100 million after). The remainder goes to the general budget, part of which also funds climate projects, but are not included here (2013 spending includes phase 3 allowances auctioned in 2012).									
Sweden *									
Revenues from auctioning	35.7	34.4	52.4	38.6	51.5	136.3	128.5	127.9	222.2
Reported as spent on climate etc.	35.7	18.9	52.4	21.7	28.8	76.5	73.9	65	222.2
% spent on climate and energy	100%	55%	100%	56%	56%	56%	58%	51%	100%
Revenues are not earmarked, example projects have been reported for at least the minimum required spending on energy and climate.									

13. EXAMPLES OF FUNDING OF CLIMATE RELATED PROJECTS

Example 1: Stimulating investment

The Swedish Hydrogen Breakthrough Ironmaking Technology (HYBRIT) financed by the Innovation Fund, aims to create a fossil-free value chain for iron and steel production using fossil-free electricity and hydrogen. The HYBRIT technology involves replacing the blast furnace process, which typically uses coal and coke to remove the oxygen from iron ore, with a direct reduction process using green hydrogen.

Example 2: Stimulating investment

In the chemical industry, the Kairos@C project has received funding from the ETS Innovation Fund. This project aims to create the first and largest cross-border Carbon Capture and Storage (CCS) value chain to capture, liquefy, ship and permanently store CO₂ underground that would otherwise be emitted. This new technology and infrastructure will be located in the port of Antwerp and is expected to become the cornerstone of Belgium's decarbonisation roadmap.

Example 3: Just transition Fund, from plans to territories

Thanks to the first Just Transition Fund (JTF) Programme adopted by the Commission on 16 June 2022, Greece will mobilise a total investment of EUR 1.63 billion to alleviate the impact of the climate transition on the local economy and society. Greece has engaged in a complete de-lignitisation process by 2028 with a drastic reduction and complete removal of lignite from the electricity mix. The Greek programme, which will benefit from grants amounting to EUR 1.38 billion from the JTF, includes three TJTPs. These focus on the phase-out of lignite in Western Macedonia and in Megalopolis, and on the closure of fossil-fuel power stations in the islands of North Aegean, South Aegean and Crete.

Just over half of the funds will support entrepreneurship through the financing of existing and new enterprises, of business infrastructure, and of stronger links between companies and research and innovation. Another large part of the funds (20.4% of the total) will strengthen human resources and the skills of the workforce in the affected areas (skilling-upskilling-reskilling) and promote employment. The JTF support will also target energy transition, land use adaptation and the circular economy (i.e. energy upgrades, strengthening self-production through energy communities, renewable energy sources, e-mobility, and energy storage systems).

Example 4: New European Bauhaus

The New European Bauhaus initiative connects the European Green Deal to our daily lives and living spaces. It calls on all Europeans to imagine and build together a sustainable and inclusive future that is beautiful for our eyes, minds, and souls. By creating bridges between different backgrounds, cutting across disciplines, and building on participation at all levels, the New European Bauhaus inspires a movement to facilitate and steer the transformation of our societies along three inseparable values: sustainability, aesthetics, and inclusion.

From 9 to 12 June 2022, Brussels hosted the first Festival of the New European Bauhaus. Designed around three pillars, Forum, Fair and Fest, the Festival was built with the NEB community to showcase, celebrate, and develop the movement. Next to the rich programme in Brussels, the Festival is also spreading throughout Europe, with more than 200 co-created side events independently organised by partners.

Example 5: Sustainable land use activities in the Republic of Congo, in the framework of the Central African Forest Initiative (CAFI)

The Central African rainforest is the second largest in the world, with an area the size of Western Europe. It represents 30% of the vegetation cover of the African continent. The conservation and sustainable use of the Congo basin forest represents a major component of global climate action. In the Republic of Congo, the forest covers about two thirds of the national territory and stores the equivalent of 10 billion tonnes of carbon dioxide.

This project, funded under the new Neighbourhood, Development and International Cooperation Instrument (NDICI-Global Europe), aims to operationalize multi-sector, inclusive, concerted, and integrated spatial planning for land management, with a view to ensure sustainable management of natural resources and preserve the exceptional natural heritage of the Republic of the Congo, in accordance with reforms initiated under national legislation. Starting this year, the project will specifically contribute to (1) develop the production of deforestation-free and sustainable agricultural commodities, (2) reduce deforestation and forest degradation resulting from uncontrolled wood-energy supply to large urban centres, and (3) mobilise finance to develop renewable energy sources., e-mobility, and energy storage systems).

Example 6: Horizon Europe Mission for Adaptation to Climate Change

The Horizon Europe Mission for Adaptation to Climate Change engages actively with communities to meet their unique needs in accelerating adaptation. A key cross-cutting element is working with nature and with ecosystems to make cities, regions, coastlines, river basins, or forests more resilient.

The Mission also aims to deliver at least 75 large-scale demonstrators of systemic transformations on the ground. The knowledge and tools developed under the Mission's aegis and the insights from the funded projects will be made openly available, to support the scaling-up of adaptation solutions beyond the active partners.

To identify interested parties, the Mission launched a Mission Charter for regional and local authorities. Signatories declare their willingness to cooperate, mobilise resources and develop activities in their respective region and communities to reach their adaptation goals, and will receive targeted support via the Mission Implementation Platform. The first 118 regions and local authorities that will sign the Charter were announced on 7 June 2022 during the Mission Forum.

Example 7: Alliance for Zero-Emission Aviation

To prepare for the advent of hydrogen-powered and electric aircraft the Commission on 24 June 2022 launched the Alliance for Zero-Emission Aviation and invited actors from across aviation to join. The European aeronautical industry is working on a new generation of aircraft in the commuter, regional and medium-haul segments that will fly on hydrogen or battery-electric power, and these aircraft are expected to enter into service in the coming decade. The Alliance for Zero-Emission Aviation will pin-point what action needs to be taken where and by when. It will also help attract the required investments.

Example 9: TANGO project funded by the Innovation Fund

Located in Catania, the 3Sun factory is one of the largest solar panel production plants in Europe. It's the first of its kind in Europe to mass produce bifacial panels with heterojunction technology (HJT). Bifacial panels can capture sunlight from their back surface too, which means they are far more efficient than traditional ones because more clean energy is produced

without major additional cost. They are also stronger and last longer, which lowers the consumption of raw materials.

The TANGO project will be carried out by ENEL Green Power, one of the largest operators in the renewable energy sector in the world. TANGO aims to expand the 3Sun factory and turn it into the GigaFactory, the first European industrial-scale manufacturing plant for highly innovative solar panels. The production capacity will reach 3 GW per year. What does this mean in practice?

- 3 GW of panels can generate around 5,5 GWh of renewable electricity per year, roughly the annual consumption of two million Italian households.
- The panels produced during the project's first ten years of operation will avoid the equivalent of 25 million tonnes of CO₂, amounting to more than 30% of all GHG emissions from public electricity and heat production in Italy in 2019.

Additionally, the future GigaFactory will create around 1000 jobs by 2024.

Example 10: LIFE-IP PAF Wild Atlantic Nature project - Protecting and restoring Ireland's blanket bog

The project (2020-2028) aims to address the identified obstacles, gaps and shortcomings that currently prevent the full implementation of the Prioritised Action Framework (PAF) for Natura 2000 on 24 sites with respect to Ireland's blanket bogs in the Northern and Western Region covering an area of over 200 000 hectares. The overall status of conservation of the blanket bog has been declining mainly due to inappropriate agricultural practices, peat cutting, forestry plantations and invasive species. To address this trend, this project has facilitated the development of a Results-Based Agri-environment Payment Scheme in the Northwest of Ireland, involving c.750 farmers and over 40 agricultural advisors, to reward high quality peatland habitats and incentivise the improvement of poorer quality habitats. This approach forms the basis of the new Cooperation Approach of Ireland's CAP Strategic Plan, which will be rolled out to over 300 000 hectares from 2023.

Example 12: LIFE CLIMARK – Promoting sustainable forest management

Sustainable forest management is a key tool to maintain and enhance the mitigation capacity of forests. The LIFE CLIMARK project (2016-2022), located in Catalonia (Spain) and replicated in Veneto (Italy), designed a local market of 'climatic credits' to promote multifunctional forest management in a rural abandonment context. Climatic credits are defined by assessing the impact of locally identified forestry practices on climate mitigation, water flow regulation and biodiversity. CLIMARK applied climatic credits on almost 88 hectares of diverse Mediterranean forest typologies and developed tools to facilitate their replication in other European regions.

Example 13: LIFE HEATLAND – An innovative pavement to mitigate the urban heat island effect

LIFE HEATLAND (2017-2021) demonstrated the effectiveness of an innovative cool pavement technology that increases the resilience to climate change in urban areas by reducing the urban heat island (UHI) effect. The cool pavement was installed in an urban area of Murcia, reducing the ambient temperature by 1.5°C and the surface temperature of the pavement by 7-11°C. In addition, this technology helped reduce the noise level and energy consumption for street lighting thanks to its higher reflection properties. In November 2021, the Barcelona City Council decided to join this initiative, carrying out an additional test of the cool pavement.

Example 14: LIFE PASTORALP – Making alpine pasture agriculture resilient to climate change

LIFE PASTORALP (2017-2022) aimed to reduce the vulnerability and increase the resilience of alpine pasture agriculture in the areas of the Parc National des Ecrins in France and the Parco Nazionale Gran Paradiso in Italy by assessing and testing adaptation measures, increasing capacity building and developing improved management strategies for climate change adaptation. PASTORALP deployed platform tools to facilitate the adoption of adaptation strategies in the Western Alps and their replication in other pastoral areas, including maps of pastoral resources, data on the impact of climate change and monitoring of biodiversity. Moreover, two pastoral areas, purchased by the Gran Paradiso National Park, will be used to demonstrate management strategies against climate change. Policy recommendations could also contribute to the definition of eco-schemes in the future common agricultural policy (CAP).

Example 15: LIFE Retradeables - Recover, Recycle and Re-use of F-gases

LIFE Retradeables (2020-2023) aims to create an innovative circular economy ecosystem for F-gases to reduce industry emissions and increase F-gas compliance and safety. The project is developing a self-certification platform, with reliable F-gas declarations for composition/recovery/recycling and establishing a new market for recycled F-gases in Europe, where gas distributors offer transparent and reliable trades for recovered F-gases in real time onsite. By fostering the use of high-quality, cost-efficient recycled F-gases and providing an accurate database of information for regulation compliance, LIFE Retradeables offers an easy and secure solution to put recovered F-gases back on to the market. The project includes activities to support EU companies to identify reclamation opportunities, raise awareness and improve industry knowledge about the development of effective climate change mitigation.

Example 16: Examples of measures with fulfilled milestones and targets

- France has put in place investments to support energy-efficiency renovation and major rehabilitation of private and social housing.
- Italy introduced new legislation to promote biomethane production and consumption.
- Spain introduced a reform to set up an enabling framework for the integration of renewables into the energy system: networks, storage and infrastructure.
- Portugal approved a reform supporting the implementation of the Innovation Agenda for Agriculture 2030, targeting R&I to the needs of the agricultural sector, food and agro-industry, and has opened a first call for tender on investments to support the decarbonisation of industry.
- Greece passed a reform to set up a framework for the installation and operation of charging infrastructure for electric vehicles.
- Croatia adopted programmes for energy efficiency of buildings and to reduce energy poverty, introduced an Energy Efficiency Programme for decarbonising the energy sector and adopted the Alternative Fuels for Transport Act.
- Romania demonstrated that a first target of 1695MW of coal/lignite-fired installed electricity production capacity have been decommissioned, as part of the replacement of coal in the national energy mix.

Example 17: Horizon Europe FIREURISK

The Horizon Europe FIREURISK project (2021-2025) is working on improving our understanding of the vulnerability and resilience of European communities and countries against the increasing wildfire risk conditions. Such risks comprise human casualties, cultural and economic losses, social disruption, major infrastructure damage, and deterioration of natural capital and biodiversity. The main objective of FIREURISK is therefore to develop, test, and disseminate an integrated, science-based strategy for wildfire risk management in Europe.