How to Raise Europe's Climate Ambitions for 2030

Implementing a -55% Target
in EU Policy Architecture

IMPULSE

Agora
Energiewende

Öko-Institut e.V.
Institut für angewandte Ökologie
Institute for Applied Ecology

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Preface

Dear reader,

The 26th UN Climate Change Conference of the Parties (COP26), rescheduled to take place in Glasgow on 1–12 November 2021, will be a crucial moment for the Paris Agreement. In applying the accord's 'review and ratcheting up' procedure for the first time, the conference will show whether the climate treaty can deliver stronger climate action to close the current gap on the way to keeping global warming 'well below 2 degrees'. To ensure the success of the agreement, the EU must make a substantial contribution to increasing climate action by raising its outdated climate target framework.

The European Commission has announced that by September 2020 it will present a comprehensive plan for increasing the EU's GHG emissions reduction targets for 2030 to at least 50 per cent and well on the way to 55 per cent relative to 1990 levels. This report, written together with the Öko-Institut, explores the question of 'How?' by mapping options for implementing a -55 per cent target in the EU's policy architecture.

I hope you find this report informative and stimulating.

Patrick Graichen,
Executive Director, Agora Energiewende

Key conclusions:

1. **An economy-wide -55 per cent GHG 2030 target is technically and economically feasible.** Technically feasible emissions reductions compatible with the 55 per cent target (relative to 1990) for the EU-27 range from 45 per cent to 49 per cent for the non-ETS sectors and from 59 to 63 per cent for the ETS sectors (both relative to 2005). Our central scenario of -47 per cent for non-ETS sectors and -61 per cent for ETS sectors represents a reasonable balance.

2. **Delivering a climate target of -55 per cent is possible with a mix of additional domestic and EU measures.** Adopting additional policy measures at the Member State level, enhanced EU-wide policies and measures and a reform of the EU-ETS are the key elements in achieving a higher target. Some Member States have already set climate goals or measures that are broadly in line with higher climate ambition in the non-ETS sectors.

3. **There are many flexibility options that allow Member States to deliver higher climate ambition targets in the effort-sharing sectors.** These include the trading of AEAs between Member States, enhanced land-use change and afforestation, greater use of ETS allowances and the inclusion of parts of the effort-sharing sectors in the EU ETS. Some of the flexibility options depend to a great extent on early action by Member States in delivering emissions reductions, which is why quick reform proposals are needed.

4. **A -55 per cent target will require changes to the current climate policy architecture and dedicated solidarity mechanisms.** Member States with below-average GDP per-capita levels will need to make greater contributions than is currently the case; otherwise there will be no credible pathway to climate neutrality by 2050. These additional efforts should be supported by dedicated solidarity mechanisms both within the Effort Sharing Regulation and in the upcoming EU budgets.

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Summary

As signatories of the Paris Agreement, the Member States of the EU have pledged to limit global warming to "well below 2 degrees" to avoid triggering dangerous tipping points in the climate system. When it comes to global warming, every tenth of a degree counts. There is broad agreement that achieving this goal will require that the European Union become climate-neutral by no later than 2050. This objective was endorsed by the European Council in December 2019.

Since the Paris climate action pledges do not add up to a well-below-2-degrees pathway – currently they would lead to 3 degrees of global warming – the signatories have committed to a binding "review and ratcheting up" procedure to take place every five years, starting at the COP 26 in Glasgow. It requires that the 188 parties to the agreement review their national contributions for limiting global warming and set more ambitious targets as needed. The first review and ratcheting-up process will represent a crucial test for the Paris Agreement. The outcome will show whether the climate treaty can really deliver.

The EU's current 2030 target of reducing domestic greenhouse gas emissions by 40 per cent relative to 1990 dates back to a decision by EU heads of state in October of 2014, more than a year before the Paris climate summit. The EU's main climate change laws for 2030 (the Emissions Trading System and the Effort Sharing Regulation for emissions outside the ETS) were calibrated using this target. If the EU wants to reach climate neutrality by 2050, it must move further and faster now to avoid doubling or tripling annual reductions in the years after 2030.

On 4 March 2020, the European Commission proposed a Climate Law setting out a legal framework to steer the EU-27 towards the 2050 greenhouse gas-neutrality target. The Commission also announced that by September 2020 it will present a comprehensive plan for increasing the EU's 2030 climate target to at least 50 per cent and towards 55 per cent compared with 1990 levels. This plan will be underpinned by a comprehensive assessment of the costs and benefits of different policy choices.

The Commission's comprehensive plan will be the focus of an intense political debate by parliaments, governments and stakeholders throughout Europe. The Commission will then propose by summer 2021 revisions to all relevant EU policy instruments necessary to deliver the additional reductions of greenhouse gas emissions by 2030.

This report explores options for increasing the EU's 2030 climate ambition to -55 per cent economy-wide. What are sensible adjustments to the EU's climate policy architecture? What are the respective roles of the EU Emissions Trading System and of national emission reduction targets for sectors outside the ETS (transport, buildings, agriculture, waste, parts of industry)? What options exist for EU Member States to achieve faster and deeper cuts in emissions by 2030?

Chapter 2 describes the existing climate target framework for the European Union and provides an assessment of historical emissions reductions for both the EU-28 and the EU-27 (post-Brexit).

Chapter 3 sketches the level of freedom and flexibility for adjusting the EU's climate policy architecture based on a -55 per cent target for the EU-27. Most importantly, we identify a central case for emission reductions on the basis of technical, infrastructure, and capital stock inertia as well as on the availability of key technologies and transformative options such as hydrogen. The central case requires reduction of emissions by 2030 in the EU ETS of 61 per cent below 2005 levels and in non-ETS sectors of 47 per cent.

Chapter 4 describes why the historic approach for distributing national effort-sharing targets among Member States' per capita GDP is no longer fit for purpose under higher ambition levels. It also suggests new approaches for distributing the enhanced 2030 ESR target across Member States that would reduce the spread between poorer and richer countries and link the 2030 target with the 2050 trajectory.

Chapter 5 discusses how to ensure fairness and solidarity in achieving higher ESR targets, given that a new distribution of Member State targets would require relatively higher contributions from Member States with below average GDP per capita-levels compared to the current distribution. The section presents two potential solidarity mechanisms: one within the Effort Sharing Regulation itself, the other as part of ongoing budget negotiations.

Chapter 6 reviews where Member States stand today with regard to setting and planning national targets, policies and measures. NECPs and scenario projections show that Member States are already committed in the aggregate to climate ambition that goes beyond the currently agreed EU-level target in sectors covered by the Effort Sharing Regulation. However, they would need to adopt significant additional policy measures to meet a higher 2030 climate target.

Chapter 7 maps three clusters of policy options for delivering higher emission reductions in the non-ETS sectors: a) delivering existing targets and legislation, b) adopting additional policy measures at member state level and c) enhanced EU-wide policies and measures. It also identifies three options for increasing national flexibility under the Effort Sharing Regulation that could enable Member States to increase their climate ambition (market-based mechanisms, LULUCF, ETS allowances).

Chapter 8 assesses the implications of a -55 per cent target for reforming the EU Emissions Trading System.

As part of the options presented, it also discusses ways of including new sectors (in particular transport and buildings) in the EU ETS.

Based on our analysis in this report, we draw the following conclusions:

1. An economy-wide -55 per cent GHG 2030 target is technically and economically feasible to implement. Technically feasible emissions reductions compatible with the 55 per cent target range from 45 per cent to 49 per cent for the non-ETS sectors and from 59 to 63 per cent in the ETS sectors (both relative to 2005). Our central scenario of -47 per cent for the non-ETS sectors and -61 per cent for the ETS-sectors represents a reasonable balance.

2. Delivering a climate target of -55 per cent can be made possible by a mix of additional domestic and EU measures. Adopting additional policy measures at the Member State level, enhanced EU-wide policies and measures, and a reform of the EU-ETS are key elements in delivering a higher target.

3. Member States are gradually aligning with the -55 per cent climate target. Some EU Member States have already made political commitments to achieving greenhouse gas neutrality economy-wide well before 2050 (FI, AT, SE). Others have set national 2030 targets that are broadly in line with higher climate ambition for non-ETS sectors proposed here (DK, ES, FI, LU, PT, SE).

4. There are many flexibility options for Member States to deliver the higher climate ambition target in the effort-sharing sectors. These include trading AEAs between Member States, enhanced land use change and afforestation, making greater use of ETS allowances and even including parts of the effort-sharing sectors in the EU ETS. Some of these flexibility options depend to a great extent on early action by Member States in delivering emissions reductions, which is why quick reform proposals are needed.

5. A -55 per cent target will require changes to the current climate policy architecture and dedicated solidarity mechanisms. Member States with below-average GDP per capita will need to make relatively higher contributions than is currently the case, as there is otherwise no credible pathway to climate neutrality by 2050. These additional efforts should be supported by dedicated solidarity mechanisms, both within the Effort Sharing Regulation and in the upcoming EU budgets.

1 Introduction

As signatories of the Paris Agreement, the Member States of the EU have pledged to limit global warming to "well below 2 degrees" to avoid triggering dangerous tipping points in the climate system. When it comes to global warming, every tenth of a degree counts. There is broad agreement that achieving this goal will require that the European Union become climate-neutral by no later than 2050. This objective was endorsed by the European Council in December 2019.

Since the Paris climate action pledges do not add up to a well-below-2-degrees pathway – currently they would lead to 3 degrees of global warming – the signatories have committed to a binding "review and ratcheting up" procedure to take place every five years, starting at the COP 26 in Glasgow. It requires that the 188 parties to the agreement review their national contributions for limiting global warming and set more ambitious targets as needed. The first review and ratcheting-up process will represent a crucial test for the Paris Agreement. The outcome will show whether the climate treaty can really deliver.

The EU's current 2030 target of reducing domestic greenhouse gas emissions by 40 per cent relative to 1990 dates back to a decision by EU heads of state in October of 2014, more than a year before the Paris climate summit. The EU's main climate change laws for 2030 (the Emissions Trading System and the Effort Sharing Regulation for emissions outside the ETS) were calibrated using this target. If the EU wants to reach climate neutrality by 2050, it must move further and faster now to avoid doubling or tripling annual reductions in the years after 2030.

On 4 March 2020, the European Commission proposed a Climate Law setting out a legal framework to steer the EU-27 towards the 2050 greenhouse gas-neutrality target. The Commission also announced that by September 2020 it will present a comprehensive plan for increasing the EU's 2030 climate target to at least 50 per cent and towards 55 per cent compared with 1990 levels. This plan will be underpinned by a comprehensive assessment of the costs and benefits of different policy choices.

The Commission's comprehensive plan will be the focus of an intense political debate by parliaments, governments and stakeholders throughout Europe. The Commission will then propose by summer 2021 revisions to all relevant EU policy instruments necessary to deliver the additional reductions of greenhouse gas emissions by 2030.

This report explores options for increasing the EU's 2030 climate ambition to -55 per cent economy-wide. What are sensible adjustments to the EU's climate policy architecture? What are the respective roles of the EU Emissions Trading System and of national emission reduction targets for sectors outside the ETS (transport, buildings, agriculture, waste, parts of industry)? What options exist for EU Member States to achieve faster and deeper cuts in emissions by 2030?

2 The climate targets of the European Union

The European Union's international and internal climate policy commitments for the period from 2021 to 2030 are based on a complex structure:

1. Under the Paris Agreement the EU has submitted a Nationally Determined Contribution (NDC) including a greenhouse gas emission reduction target based on the following elements:

→ The base year for the commitment is 1990.

→ The scope of the emission reduction targets includes all greenhouse gas emissions from energy (CRF category 1), industrial processes and product use (CRF category 2), agriculture (CRF category 3), waste (CRF category 5) as well as emissions from international aviation (reported as a memo item under the UNFCCC); it does not include emissions from international navigation (reported as a memo item under the UNFCCC).

→ The approach for including land use, land use change and forestry (LULUCF, CRF category 4) in the commitment has not yet been formally submitted under the international framework of the UNFCCC.

→ Domestic greenhouse gas emissions must be reduced to a level of at least 40 per cent below the base-year emissions.

2. This international commitment has been translated into an internal EU commitment structure:

→ The CO_2 emissions from energy-intensive industries as well as N_2O emissions from specific industrial processes and CO_2 emissions from EU-internal aviation are regulated by the European Union Emissions Trading System (EU ETS). It sets an aggregate target for all EU Member States (and other linked countries) that is based on a continually decreasing linear reduction factor. Currently, the factor leads to a EU cap in 2030 that is 43 per cent below 2005 emissions levels (-44 per cent for stationary installations and -27 per cent for EU-internal aviation). The cap does not translate directly into 2030 emissions levels:

- With a view to the unlimited banking in the EU ETS, emissions in 2030 could be higher than the cap mentioned above in the case of surplus allowances issued in previous years. In addition, operators can borrow allowances from 2031 for compliance in 2030.
- The Market Stability Reserve (MSR), which absorbs parts of the surplus allowances and cancels a share of it, could partly offset the effects of surplus banking;
- Additional allowance cancellations by the Member States as a complementary measure for coal phase-out policies etc. as well as allowance cancellations by a few eligible Member States for compliance under the Effort Sharing Regulation could further decrease the amount of emission allowances;

→ Greenhouse gas emissions from all other sources, except aviation, international shipping and LULUCF, are regulated by the commitment system established by the Effort Sharing Regulation (ESR) which aims at an emissions reduction of 30 per cent below 2005 emission levels for the EU-28. It also establishes linear emission reduction trajectories for all EU Member States from 2021 to 2030 with emission target levels ranging from 0 to -40 per cent relative to 2005, depending on economic strength measured by Gross Domestic Product (GDP) per capita. Again, these targets do not directly translate into 2030 emission levels:

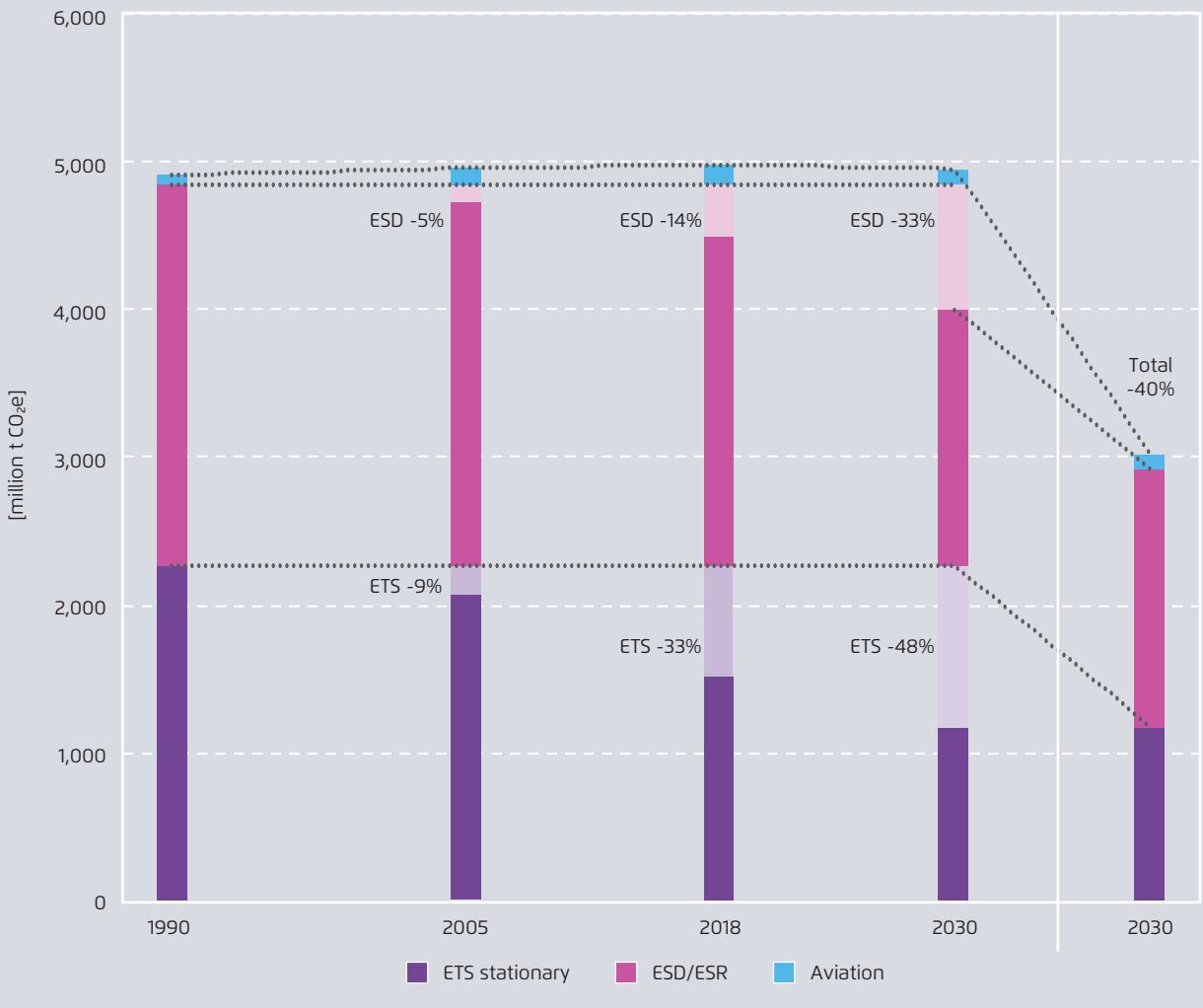
- Due to the high ambition level of the UK under the ESR (-37 per cent) the existing member state targets under the ESR amount only to an emission reduction of the ESR-regulated GHG emissions of approx. 29 per cent. (The remaining gap in the 30 per cent target for EU-27 is approx. 30 Mt CO_2eq.)
- All Member States can bank or borrow emission allowances within certain limits. (The AEAs technically implement the emission reduction trajectory.)

- All Member States can buy or sell AEAs to or from other Member States.
- Certain Member States can cancel emission allowances from the EU ETS to meet their annual ESR targets within certain limits (not exceeding 100 million allowances EU-wide for the entire 2021–2030 period).
- All Member States can use credits from LULUCF within certain limits (not exceeding 280 million credits EU-wide for the entire 2021–2030 period) and only in specific circumstances.

→ The LULUCF regulation for greenhouse gas sources and sinks from land use requires that Member States ensure that accounted greenhouse gas emissions from LULUCF are offset by at least the equivalent removal of CO_2 from the atmosphere in the 2021–2030 period ("no debit rule").

→ The greenhouse gas emissions from international aviation remain unregulated as long as they are not effectively covered by the EU ETS or any other mechanism.

Historical emissions and the recent target architecture for the EU-27, 1990–2030 Figure 1



Calculations by Öko-Institut e.V. based on EEA (2019c)

3. As a companion strategy for greenhouse gas emission reduction commitments, the EU has set itself additional binding targets for energy efficiency and renewable energies that contribute significantly to overall greenhouse gas emission reduction objectives:

→ The binding energy efficiency target, to be achieved collectively across the EU, is set by the Energy Efficiency Directive and requires a reduction of primary energy consumption by at least 32.5 per cent relative to the 2007 modelling projections for 2030. For the EU-28, primary energy consumption must not exceed 1,273 million tons of oil equivalents (mtoe) in 2030 and the corresponding final energy consumption must not exceed 956 mtoe.

→ The binding target for the use of energy from renewable sources is set by the Renewables Directive and requires that EU Member States collectively increase the share of energy from renewable sources in gross final energy consumption to at least 32 per cent by 2030.

The existing commitment framework for reducing greenhouse gas emissions targets only domestic emissions reductions (Figure 1). The use of international credits, based on Article 6 of the Paris Agreement, is currently foreseen neither in the overall EU targets nor in the compliance of national targets for internal EU mechanisms.

The EU climate policy architecture was developed originally for the EU-28, including the UK. With a view on the progress of EU climate policy to date, the UK's leaving of the EU leads to the following changes for the EU-27:

- The overall greenhouse gas emission reduction (with international aviation) from 1990 to 2018 decreases from 23 per cent (EU-28) to 21 per cent (EU-27).
- The greenhouse gas emission reduction from the energy sector decreases from 36 per cent to 31 per cent.
- Greenhouse gas emissions from transport (w/o) aviation from 1990 to 2018 increases by 24 per cent for the EU-27 and only by 20 per cent for the EU-28.
- Greenhouse gas emissions from industrial process decreases by 23 per cent for the EU-27 and by 28 per cent for the EU-28.

Meeting the emission reduction targets for 2030 will therefore require a greater emission reduction effort for the remaining 27 EU Member States than would have been the case in the EU-28.

3 Pathways towards a 55 per cent reduction of emissions

Greenhouse gas emissions from the EU-27 Member States (including total aviation) decreased by 21 per cent from 1990 to 2018. Most of the emission reductions came from the energy industries (almost half the total), industry (approx. 30 per cent), and the residential and commercial sectors (nearly 20 per cent). By contrast, greenhouse gas emissions in the transport sector (including aviation) have actually significantly increased since 1990.

→ Since 2005, the start year for the EU ETS emissions reduction target, emissions regulated by the EU ETS decreased by 26 per cent. These GHG emissions reductions were significantly but not exclusively driven by changes in the energy sector.
→ Since 2005, the base year for the ESR commitments, emissions decreased by 9 per cent in total, resulting from nearly stagnating emissions in the transport and agriculture sectors on the one hand and significant emission reductions for the residential and commercial sectors and for waste management on the other.

To sketch the level of freedom and flexibility for the adjustment of the EU's climate policy architecture, we analysed two scenario marking the window of possible emissions abatement patterns (Figure 2).

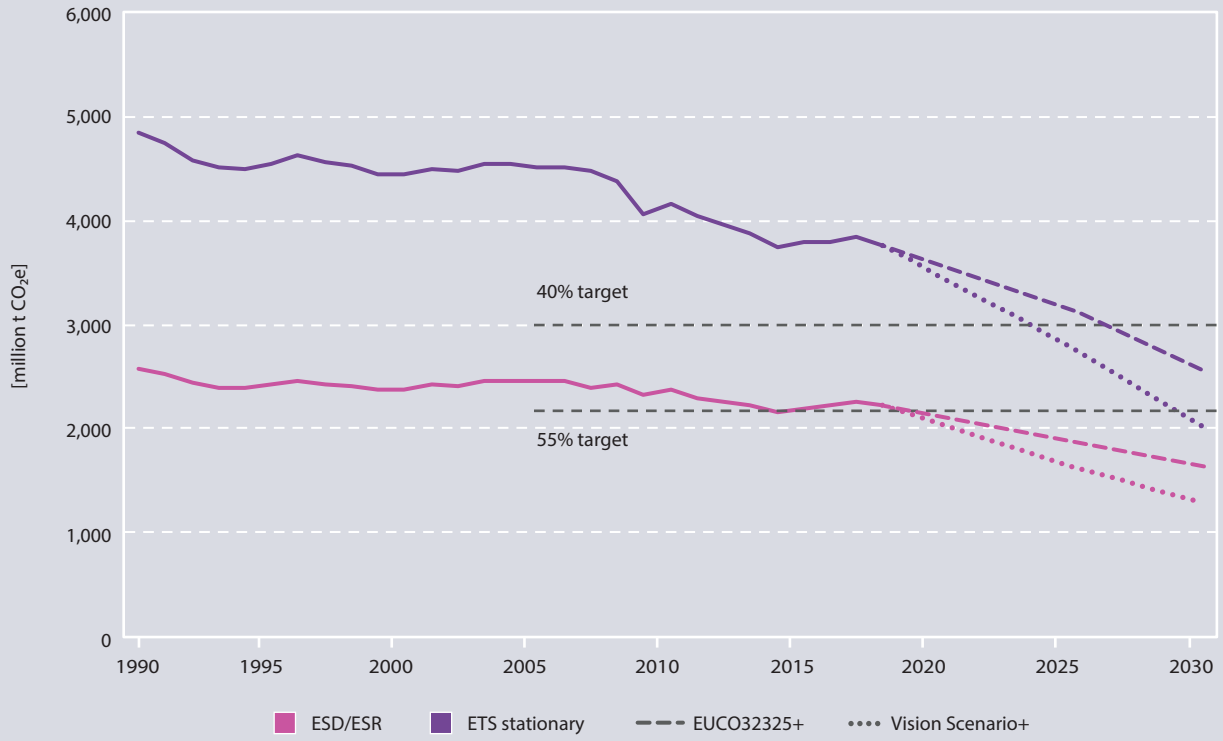
→ The lower bound of feasible emissions reductions is marked by the Euco32325 scenario exercise (EC 2019a), which presents a numerical analysis of the impact of the recent energy target framework with regard to renewable energy and energy efficiency. This scenario was updated for this study to cover the EU-27 and reflect the coal phase-out policies for seven EU Member States (Denmark, Germany, Greece, Ireland, Italy, The Netherlands, and Spain), which were not fully reflected in the Euco32325 scenario as of 2019. In the scenario,
  - the total greenhouse gas emission reduction for the period from 1990 to 2030 amounts to approx. 44 per cent;
  - the greenhouse gas emissions from stationary installations regulated by the EU ETS decrease by 54 per cent from 2005 to 2030; and
  - the greenhouse gas emissions from sources that are covered by the ESR decrease by 32 per cent from 2005 to 2030.

→ The upper bound of emission reductions that could be feasible in light of limits regarding infrastructure, capital stock, and the availability of key technologies and transformative options such as hydrogen is described by the Vision Scenario (Öko-Institut 2018), which was updated for the EU-27 and the latest developments in the power sector. With regards to EU targets these limits are as follows:
  - total greenhouse gas emissions reduction for the period from 1990 to 2030 amounts to approx. 57 per cent;
  - greenhouse gas emissions from stationary installations regulated by the EU ETS-decrease by 63 per cent from 2005 to 2030; and
  - greenhouse gas emissions from sources that are covered by the ESR decrease by 49 per cent from 2005 to 2030.

Based on this upper bound, we estimate that the technically feasible emissions reductions compatible with the 55 per cent target range between a target combination of 45 per cent for non-ETS sectors and 63 per cent in ETS sectors (both relative to 2005) and a target combination of 49 per cent for non-ETS sectors and 59 per cent in ETS sectors.

Historical ESD/ESR and stationary ETS emissions, and the range of recent projections for the EU-27, 1990–2030

Figure 2



Calculations by Öko-Institut based on EEA (2020), EC (2019a) and Öko-Institut (2018)

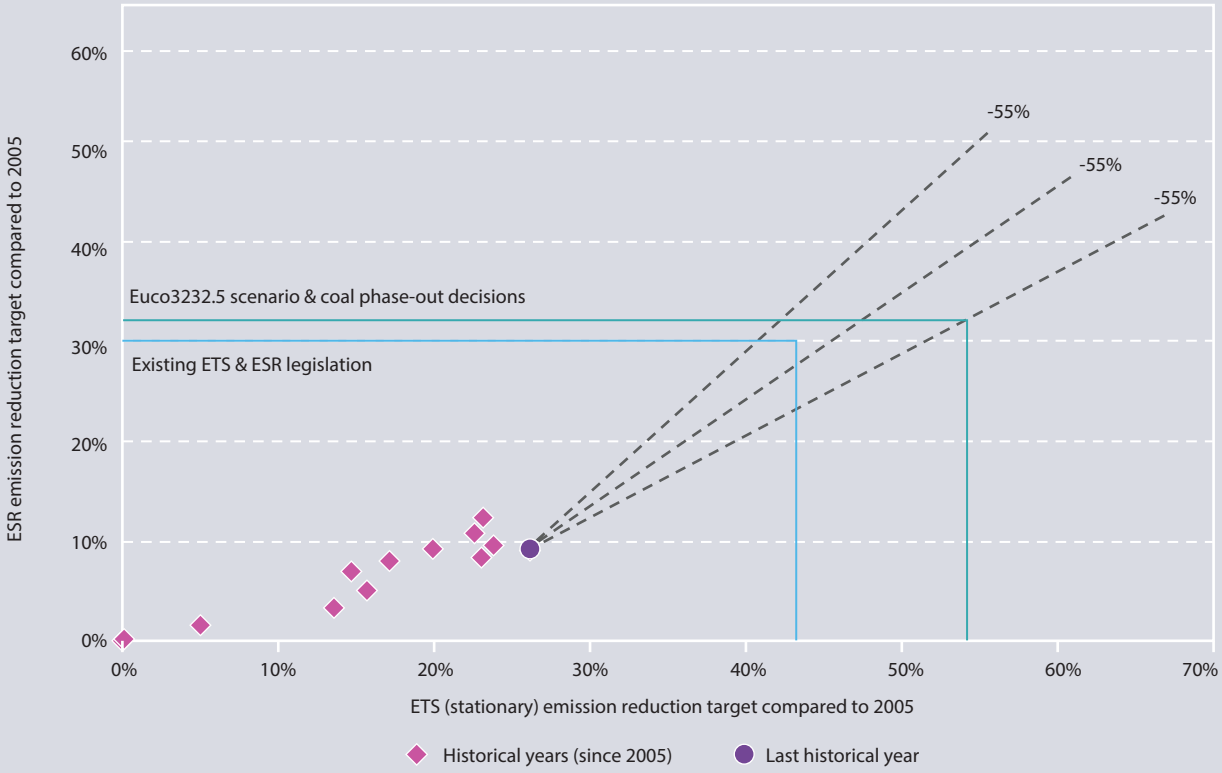
Against this background we identified a central case for the emission reduction patterns in the framework of an overall greenhouse gas emission reduction target of 55 per cent for the EU-27 over the 1990– 2030 period. This central case is based on comprehensive analysis using Öko-Institut's EU Ambition Calculator and reflects the complex commitment structure described in chapter 2 (Figure 3). In our central case,

- → the total emission reduction by 2030 (including total aviation) is 55 per cent below the 1990 level;
- → the EU ETS cap for stationary installations is 61 per cent below the 2005 emissions regulated by the EU ETS in 2005 (adjusted for EU ETS scope changes);
- → the target for ESR-regulated emissions is 47 per cent below the base level of 2005; and
- → the cap adjustment mechanism for the aviation cap under the EU ETS remain unchanged.

In this central case the additional emission reduction effort relative to the lower-bound baseline scenario (Euco32325) is more significant for the ESR-regulated greenhouse gas emissions (-48 per cent in the Vision Scenario for 2005/2030 versus 33 per cent in the Euco32325 scenario) than for the stationary installations covered by the EU ETS (64 per cent versus 54 per cent). This reflects the significant emissions reductions in EU ETS sectors expected in the Euco32325 scenario due to the implementation of the "Clean Energy for All Europeans" Package, especially with regard to increased renewable power generation.

The NDC commitment of 55% and the patterns for ESR and ETS targets in view of historical trends and the current policy framework

Figure 3



Calculations by Öko-Institut e.V. (2020)

Figure 3 shows that other ambition level patterns for ETS- and the ESR-regulated greenhouse gas emissions would theoretically be conceivable while reaching or exceeding the limits of conceivable developments for either the ESR or the ETS segment of EU climate policy architecture.

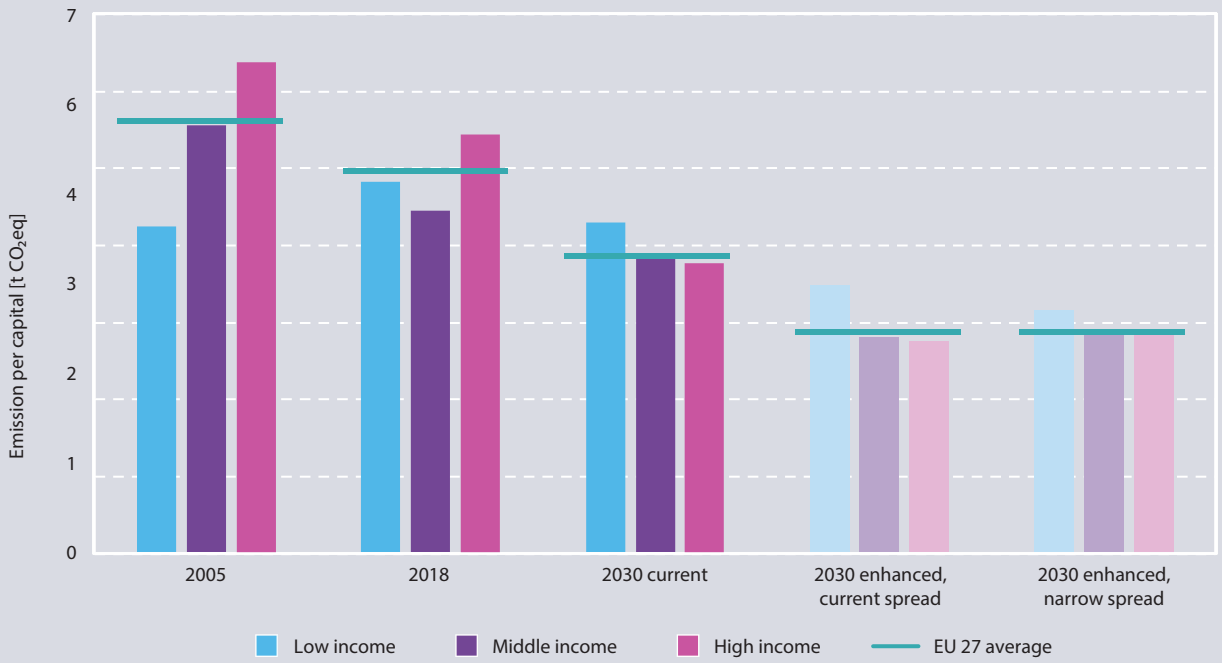
4 Raising ambitions in the Effort Sharing Regulation

As discussed above, the 2030 target for the sectors covered by the Effort Sharing legislation will need to be increased to achieve an overall reduction of 55 per cent relative to 1990 levels. Depending on the political and economic choices for the contribution of the ETS, the new 2030 ESR target will need to be in the range of 45 per cent to 49 per cent below 2005 levels. The ESR target will be achieved through collective action with each Member State contributing to the required mitigation. Both the targets for 2020 and the targets for 2030 were distributed according to the relative wealth measured in the GDP per capita for each Member State. The poorest country – Bulgaria in each case – received the lowest target whereas Luxembourg, the wealthiest country in each case, and second-wealthiest (Ireland and Sweden, respectively), received the highest reduction target. All other countries were located between the two points by GDP per capita. For both periods the spread between the poorest and richest Member States was 40 percentage points. By 2020, Bulgaria had to increase emissions by up to 20 per cent relative to 2005 levels whereas Luxembourg and Ireland needed to reduce emission by -20 per cent. For the period through 2030 Bulgaria needs to stabilize emissions at 2005 levels, while Luxembourg and Sweden need to reduce emissions by 40 per cent. This approach was chosen because per capita emissions in the poorer countries were lower and to show solidarity between all Member States.

Going forward to 2050 this approach for ESR targets needs modifying. To achieve climate neutrality all Member States need to stop using fossil fuels and reduce emissions from industrial processes, agriculture and waste as much as possible. There cannot be a distinction between the targets of wealthier and poorer countries; the capacity for natural and technical sinks will be required to offset remaining emissions. This message is reinforced by the development of per capita ESR emissions since 2005 (Figure 4). In 2005 the poorer countries with a GDP per capita below 60 per cent of the EU average had lower per capita emissions from ESR sectors than the richer Western European nations. Under current targets, this picture changes by 2030. Most of the poorer Member States will have higher per capita emissions than the EU average. This will make the transition after 2030 more challenging: instead of a gradual increase of reduction efforts, more drastic changes will be required to meet the 2050 target. Distributing the enhanced targets for Member States using the current spread of 40 percentage points between poorer and richer countries would only exacerbate the situation. The proposed distribution of the enhanced target using a narrowed spread of 30 percentage points (see below) would greatly reduce the difference in per capita emissions between Member States in 2030.

Table (1, page 25) shows the per capita emissions by Member State. Clearly, the 2030 enhanced target scenario with the current spread between countries (with Bulgaria and Luxembourg at the extremes), would lead to much higher per capita emissions in the low income Member States.

Per capita ESR emissions by income bracket, 2005–2030 Figure 4



Notes: High income countries have a GDP per capita above the EU-27 average; middle income countries, between 60% and 100%; and low income countries, below 60%. In the "wide spread" scenario, the poorest Member State has an ESR target of 15%; the richest, 55%. In the narrow-spread scenario, the poorest would receive a target of 25%; the richest, 55%.

Calculations by Öko-Institut e.V. based on EEA (2020), Eurostat (2020)

Per capita ESR emissions by Member State, 2005–2030 Table 1

		GDP/cap	2005	2018	2030 current targets	2030 enhanced targets current spread	2030 enhanced targets narrow spread
		[% of EU 27]	[t CO_2eq/capita]			[t CO_2eq/capita]	
low income countries	Bulgaria	23%	3,4	3,8	3,4	2,9	2,4
	Romania	30%	3,7	3,9	4,2	3,4	2,8
	Croatia	42%	4,1	4,1	4,2	3,4	2,9
	Latvia	43%	3,8	4,8	4,7	3,7	3,1
	Hungary	44%	4,5	4,4	4,6	3,7	3,3
	Poland	44%	4,8	5,8	4,5	3,6	3,2
	Lithuania	46%	3,4	5,0	4,7	3,8	3,2
	Estonia	54%	4,7	4,9	3,6	2,9	2,7
	Slovakia	55%	4,1	4,0	3,7	2,9	2,7
middle income countries	Czechia	63%	6,1	6,1	4,9	3,7	3,6
	Greece	64%	5,7	4,1	5,1	3,9	3,5
	Portugal	64%	4,5	3,9	4,0	3,1	2,8
	Slovenia	71%	5,9	5,3	4,8	3,4	3,4
	Malta	77%	2,3	3,3	1,5	1,1	1,4
	Cyprus	84%	5,8	4,7	3,3	2,4	2,6
	Spain	90%	5,5	4,2	3,6	2,5	2,6
	Italy	97%	5,7	4,5	3,7	2,7	2,8
Ø	**EU-27**	**100%**	**5,7**	**5,0**	**3,9**	**2,9**	**2,9**
high income countries	France	120%	6,3	5,1	3,6	2,7	2,9
	Belgium	129%	7,5	6,3	4,4	3,2	3,4
	Germany	131%	5,8	5,4	3,5	2,6	2,8
	Finland	132%	6,5	5,4	3,8	2,8	3,0
	Austria	137%	6,9	5,8	4,0	2,9	3,1
	Netherlands	151%	7,6	5,9	4,6	3,3	3,5
	Sweden	159%	4,7	3,3	2,3	1,8	2,1
	Denmark	172%	7,3	5,7	4,1	3,1	3,3
	Ireland	209%	11,3	9,2	6,0	3,8	4,3
	Luxembourg	305%	21,9	15,7	8,8	6,6	7,9

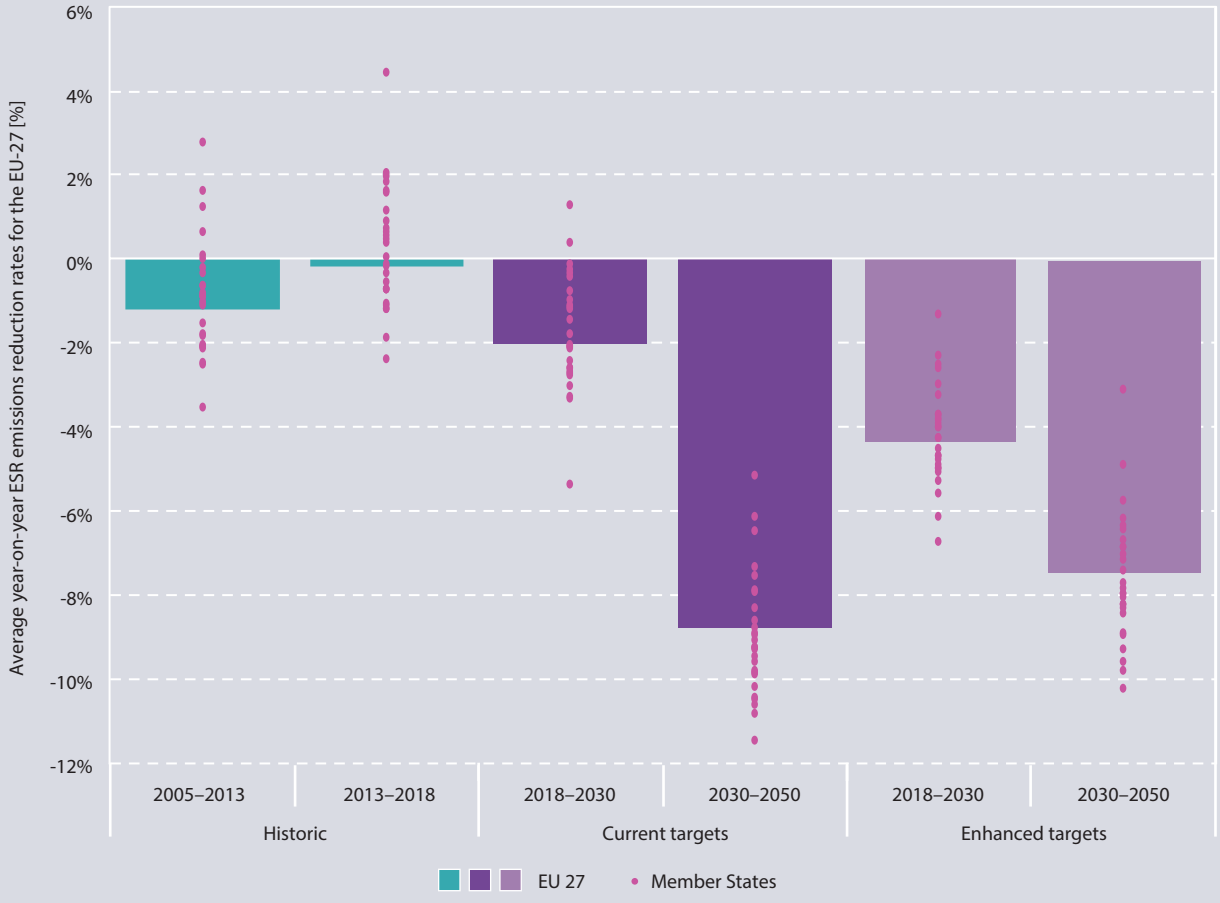
Notes: the colours show the relative per capita emissions for each column the country with the lowest emissions (Malta) in green and the two countries with the highest emissions (Ireland, Luxembourg) in pink. The EU average value is white.

Calculations by Öko-Institut e.V. based on EEA (2020), Eurostat (2020)

The same point applies when considering the historic annual emission reduction rates and the rates required to meet the 2030 and 2050 targets (Fig 5). EU 27 ESR emissions need to decrease by 2 per cent per year between 2018 and 2030 to meet the current target. All Member States with above-average GDP per capita have a target that requires higher annual reductions, but only four out of the 17 poorer Member States do. The figure also shows why achieving the climate neutrality target without greater ambitions for 2030 will be very challenging: it would require EU-wide annual emission reductions of 8.8 per cent for each year between 2030 and 2050.[1] With the enhanced target, the reduction rate increases to 4.4 per cent until 2030. Between 2030 and 2050, annual reductions of 7.5 per cent would be required to achieve climate neutrality.

1 2050 ESR targets by Member State are based on the Vision Scenario (Öko-Institut 2018). In this scenario emissions from agriculture need to be reduced by 43 per cent relative to 2005; from waste and other areas, by 85 per cent; and from industry, by 93 per cent. All energy-related emissions are reduced by almost 100 per cent. These reduction values were applied to the 2005 ESR emissions of each Member State to calculate national 2050 targets.

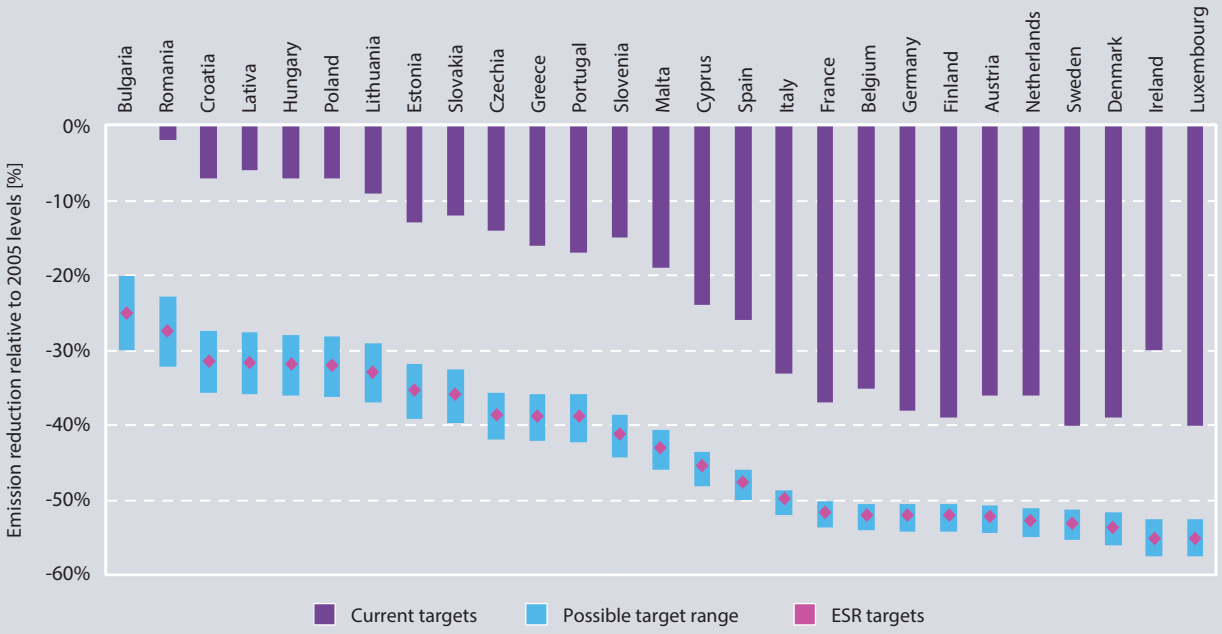
Average year-on-year ESR emission reductions rates for the the EU-27 from 2005 to 2050 [%] Figure 5



Calculations by Öko-Institut e.V. based on EEA (2020)

Based on these considerations, the mechanism to distribute the enhanced 2030 ESR target across Member States needs to be modified to ensure that all countries are on a path towards climate neutrality. Figure 6 shows a distribution of an EU-wide ESR target of 47 per cent in which the spread between Bulgaria and Luxembourg/Ireland falls to 30 percentage points. Bulgaria would receive an ESR target of 25 per cent below 2005 levels; the richest two countries, 55 per cent. The blue bars show the range of national ESR targets for the overall ESR target range of between 45 per cent and 49 per cent below 2005 levels.

Enhanced 2030 ESR targets by Member State — Figure 6



Note: Member states are ordered by GDP/capita. The current 2030 ESR targets include other elements in addition to the GDP/capita distribution. This is the reason why e.g. Ireland has a relatively low target despite having the second-highest wealth per person in the EU. These special provisions could be applied to the enhanced ESR targets as well.

Calculations by Öko-Institut e.V.

5 Ensuring fairness and solidarity when implementing the higher target

The proposed distribution and reduced spread would require relatively higher contributions from Member States with below average GDP per capita compared with the current target distribution. As noted, this follows logically from the target of a climate neutral Europe in 2050. At the same time, the European Green Deal clearly states that the "transition can only succeed if it is conducted in a fair and inclusive way" (EC 2019b). Hence, other mechanisms need to be implemented to reflect the principle of solidarity for enhanced ESR targets. There are, in general, two ways to address this: through the Effort Sharing Regulation or through ongoing budget negotiations.

To ensure fairness within the Effort Sharing Regulation, the following approaches might be considered:

- **ESR modernisation fund:** A modernisation fund could be established that receives a certain percentage of all emission quantities (AEA, annual emission allocation). These AEA units will be auctioned and revenues will be used to support emission reduction projects in poorer Member States. Such a system is already established in the EU ETS. The modernisation fund receives 2 per cent of all allowances that are auctioned. Revenues are used for Member States with a GDP per capita below 60 per cent of the EU average. (In 2017, Bulgaria, Romania, Croatia, Latvia, Hungary, Poland, Lithuania, Estonia and Slovakia were below the threshold.) The revenues should primarily be aimed at supporting investment in renewable energy, energy efficiency, energy storage, energy networks and just transition. Under the current ETS, the ETS Modernisation Fund is expected to raise some €14 billion over the 2021–2030 period, depending on the carbon price (DG Clima 2020b). The solidarity aspect of the ESR modernisation fund could be strengthened by having a higher percentage attributed to it (>2 per cent) and/or by taking the AEAs only out of the quantities assigned to Member States with above-average GDP per capita. (In 2017, these consisted of France, Belgium, Germany, Finland, Austria, Netherlands, Sweden, Denmark, Ireland and Luxembourg.)

- **AEA allocation with mandatory auction:** Through a solidarity AEA allocation mechanism poorer Member States could receive more AEAs than determined by their effort-sharing target. However, extra AEA units would have to be auctioned off to other EU Member States. This mirrors a similar approach in the EU ETS, where some Member States are allocated more ETS auction shares than justified by the emissions base in their countries' energy sector. The main difference of this approach to the modernisation fund approach is that revenues go directly to Member States.

The two options would draw from the experience gained in the EU ETS regarding solidarity and are well-established and well-functioning in the ETS context. In addition to ensuring fairness in achieving the ESR target they would also help establish a price for AEA units well before 2030. This would be very valuable because it signals to Member States the cost of non-compliance with ESR targets – and the value of their policies and measures (see section 7.4).

The other way to support poorer Member States in delivering on higher climate ambition is to include these considerations in the EU budget. In the second half of 2020, EU Member States will discuss and decide the next EU budget, which will cover the 2021–2027 period, as well as the proposed NextGenerationEU COVID-recovery fund. EU-level financing is specifically important for ensuring that the costs of the European energy transition are distributed fairly and that its benefits accrue equally to everyone. A prominent example of this is the proposed Just

Transition Fund, which will help coal regions transition their economic base into a future without coal mining. Obviously, more measures can be imagined, as the following two examples show:

→ **Local infrastructure support:** In many Eastern and Southeastern European Member States government investment in public infrastructure relies to a significant degree on EU funding (Figure 7). For example, while much of the cost-effective potential for renovating buildings is located in Central and Southeastern Europe, public authorities in these Member States often lack adequate policies to encourage large-scale building renovations and often lack project development capacity at the regional and local levels. The upcoming Renovation Wave Initiative of the European Commission aims to make investment in residential energy efficiency projects more attractive to private-sector investors. Here the EU budget could play a critical role not only by earmarking high shares of the funds for poorer Member States, but also by providing technical assistance and introducing financial platforms and one-stop shops for project developers to help reduce the cost of energy renovation in the region. Grants to Member States at the municipal level could also be very important for co-financing green district heating and for supporting a renovation wave for schools, hospitals and social housing.

→ **Transport infrastructure support:** Similar issues regarding cohesion and solidarity exist in the transport sector. For example, there is a geographic imbalance in the distribution of multimodal TEN-T projects between EU Member States: about 90 per cent of such projects are located in Western and Northwestern Europe (Pastori et al. 2018). A similar geographic disparity between Western and Eastern Europe could develop for the charging infrastructure of electric vehicles. While public charging infrastructure is generally expected to be adequate, Southern, Central and Eastern Europe will significantly lag behind Northern and Western Europe, based on Member State plans (T&E 2018). EU funding from the Connecting Europe Facility will be critical for ensuring that the whole EU territory receives the same opportunity for rail connections and a comprehensive electric vehicle charging network.

Share of cohesion policy funding in public investment by Member State, 2015–2017 Figure 7

EC (2018a)

These examples illustrate that EU co-funding and the use of EU money can play a critical role in accelerating and scaling public and private investment in buildings and transport, helping to renovate the existing building stock and to enhance and strengthen transport and heat networks. This is especially true for poorer Member States. In a recent analysis of the Commission's EU budget proposal, Agora Energiewende proposes four flagship initiatives for the buildings and transport sectors (see Box 1).

Currently, the EU's proposed 1.85-trillion-euro budget does not provide adequate safeguards to ensure that the future EU budget will actually play the role of helping poorer Member States ramp up investment in buildings, power, transport and industry. It is thus crucial that, as part of the EU budget agreement, dedicated EU facilities are established to accelerate climate action in critical areas, with a special focus on poorer Member States.

Box 1: Four EU flagship initiatives for the buildings and transport sectors

Buildings sector flagship: A European renovation financing facility to double-boost the renovation wave and employment: To address the remaining investment and financing gap in the buildings sector (884 billion euros over the 2021–2027 period) the European Investment Bank should set up a European renovation and financing facility to support the proposed European Renovation Wave.[2] Such a facility would provide the sector with access to blended financing instruments (such as grants and loans). To mobilize additional (private) funding, the EIB could convert the facility into a fund for (private) investors. Guarantees could be used to arrange a waterfall structure, e.g. using public money for high-risk first-loss shares and offering private investors less-risky / mezzanine shares. A leaked Commission working paper prior to the budget proposals called for €91 bn to be spent per year from the additional funds of the EU Recovery Plan (€25 bn in grants and €61 bn in guarantees) ringfenced and allocated to InvestEU.

Transport Sector Flagship-1: A rural low-carbon transport infrastructure fund: To address the remaining investment and financing gap in the transport sector (568 billion euros), low-carbon vehicles and infrastructure need to be supported. Specific funding should be dedicated to low-carbon transport infrastructure in rural areas with specific milestones such as establishing 2 million public charging stations by 2025.

Transport Sector Flagship-2: A rail investment package: The aforementioned leaked Commission working paper called for a rail investment package (€40 bn) through frontloaded CEF and CF rail windows and increased co-financing. Our analysis shows that targeted funds to remove bottlenecks for rail infrastructure (e.g. in border regions) is particularly effective. Financing through InvestEU should also be made available to change the rolling stock where necessary.

Transport Sector Flagship-3: Strengthening the European Battery Alliance: Innovation funding and the de-risking of private investment should boost the European Battery Alliance. Where useful, innovation funding could be combined with Just Transition and Recovery funding as part of structural change in former high-carbon regions.

Agora Energiewende (2020)

2 Such a proposal was included in a leaked Commission working paper on a green recovery plan.

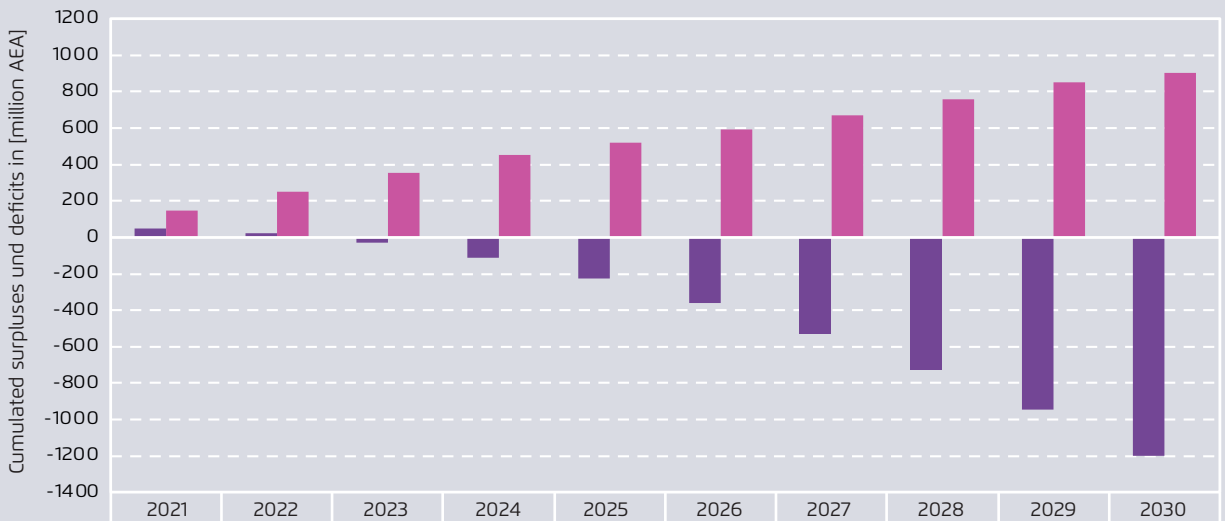
6 Where do we stand today? Current Member State scenario projection

Under the Monitoring Regulation (EU Regulation) No 525/2013, EU Member States must report their latest GHG projections. It is mandatory to report scenarios that integrate the effects of existing policies and measures (WEM). With Member State projections based on existing policies and measures, EU emissions in the year 2030 would be about 300 Mt CO_2 eq. above the ESR target, a reduction of 20 per cent relative to the reference emissions in 2005.[3] In all years after 2021 emissions would be higher than the annual ESR targets; the cumulated difference for the 2021–2030 period is about 1 200 million AEAs[4] The numbers highlight that significant additional polices and measures beyond the WEM scenarios are needed to achieve the emissions reductions required by the current Effort Sharing Regulation, let alone a -55 per cent reduction of GHG emissions.

3 The Member state WEM projections presented here are from 2019.

4 The AEAs for 2021–2030 were calculated using the latest data from 2019. Final AEAs will be available in 2020 following the review of GHG inventories and the calculation of ESD emissions in 2005 and 2016–2018. Only after their transformation to GWP from AR4 to AR5, will these be fixed in an implementing decision. We have considered ESR flexibilities following ESR Article 6 and 10.2.

Differences of cumulated AEAs between the WEM* and WAM** scenarios — Figure 8



	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
WEM	46	22	-31	-113	-223	-362	-529	-725	-948	-1,200
WAM	148	252	353	453	518	591	670	756	850	904

* with existing measures, ** with additional measures

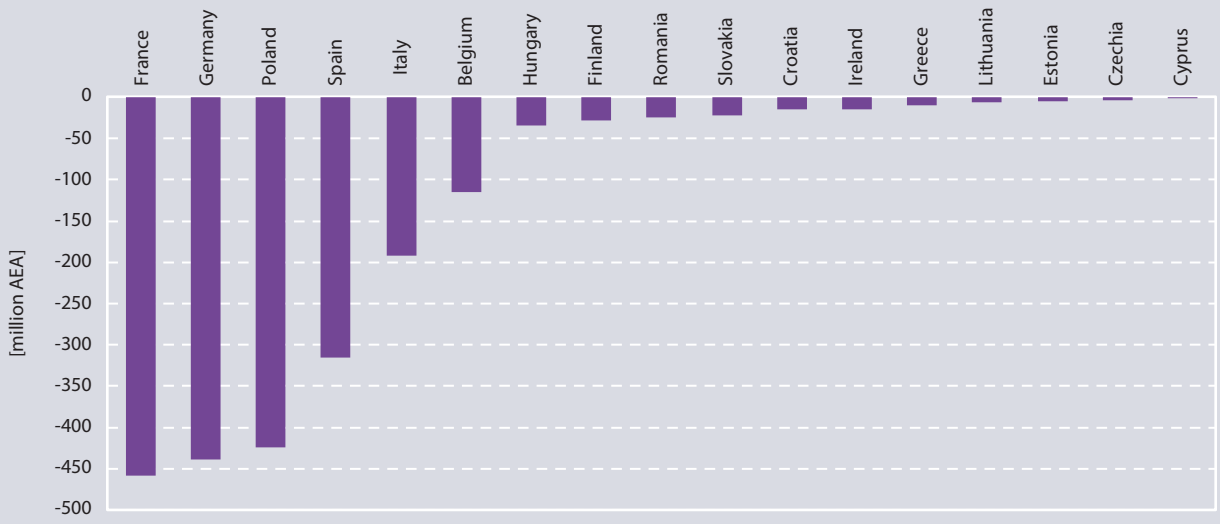
Calculations by Öko-Institut e.V. based on EEA (2020), BMWi (2020), Ministerstwo Klimatu (2019)

More recent projections and plans show that Member States are moving gradually, but decisively, in the right direction. Member states are also asked to report scenarios that show the effects of additional polices and measures (WAM) when these are available. The definition of additional measures in the regulation reflects the status of decisions in Member States by a certain cut-off date, which in most cases is between mid 2018 and the beginning of 2019. Currently, only 18 Member States have reported GHG projections showing the effects of additional policies and measures, with some high-emission Member States missing such as Germany and Poland. However, if these and some recently submitted National Energy and Climate Plans (notably Germany and Poland) are considered, the difference between EU emissions and the current effort target in 2030 closes and becomes a surplus. In Figure 8 the differences between cumulated AEAs are shown between the Member State WEM scenarios and WAM scenarios (incl. the German and Polish NECP data) with relevant changes for emissions covered under the Effort Sharing Regulation. These calculations show a cumulative difference of 2 100 Mt CO_2eq between the two scenarios and an overall projected surplus of 904 Mt CO_2eq relative to the current 2030 ESR target. In relative terms, the WAM scenarios (incl. the two NECPs) equal a target level of -30 per cent for non-ETS sectors in the EU-27 in 2030, meeting the current ESR target.

The effects of additional measures in France, Germany, Poland, Spain, Italy and Belgium are especially relevant for the overall change at the EU level (Figure 9). These countries want to reduce their Effort Sharing emissions between 22 per cent (Italy) and 32 per cent (France) from 2018 to 2030. But smaller Member States with lower absolute emissions have also submitted WAMs or NECPs projecting emissions reductions in the non-ETS sectors that go significantly beyond their national targets.

These figures demonstrate that targets long portrayed as "unreachable" can be met if Member States take concerted action and climate policy is given adequate attention by policy-makers. They also highlight that by collectively closing the gap to the EU target, Member States can apply certain limited "flexibilities" for trading AEAs.

Impact of additional measures reported by Member States — Figure 9



Calculations by Öko-Institut e.V. based on EEA (2020), BMWi (2020), Ministerstwo Klimatu (2019)

7 Meeting the enhanced Effort Sharing Regulation target

The previous sections have shown that an increased 2030 emissions reduction target of -55 per cent will require significantly higher targets for the non-ETS sectors, as well as significant additional policy measures to close the "delivery gap" between the higher targets and the expected 'business-as-usual' emissions reduction pathways. This section presents three different options that Member States can take to help close the gap, as well as three limited flexibilities that would allow Member States to partially achieve their targets through emissions reductions in other sectors and Member States.

7.1 Option 1: Deliver existing energy targets and legislation

A significant portion of additional effort has already been agreed with the adoption of new 2030 energy targets and revised energy legislation in the Clean Energy for All Europeans Package under the last European Commission. The energy efficiency and renewable energy targets of 32.5 per cent and 32 per cent in the EU's 2030 framework for the EU 27 together with the phase-out of coal in some Member States would lead to economy-wide greenhouse gas emissions reductions of 45 per cent below 1990 levels by 2030, as well as emissions reductions in the non-ETS sectors of roughly 32 per cent below 2005. These projected emissions reductions are beyond the officially agreed reductions targets of -40 per cent and -30 per cent, respectively. This shows that some of the "ambition gap" for a higher climate target has already been closed politically. Furthermore, several policy instruments within the EU's Governance Regulation have already been developed to help safeguard this higher target delivery, including the requirement that Member States develop National Energy and Climate Plans (NECPs), publish their plans for delivering on their 2030 climate ambitions and propose a renewable energy "gap filler" mechanism in the form of a Renewable Energy Financing Mechanism. In a press conference in June 2020, Energy Commissioner Kadri Simson announced that a preliminary assessment with 26 of 27 NECPs[5] submitted showed that the NECPs added up to a 33 per cent share of renewables in 2030, surpassing the EU target, while an ambition gap remains for primary energy and final energy of -3 per cent and -3.2 per cent, respectively (Council 2020). In October 2020, a comprehensive assessment of the Member State NECPs is planned to be released together with the Energy Union status report.

Currently, no equivalent EU-level "gap filling" mechanism exists for delivering on emissions reductions in the non-ETS sectors beyond the compliance mechanisms laid out in the Effort Sharing Regulation and standard infringement procedures in the EU treaties. However, the delivery of the EU's energy targets has also been substantially advanced with the adoption of revised Energy Efficiency Directive (EED), the Energy Performance of Buildings Directive (EPBD) and the Renewable Energy Directive (RED). Fully implementing and delivering on these legal frameworks would serve as a strong foundation for Member States to go above and beyond the emissions reductions in the EU's renewable energy and energy efficiency targets. [6] While this rulemaking is sometimes concerned with technicalities and details, it can have a substantial impact on the effectiveness of the legislation in practice. In many cases, Member States have significant leeway to determine policies that are suitable at the national

5 As of 15 June 2020, the final NECP of Ireland had yet to be submitted.

6 Additional options for enhancing this legislation can be found in section 5.3.

level when transposing EU directives into national law. While national policymaking processes provide an opportunity for policy innovation and local ownership, they may also result in the watering down of relevant measures. Similar opportunities for watering down EU regulations occur whenever new rules are made or new acts are implemented. Most important, however, Member States and the EU will need to establish strong monitoring and enforcement procedures to ensure that the various requirements contained in the legislation are translated into action and that they achieve their intended objectives.

7.2 Option 2: Adopt additional policies and measures at the Member State level

It must be stressed that in the decade leading up to 2030, most Member States will not be breaking new ground in the clean-energy transition. Leading Member States have achieved significant emissions reductions in the past years and decades, developing valuable best practice experience in transitioning their transport and heating systems away from fossil fuels. For example, in the buildings sector, emissions reductions for the EU 27 in 2018 were only roughly -21 per cent relative to 2005. By contrast, Sweden, Denmark and Portugal had reduced emissions by -65 per cent, -45 per cent and -43 per cent, respectively. In fact, since 1990 the Swedish buildings sector has seen a -94 per cent drop in GHG emissions from residential buildings and a -86 per cent drop from commercial buildings (Naturvårdsverket 2020). In just a few decades it has gone from being dominated by oil heating to a much more efficient system based on heat pumps and district heating powered by renewable energy. These successes were not achieved over night and are a result of decades of forward-thinking policy and regulations. This is especially true for the Nordic heating transition front-runners: Denmark, Finland and Sweden. They demonstrate that great changes are possible when a robust mix of policy measures are applied. These include:

Select national and regional targets for fossil-fuel heating bans as of June 2020 Table 2

Country	Selectivity
Austria	2021 (oil, new installations); 2025 (gas, new buildings); 2035 (oil, all buildings)
Belgium (Flanders)	2021 (oil, new buildings and major energy efficiency retrofitting)**
Denmark	2013 (oil, new buildings)
Germany	2026 (oil, new installations)*
Ireland	2020 (oil, new buildings); 2025 (gas, new buildings)
Luxembourg	2023 (oil and gas, new buildings)
Netherlands	2021 (gas, new buildings); 2050 (gas, all buildings)
Norway	2020 (oil, all buildings)
United Kingdom	2025 (gas, new buildings)

* When a low-carbon alternative is technically feasible
** Under discussion

Analysis based on research by Öko-Institut e.V. (2020)

- → improved standards for building envelopes
- → building codes and other regulations that promote renewable heating
- → restrictions in the use of fossil fuels for heating
- → financial incentives for low-carbon heating and energy efficiency improvements
- → comprehensive local heat planning and support for the expansion of district heating
- → high energy and CO_2 taxation on fossil heating fuels

Furthermore, while emissions in the transport sector have only declined by -2 per cent since 2005 for the EU 27 as a whole, they have decreased by around -20 per cent in Sweden and Italy and by around -15 per cent in the Netherlands and Portugal. These numbers show that in addition to EU policies (e.g. CO_2 standards for cars), national policies have played an important role in influencing transport

emissions. These policies include taxation and fiscal policies that incentivize the uptake of electric vehicles and reduce sales of high-consumption diesel and petrol cars such as:

→ vehicle registration taxes,
→ motor vehicles taxes,
→ company car taxes,
→ energy taxes,
→ purchase subsidies for zero-emissions vehicles.

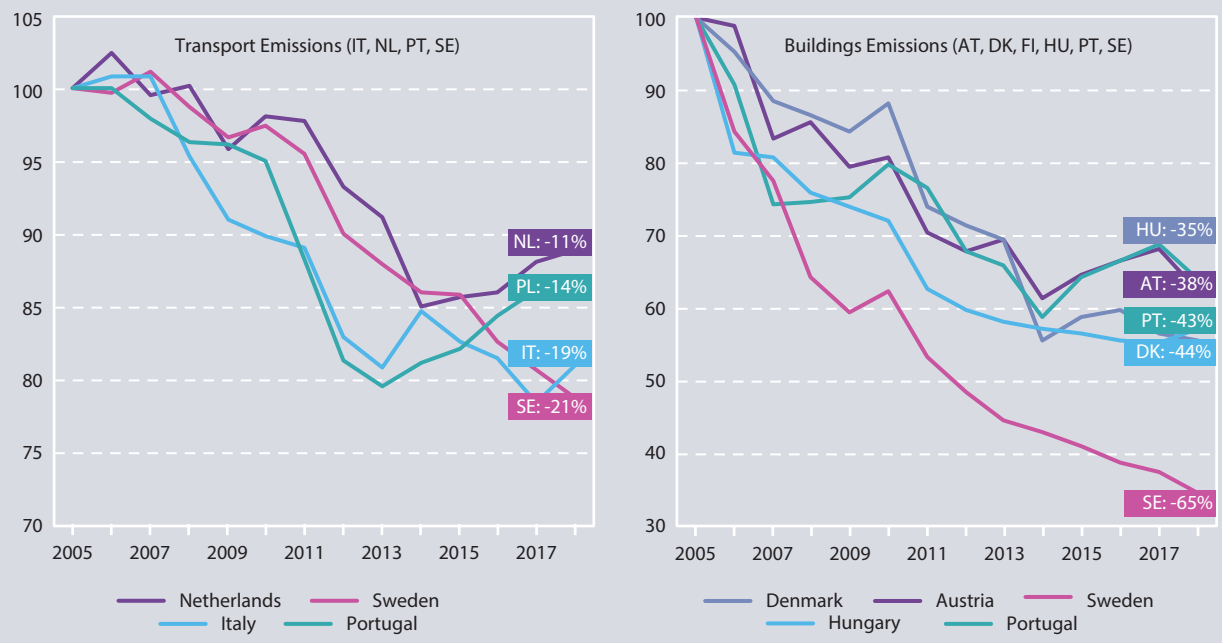
For example, in 2018 the Swedish government introduced a bonus-malus vehicle taxation system that provides a purchase incentive of up to € 5,700 for electric vehicles and finances the incentive with a higher charge for CO_2-intensive combustion engine vehicles. A similar system exists in France, where the malus component is as high as € 20,000 for high-emitting vehicles, and in Netherlands and Norway, where the tax level is even more progressive and lacks an upper limit.

Member States are increasingly also taking ambitious measures to ensure a sufficiently dense, fully interoperable, and accessible recharging and fuelling network for zero-emissions vehicles. For example, Germany has announced as part of its new €130 billion euro economic recovery plan that it will oblige all petrol stations to offer electric car charging to help remove refuelling concerns and boost consumer demand for the vehicles (Steitz & Taylor 2020).

Sweden (27 per cent), Finland (16 per cent), the Netherlands (12 per cent), and France (10 per cent) are currently the leading electric vehicle markets in EU based on share of new vehicle registrations (ICCT 2020). With electric vehicles at 70 per cent of new-vehicle registrations (two-thirds of which are battery-electric vehicles). Norway is demonstrating that the road transport sector can move towards electrification at an extremely rapid rate.

Development of emissions in the transport and buildings sectors in select Member States, 2005–2018 (2005=100)

Figure 10



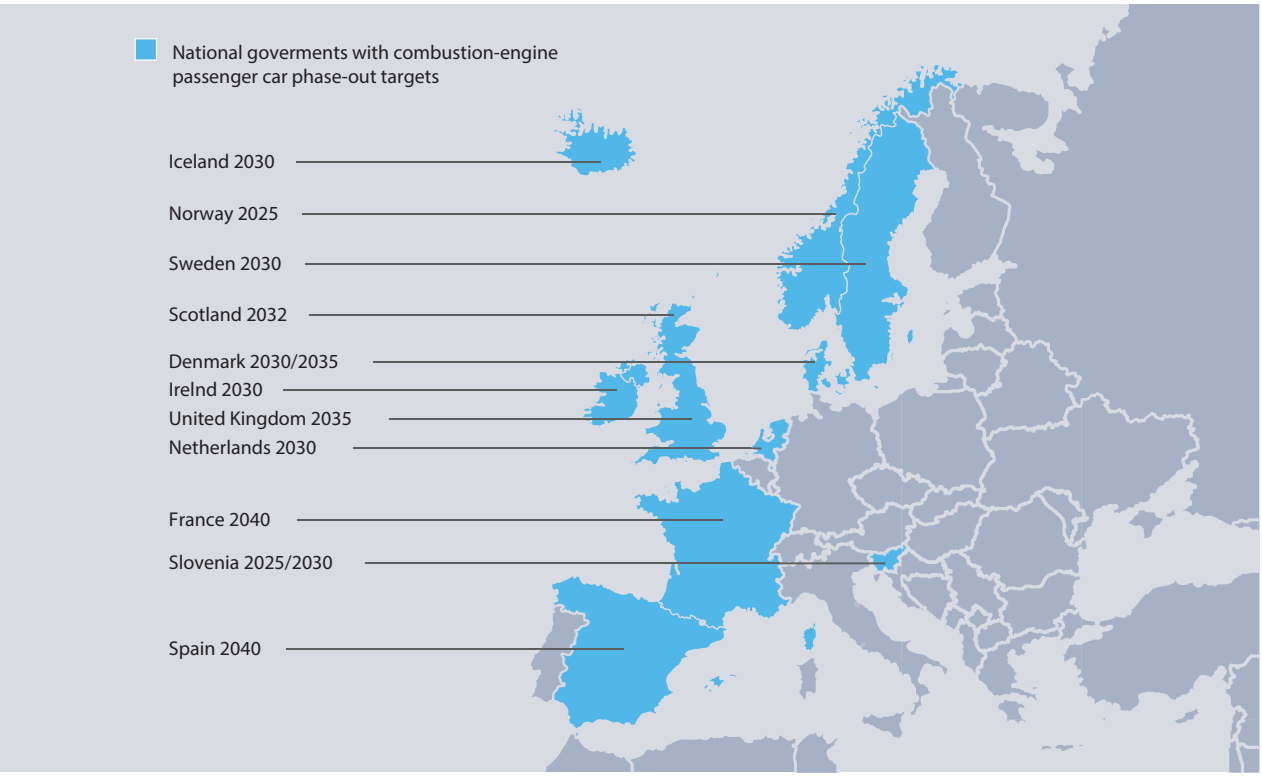
Calculations by Öko-Institut e.V. based on EEA (2020)

However, it should also be noted that in some cases the projections reported by Member States to the European Commission do not yet reflect the increased climate targets set by Member States in the last year. This includes:

- → Sweden's Climate Act from 2018 sets out a long-term target of net-zero emissions by 2045, as well as interim milestones for the non-ETS targets of -63 per cent by 2030 and -75 per cent by 2040 (Naturvårdsverket 2019).
- → Denmark has committed itself to reducing overall greenhouse gas emissions by -70 per cent (compared to 1990 levels) by 2030 (CHN 2019).
- → Austria's recent conservative-green coalition agreement sets out goals of achieving net-zero by 2040 and 100 per cent renewable electricity by 2030 (CHN 2020).
- → Finland's five-party government has commited the country to become carbon neutral by 2035 (Government of Finland 2019).
- → Luxembourg has recently submitted an NECP with a non-ETS sector target of -55 per cent by 2030.
- → Ireland's new coalition agreement includes a pledge to achieve overall emissions reductions of -51 per cent GHG and a 70 per cent renewable electricity share by 2030 (Irish Times 2020).

In fact, we estimate that at least six Member States (Sweden, Luxembourg, Finland, Denmark, Spain, Portugal) have developed national targets in one form or another that would place their non-ETS sector emissions reductions in the Member State target ranges for the EU-wide GHG target of -55 per cent described in Section 4.

Select national government targets for combustion engine car bans as of April 2020 Figure 11



Wappelhorst (2020)

Select national carbon pricing in the non-ETS sectors as of June 2020 Table 3

MS	Year introduced (last reform)	Level (per t/CO_2)	Share (%) of overall GHG emissions*	Share (%) of 2015 emissions in buildings with effective carbon rates above €60/tCO_2
SE	1991 (2019)	SEK 1.190 (EUR 115) (2020)	40%	98%
CH	2008	CHF 96 (EUR 90) (2020) -CHF 120–210 (EUR 112–196) (2028)***	33%	N/A
FI	1990 (2019)	EUR 53	36%	98%
NO	1991 (2020)	NOK 544 (EUR 50)	62%	88%
FR	2014 (2019)	EUR 45 (2020)	35%	0%
DE	2019	EUR 25 (2021) – EUR 55 (2025)	40%	1%
DK	1992	DKR 177 (EUR 24)	40%	76%
IE	2010	EUR 26 (2020) – EUR 100 (2030)	49%	0%

* These carbon pricing systems generally apply to fossil-fuel emissions not covered by the EU-ETS and include varying exemptions, especially for the industry due to competitiveness concerns.
** Effective carbon rates, including carbon taxes, energy taxes and price of emission permits, but excluding emissions from the combustion of biomass in the emissions base.
*** Provided that targets are not met.

Based on World Bank (2020), OECD (2018) and research by Öko-Institut e.V. (2020)

This increased ambition is also reflected in a growing number of fossil-fuel restrictions or bans adopted by Member States specifically targeting emissions reductions in the non-ETS sectors of buildings and transport (Figure 11).

Also, while the buildings and transport sectors have often not been subject to explicit CO_2-pricing in the same way as the sectors covered by the EU-ETS, a growing number of Member States have begun to introduce carbon prices in these sectors, including non-negligible effective carbon rates (incl. non-CO_2 energy taxes) in the buildings sectors. The table above lists some examples.

7.3 Option 3: Expand and enhance EU-wide policies and measures

EU-wide policies will also play a key role in delivering emissions reductions in sectors covered by the ESR. Standards for vehicles and buildings, harmonized energy taxes and the common agriculture policy are examples of EU regulations and directives that can directly influence GHG emissions in Member States. In this section we show the potential impact of reforms to some of these key policies.

Revision of performance standards for CO_2 emissions from cars and vans

In the Green Deal Roadmap (KOM 2019) the European Commission announced a proposal for reforming performance standards for CO_2 emissions from cars and vans (EU 2019) by June 2021. The objective of the reform is to ensure a clear pathway from 2025 onwards towards zero emission mobility. It is part of a larger effort to align all EU legislation with the new climate neutrality objective (reducing all emissions to net zero by 2050).

The current regulation sets out the following performance standards: By 2025, manufactures will need to reduce fleet-wide emissions by 15 per cent for newly registered passenger cars and vans relative to 2021 levels. The specific emission targets take into account the average test mass of a manufacturer's newly registered vehicles. By 2030, they will need to reach a 37.5 per cent reduction and a 31 per cent reduction below 2021 levels for cars and vans, respectively.

A study by Transport & Environment estimates that with these targets, performance standards for cars, vans and trucks would contribute only about 35–39 per cent of emissions reductions required by the sector to contribute its fair share to the ESR target in 2030 (T&E 2017).[7]

Modelling different scenarios for the regulation's impact assessment shows that a reduction of 50 per cent below 2021 levels by 2030 would have a cumulative mitigation potential of nearly 1 500 $MtCO_2$ for cars and 400 $MtCO_2$ for vans in the 2020–2040 period. Furthermore, a 50 per cent target would provide an additional reduction of 11.4 per cent below the baseline in 2030. For cars, the analysis estimates that a 50 per cent target can be nearly cost-neutral (-2 euros per car) over the lifetime of a vehicle by 2030, while it would come with net economic savings of 2 060 euros per vehicle for vans (DG Clima 2017).

Increasing the EU targets would also reduce pressure on governments to introduce additional measures at the national level. Research for Germany shows that more ambitious reduction targets of 45 per cent by 2025 and 75 per cent by 2030 below 2021 levels would have a mitigation potential of 20 Mt CO_2 for the German transport sector in 2030. This measure alone could effectively double the emissions reductions in the transport sector relative to the "With Existing Measures" scenario in Germany's NECP climate policy scenario, which stand at 21 Mt CO_2 for 2030.

With an average vehicle lifetime of roughly 11 years for passenger cars (ACEA 2019)[8], Europe's goal of climate neutrality by 2050 would require that only zero emissions vehicles (ZEVs) should be permitted to be sold on the domestic market well before 2040[9], which implies a CO_2 standard of 0g CO_2/km.
A significantly tighter 2030 CO_2 standard would also be necessary to avoid a much steeper drop between

7 T&E estimates a contribution of 35 per cent to the ESR target with a 35 per cent reduction of CO2 emissions by 2030 for cars, a 35 per cent reduction for vans and a 20 per cent reduction for trucks, and a 39 per cent contribution to the ESR target with a 40 per cent reduction of CO2 emissions for cars, a 40 per cent reduction for vans and a 20 per cent reduction for trucks.

8 Note that a significant portion of the existing vehicle fleet is substantially older than the average.

9 The theoretical possibility of fuelling a limited number of conventional passenger cars with synthetic fuels would distract from the need for a systemic change in the energy supply chain and entail large additional demands for renewable energy due to the low system efficiencies of synthetic fuels.

2030 and 2040. Similar arguments apply to CO_2 standards for trucks.

Increasing EU CO_2 standards could also serve to avoid the growing fragmentation of the domestic market due to the introduction of national and local bans on fossil-fuel vehicles.[10] This would be in line with the preferences of a growing number of Member States (T&E 2019b). At the same time, it can also be seen as a necessary complementary measure to ensure the effectiveness of national fossil-fuel vehicle bans.

Revising the directive on car labelling

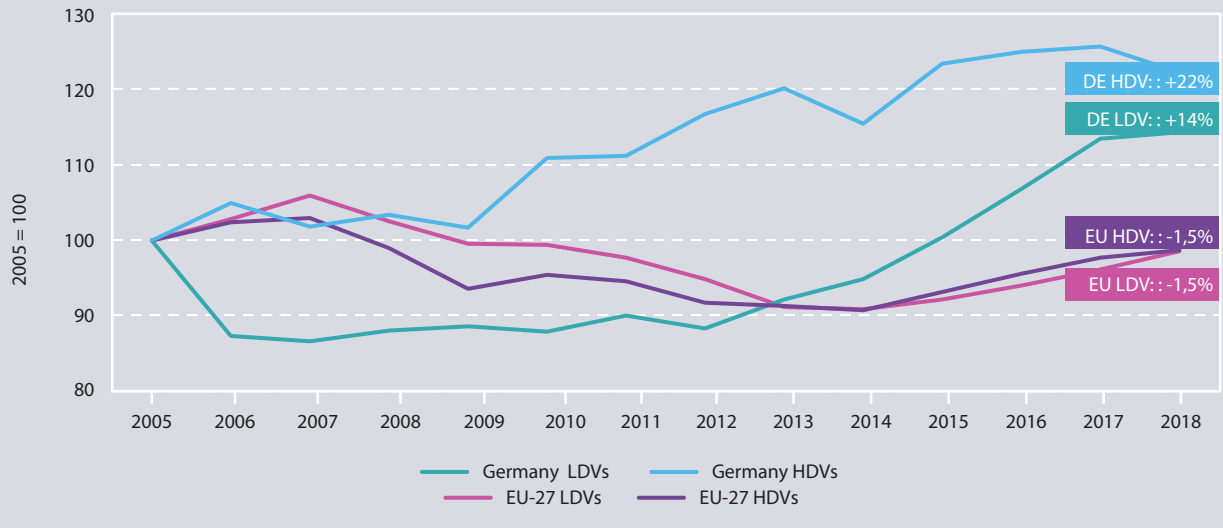
Directive 1999/94/EC requires measures to inform consumers about the CO_2 emission levels of new passenger cars, including a label to be displayed in the showroom and other media. At present Member States are free to apply an "absolute" logic in which the classification of the vehicle depends on its absolute level of CO_2 emissions, or a "relative" label in which the classification depends on how the car performs in relation to other, similar cars. This allows high-emitting cars to be given favourable label classifications if other cars of the same type release more emissions. In a policy environment that aims at accelerated emission reductions, an "absolute" format should be introduced across the EU.

Revising CO_2 standards for trucks and the Eurovignette Directive

Freight volumes have increased significantly since 1990 and will continue to grow in the years up to 2030. At the same time, the modal shares and competitive positions of road and rail freight transport remain substantially unchanged. Road freight transport dominates among inland modes (comprising 73.3 per cent of freight volumes in 2017), while rail freight (with a share of 16.5 per cent in 2017) (DG Move 2019) remains well below its potential for minimizing the environmental impacts of freight transport activity. As is the case with individual mobility, governments in Europe with comparatively

10 In addition to the national targets mentioned in section 7.2, a number of major European cities, including Amsterdam, Athens, Barcelona, Bristol, Brussels, Copenhagen, Heidelberg, London, Madrid, Milan, Paris and Rome have signed declarations supporting the ban of emitting vehicles by 2030.

GHG emissions from light- and heavy-duty vehicles (LDVs & HDVs) Figure 12



Calculations by Öko-Institut e.V. based on EEA (2020)

high national emission reduction targets under the Effort Sharing Regulation will be obliged to put in place additional national measures to reduce freight transport emissions. In contrast to individual mobility, however, Member States are more constrained in their ability to take measures that regulate cross-border trade, especially when they would result in limiting the free internal movement of goods in the EU's Single Market. Thus, the effective regulation of emissions from road freight at the EU level is the most important lever available to Member States for reducing emissions from heavy transport. This is particularly the case for Germany, which at the geographic centre of the European Union has experienced a significantly larger rise in road transport emissions from light- and heavy-duty vehicles than the EU-27 average due among other things to freight traffic from peripheral countries.

Responding to this challenge, EU Member States adopted EU-wide CO_2 emission standards for heavy-duty vehicles for the first time in 2019 (-15 per cent CO_2 emissions by 2025 and -30 per cent by 2030 relative to 2019 levels, in addition to an incentive system for zero- and low-emission vehicles). However, this target is considered to fall well short of the technical potential for improving road freight efficiency, which some sources estimate to be at least 40 per cent relative to current levels (Oscar Delgado et al. 2017). Thus, during the 2022 review of the recently adopted CO_2 standards for heavy-duty vehicles the Commission proposed revising this target upwards.

While Directive 1999/62/EC – known as the "Eurovignette Directive" – sets out rules for charging heavy-duty vehicles for use on Trans-European Transport Network roads and motorways, it currently does not take into account CO_2 emissions and other externalities. In May 2017 the Commission adopted a legislative proposal for an amendment of the directive that would extend its scope to passenger cars, vans and buses and allow the differentiation of charging according to CO_2 emissions. The proposal could save an estimated 2.5 – 7.1 Mt CO_2 emissions by 2030 relative to the baseline (DG MOVE 2017). The Commission estimates that this would represent between 4 to 14 per cent of the additional road transport emission reductions by 2030 needed on top of the baseline. However, negotiations have stalled in the Council, and Member States have so far failed to come to a general agreement for moving forward with negotiations. Member States could use this opportunity to adopt an ambitious reform of the Eurovignette Directive that allows Member States to apply road charges to all road vehicles, internalize the cost of climate pollution and add it to other chargeable external costs [11] and help finance the infrastructure investments needed for the transition to zero- and low-emission vehicles (ZLEV). A reduction of fees specifically for ZLEV could also allowed.[12]

Revision of the Energy Taxation Directive (ETD)

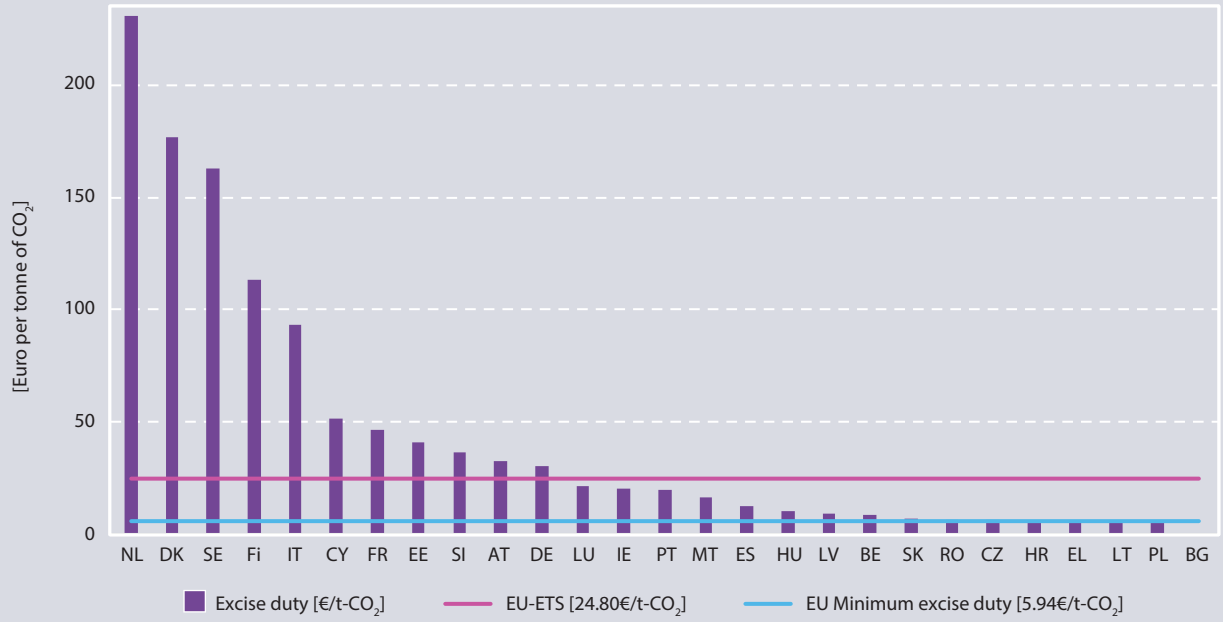
Pricing CO_2 emissions is widely regarded as one of the most efficient tools to mitigate emissions cost-effectively. While the ETS sets an explicit, EU-wide price signal for power generation and carbon-intensive industries, not all Member States apply CO_2 prices in non-ETS sectors such as transport, buildings and agriculture. Instead, taxes, fees and levies in the energy systems of EU Member States have grown historically and do not give a consistent price signal for CO_2. Currently the EU Energy Taxation Directive of 2003, which is designed to harmonize energy taxes in the EU, only stipulates minimum tax rates for each fuel, but without a link to carbon content.[13] As a general pattern, all Member States levy higher taxes on transport fuels than on

11 Agora Energiewende & Agora Verkehrswende (2019) recommend that CO_2 costs be in line with the social cost of carbon, which was estimated by UBA (2019) to be €180 /t CO_2 in 2016 and to rise to €205 in 2030.

12 The most recent draft proposal of the Croatian oresidency, however, does maintain a principle of applying a reduction in fees ranging from 5 per cent to 75 per cent for low-emission vehicles.

13 Directive 2003/96/EC of 27 October 2003 restructures the Community framework for the taxation of energy products and electricity.

Taxation of natural gas heating fuel for non-business use in the EU (in EUR/t CO_2) Figure 13



Note: Shows the situation as at 01/01/2020; EU-ETS Price represents the average 2019 price on secondary market [EEX] (EUR 24.84).

Calculations by Öko-Institut e.V. based on DG TAXUD (2020)

fuels used for power or heat generation, but tax levels also vary significantly between Member States (Figure 13).[14] Implicit CO_2 prices also vary within sectors, i.e. fuels used for the same purpose carry a different implicit CO_2 price. For example, the implicit carbon price on petrol is more than twice as high as the rate for diesel in several Member States. This disparity in implicit CO_2 prices across the economy distorts incentives to invest in the most cost-effective emission reduction options. Moreover, some EU countries – Germany and Italy, say – have high taxes and surcharges on electricity that serve as a barrier to sector coupling and the provision of flexibility.

As mandated by the Green Deal Roadmap, the Commission will develop a proposal for a reform to the Energy Taxation Directive (EC 2003) by June 2021. Currently, the reform will consider current tax exemptions, including for aviation and maritime fuels, and the best ways to close any loopholes. In the light of more stringent non-ETS targets for 2030, however, the Commission could also propose a more fundamental overhaul of the Energy Taxation Directive. For example, the current approach of mandatory minimum rates could be maintained, but changed to reflect the carbon and the energy content of each fuel rather than its volume and include a gradually increasing minimum effective carbon price for transport and heating fuels.

However, taxation reform at the EU-level will only be possible with public support. The proposal would therefore also have to allow Member States to compensate low-income households and industries

14 OECD (2018). Note that the publication includes only 21 of the EU Member States. There are no data for Bulgaria, Croatia, Cyprus, Latvia, Lithuania, Malta and Romania. The data includes taxes and ETS prices, but it does not take into account surcharges and levies such as those used to finance renewable energy investment or grid costs.

threatened by carbon leakage, so that such schemes can obtain state aid approval. Lump-sum payments per person or unit of output can incentivize the abatement of emissions while protecting consumers and businesses from hardship.

Revision of the Alternative Fuels Infrastructure Directive

The availability and reliability of and access to recharging and refueling points for alternative fuels is an important factor for how market actors respond to low-emission mobility alternatives. The Alternative Fuels Infrastructure (AFID) Directive (EU 2014) aims at ensuring the build-up of alternative refueling points across Europe with common standards for their design and use, including a common plug for recharging electric vehicles. The directive requires Member States to set targets by 2020 for recharging points for electric vehicles accessible to the public. It further requires Member States to ensure enough publicly accessible refueling points for liquified natural gas (LNG), compressed natural gas (CNG) and hydrogen by 2025.

By 2016, all Member States had set out their targets and objectives and supporting actions in National Policy Frameworks (NPF). An assessment of the Commission in 2017 found that the overall ambition level of the national AFI targets was low and estimated that their combined implementation would contribute CO_2 emission reductions of only 1.4 per cent by 2030 relative to a scenario without the NPFs (DG MOVE 2019).

At the same time the assessment highlights the potential emission reductions that can be achieved with ambitious medium- to long-term AFI plans. For Austria, for example, the Commission assessment estimates that the CO_2 emissions improvements from its NPF could lead to a 13 per cent CO_2 emissions reduction in transport by 2030 relative to a scenario without the NPF (DG MOVE 2019).

The Commission is currently carrying out an evaluation of the directive with the ambition to propose a reform in 2021. The inclusion of binding targets for the deployment of public infrastructure at the national level in 2025 and 2030 could be a way to address the current lack of ambition in the NPFs and make a more meaningful contribution in terms of emission reductions in the transport sector.

In view of the EU goal of climate neutrality, fossil fuels can no longer be supported by EU policy instruments. Therefore, the revision of the AFID should remove natural gas and LPG from the definition of alternative fuels supported by the directive, in line with the "do no harm" principle. An analysis by Transport & Environment shows that when including a full emissions cycle certain models can even be worse for the climate than diesel trucks, while others deliver limited climate benefit (T&E 2019a). As such, the revised AFID should prioritize ZEVs – public charging infrastructure in rural areas and long-haul road freight transport, specifically – to ensure pan-European infrastructure coverage by 2035 (T&E 2020).

Revision of the Energy Performance of Buildings Directive

The impact assessment for the current version of the EPBD (DG ENER 2016) included a policy option for enhanced implementation and reform beyond the current intervention logic and level of subsidiarity. Among other things, this option would have introduced mandatory requirements for building renovations (e.g. when changing ownership or tenancy). Since it would have significantly changed the architecture of the EPBD it was not the preferred policy objective. The Commission estimated that the "enhanced implementation and revision" policy option would bring reductions of 134 Mt CO_2 by 2030 relative to the reference level. This is substantially higher than the 38 Mt CO_2 of reductions that the Commission estimated for the preferred policy option. The "enhanced implementation and revision" policy option would further create an estimated 280 000 additional jobs by 2030 over and beyond the preferred policy option and would have about

twice as high an effect on economic growth incl. SMEs in 2030 (DG ENER 2016).

The EPBD also foresees a number of obligations supporting the electrification of transport. Governments should consider an ambitious implementation of the EPBD pre-wiring requirements beyond the minimum requirements to enable significant home and workplace charging for electric vehicles in residential and commercial buildings as soon as possible.

Revision of the Ecodesign and Energy Labelling Directives

According to a recent scenario review by the Joint Research Centre, aiming at an emissions reduction higher than 50 per cent by 2030 will require the replacement of up to 35 per cent of individual fossil-fuelled boilers (JRC 2020). Appliance standards, including standards for heating systems, have played an essential role in reducing energy demand. In Europe, these appliance standards are set through the Ecodesign Directive. The Ecodesign Directive requires manufacturers to decrease the energy consumption of their products by establishing minimum energy efficiency standards, including minimum energy performance standards for energy-consuming appliances (e.g. household heating appliances) and products affecting energy demand (e.g. windows and insulation). The Energy Labelling Regulation complements the Ecodesign Directive by establishing mandatory labelling for energy-consuming products by helping consumers to choose products with the highest performance levels.

Ecodesign and labelling requirements were applied for space and water heaters in 2015. It effectively eliminated the sale of the most inefficient boilers on the market in a technology-neutral way. The European Commission has estimated that Ecodesign and Energy Label measures relating to building installation products will lead to a total savings of 126 Mt CO_2eq/yr in 2020 and 210 Mt CO_2eq/yr in 2030 relative to BAU, representing 42 per cent of the savings on EU GHG emissions from regulated products (VHK 2019). These standards could be further tightened to rule out specific types of heating systems from being sold to consumers on the domestic market and to phase out the most inefficient fossil-fuel heating systems. In principle, appliance standards could also be used to implement an EU-wide ban of fossil-fuel-based heating systems through tighter requirements in line with the EU's goal of climate neutrality.

A reform of the labelling system is under way with new legislation being enacted at the EU level. The current labelling system uses a seven-point scale from A (most efficient) to D (least efficient). The first four-point scales were all A (A+++; A++, A+, A), which made the differences between the categories less evident for consumers. The reformed label which will enter into force in 2021 for specific products will use a more explicit, seven-point A to G scale which is expected to significantly improve the informativeness of the labels. However, the new efforts fall short of ambition in the most critical areas of building emission: cooling and heating systems (including water heating). In these areas the new labels will not be introduced until 2025 and 2030, respectively. Having old labels on these products while placing new labels on other products could confuse consumers and unnecessarily extend the market life of fossil-fuelled devices. Given that the new labelling regime would help consumers navigate the purchase of energy-efficient products, Member States could consider shortening the transition period for the new energy labels and harmonising them across all products. This would allow its positive effects to emerge as early as 2021.

Revision of the Renewable Energy Directive

The decarbonisation of the non-ETS sectors will be facilitated not only by the direct electrification of buildings, transport with heat pumps and EVs powered by renewable electricity, but also by the effective utilization of waste heat from industrial sites and data centres, the deployment of direct renewables in heating & cooling (e.g. solar thermal,

geothermal, biomass), as well as the use of sustainable fuels in transport (primarily for aviation and shipping). District heating & cooling infrastructure will also need to be significantly expanded in the EU, especially in densely populated urban areas, to decarbonize the buildings sector cost-effectively and efficiently at the speed and scale needed.

Under the recent revision of the Renewable Energy Directive (RED II), national governments need to specify the level of final energy for heating and cooling that will be provided by renewable sources by 2030, and will have to implement measures to ensure an annual indicative increase of 1.3 percentage points for renewables in heating and cooling between 2020 and 2030. Based on EEA estimates, renewables had a share of 19.8 per cent in heating and cooling final energy consumption in 2018 (EEA 2019b). Assuming the average annual growth rate of 5 per cent (2005-2017) is maintained until 2020, and the share of renewable heating and cooling is increased by the indicative 1.3 percentage point target EU-wide from 2021–2030, this would lead to a renewable share in heating and cooling of roughly 35 per cent. By contrast, Öko Institut's Vision Scenario projects a share of renewables in heating & cooling (direct and indirect renewables) of closer to 50 per cent. To help close this gap, Member States could revise the Renewable Energy Directive to increase the renewable heating & cooling target to 2 percentage points and make this indicative target binding, as called for by the European Parliament during the negotiation of the RED II.

As for transport, the Renewable Energy Directive sets out a renewables target of 14 percentage points for 2030, as well as a cap of 7 percentage points[15] for first-generation biofuels produced from food and feed crops. As such, the implicit target for advanced alternative fuels is set at 7 percentage points. This can be met through a complex set of multiplication factor provisions that imply that the actual magnitude of the mandate is actually significantly lower (Giuntoli 2018). Currently, the EEA estimates that renewables made up 8.1 per cent of transport final energy consumption in 2018 (EEA 2019). Instead of mandating the quantities of specific energy forms, a more direct climate policy instrument would aim at greenhouse gas intensities directly. Hence, measures could be taken to continue and strengthen provisions under the Fuel Quality Directive, which are set to expire at the end of 2020. The Fuel Quality Directive (FQD) applies to petrol, diesel and biofuels in road transport and requires a minimum 6 per cent reduction in the greenhouse gas intensity of transport fuels by 2020. The FQD also sets mandatory reductions in the sulphur content of transport fuels, helping to reduce air pollution. The GHG intensity of fuels is calculated on a life-cycle basis, covering emissions across the fuel value chain from extraction to processing and distribution. Emissions reductions are calculated against a 2010 baseline and can be met through the use of alternative fuels and the reduction of upstream emissions (such as flaring and venting) at the extraction stage.

Adoption of a ReFuelEU Aviation legislative initiative

Though aviation currently accounts for only 3 per cent of the EU's greenhouse gas emissions, air travel is increasingly significantly in the EU and globally. By 2030, this rise could wipe out around half of the reductions achieved in land transport emissions. Existing mature technologies for the direct electrification of transport are either unsuitable here or are insufficiently energy-dense to power long-distance aviation. Decarbonizing such routes is therefore likely to require the use of advanced fuels (including electrofuels and advanced biofuels), as well as a significant increase in the efficiency of planes. Each of these approaches will require large-scale investment in further research, innovation, and scaling if they are to become viable solutions.

The new EU Renewable Energy Directive requires Member States to reach minimum levels of advanced biofuels in the transport sector. However, the flexibility

15 Or the share of 2020 plus one per cent, whichever is lower

of the associated conditions makes it highly unlikely that any Member State will prioritize the decarbonization of aviation and shipping fuels. Thus, Member States could consider adopting a sustainable aviation fuels blending mandate as part of the European Commission's upcoming ReFuelEU Aviation legislative initiative planned for the fourth quarter of 2020 (EP 2020). The recent Hydrogen Strategy of the Netherlands confirms that the country is 'firmly committed' to a European blending obligation and will pursue a national obligation as of 2023 (NL 2020). Similarly, in its own recent hydrogen strategy, the German government announced its intention to assess a renewable fuel quota for aviation kerosene of 2 per cent in 2030 (CLEW 2020). Furthermore, France has developed a national roadmap aimed at replacing fossil kerosene with 2 per cent of sustainable aviation fuel by 2025, 5 per cent in 2030 and 50 per cent in 2050 (FR 2020).

7.4 Flexibility 1: Market-based mechanisms

Trading of emission rights

Annual emission allocations (AEAs), the emission quantities under the ESR, can be traded between Member States. The receiving country may use the AEAS for compliance without any limitations under the ESR and LULUCF regulation (see section 7.5). Governments can sell any excess AEAs from previous years after compliance for those years has been established. For years where compliance has not yet been determined, Member States can transfer up to 5 per cent (2021–2025) or 10 per cent (2026–2030). AEA trading can be used by governments as a fallback option in cases where domestic action was less effective than anticipated, as a strategy to comply with the ESR if domestic action is seen as too costly or as an explicit mechanism to raise revenues (see also section "Project mechanisms", page 49)

Figure 8 shows the net supply of emission quantities in the current ESR through the year 2030 both in the *with existing measures (WEM)* scenario and in the *with additional measures (WAM)* scenario. In the WEM-scenario there is a net deficit of 1 200 million AEAs. Despite this there are eight Member States that together have a surplus of approx. 160 million AEAs. The demand from the other countries is approx. 1 360 million AEAs, over nine times higher. In this case AEA prices are expected to be very high giving an incentive for countries to adopt further measures, either to reduce demand for AEAs or to be able to sell additional quantities. The situation changes in the WAM scenario: the joint surplus of 800 million AEAs from 17 Member States is higher than the total demand of 320 million AEAs. In this case the AEA price will be rather low.

Under the enhanced targets, the EU will be short even in the WAM scenario; countries will need to adopt additional measures to achieve the ESR target. In this case, Member States with a surplus will again be able to sell AEA at higher prices.

Creating an AEA market

As shown above, there is the option of trading AEAs between countries and there are countries that will have surplus emission quantities and countries with a clear demand. However, despite the rules for AEA trading since 2013 there is currently no real AEA market due to several factors: AEA market participants are exclusively governments; a direct participation of private actors is not possible. The 27 national governments are in very different stages concerning their readiness and willingness to trade. Some countries have vastly more market power than others both in terms of fiscal resources as well as in terms of demand for/supply of AEAs. Looking to 2030, the main obstacle is likely the absence of a price signal and potentially very low liquidity. The few AEA trades that have taken place so far were conducted behind closed doors and there is no publicly available information about the closing price. There is also no information platform where Member States can show their interest to buy/sell AEAs. A government interested in trading AEAs needs to contact all potential partners individually.

A similar situation occurred under the Kyoto Protocol when some countries sold their emission units without disclosing the price. One of the main differences was that there was an active market for units from the Clean Development Mechanism and Joint Implementation projects which gave a price signal and reference for all actors. This price could then be used to assess the economic viability of implementing new offset projects or to estimate avoided CO_2 costs for domestic action. For AEAs there is no secondary or parallel market that could be used for this purpose. Any governments engaged in AEA trading needs to establish a price it is willing to accept based on other considerations such as the supply/demand levels from other countries or abatement costs. The risks for both buyer and seller are high and it is likely that they will agree to a price that is unfavourable due to the lack of transparency and a reference price (Bart et al. 2019). For the ETS this situation is different: due to the large number of market participants and the different trading platforms there is a clear price signal. Unfortunately, the price cannot be used for the ESR: ETS allowances cannot be used in the ESR and the sectors covered have very different mitigation options and abatement costs.[16]

Expectations for the cost of an AEA from 2021 onwards vary wildly and depend strongly on the overall supply and demand situation in the market. Until 2020 the Effort Sharing market was very long: the estimated surplus through 2018 was about four times higher than annual emissions. These AEAs are not valid for the period until 2030; any remaining units will lose their value and can therefore be bought at very low prices. This picture might change considerably, with some studies assuming prices of up to 100 EUR/t CO_2 based on CO_2 taxes in some European countries and the assumption of a very limited supply of emission quantities (Agora Energiewende & Agora Verkehrswende 2018; Gores & Graichen 2018). Under other conditions, e.g. if Member States implement significant additional measures going far beyond the emissions reductions demanded by the effort-sharing regime, prices will be much lower.

Several options exist to create a more liquid and transparent AEA market that is suited for higher climate ambition. These include:

- → The creation of an information platform that provides information on the market situation, interested buyer and sellers and finished trades. The platform could also go further and include agreed prices for finished trades as well as bids and offers.
- → The introduction of central auctioning for some AEAs. The revenues could be used to supply an ESR modernisation fund similar to the one in the ETS.
- → The creation of mandatory auctioning. All Member States would be required to auction a small share of their AEAs; they could use the revenues to buy back the same quantity of allowances. Even if all Member States would use this approach it would provide an AEA price which could be used for other deals.
- → The inclusion of the private sector through project mechanisms and/or trading entities (see next section). This approach was very successful for establishing a CO_2-price under the Kyoto Protocol.

The information platform is unlikely to provide a clear price signal but would at least enhance transparency in the market. The other option would provide a clear price signal. This signal could also be relevant when governments discuss domestic action. Being able to quantify avoided costs for AEA purchases (or potential revenues from AEA sales) can be an important factor when deciding on new policies and measures to reduce GHG emissions.

16 Some Member States may use a limited amount of ETS allowances in the ESR (section 7.6). The limit is so low that this will not decide the AEA price.

Project mechanisms

Project mechanisms are another way to increase supply of AEAs: a country implements measures to reduce GHG emissions and sells any generated emission allowances to another country. The country can do this unilaterally like any other policy. Alternatively, it can do this together with the government that is buying the AEAs. In this case both sides would agree on the scope, costs and methodology for estimating emission reductions. The advantages of joint implementation are clear: both seller and buyer have certainty about the AEA price ex-ante and a guaranteed supply/demand and there is the possibility that the buyer provides pre-financing for the implementation. While this mechanism has many similarities with JI/CDM under the Kyoto Protocol there are important differences. One of the main weaknesses of these mechanisms was that many of the generated units were not in addition to the original allotment (Cames et al. 2016; Kollmuss et al. 2015). There is little danger that this will be a serious concern under the ESR, however. All Member States have binding targets, which are stringent enough that there is little room for "hot air". This is especially true for the enhanced targets. For example, the current ESR is a closed system with a net shortage of emission rights. If a country would sell more AEAs than warranted by a project this would lead to a shortage in the selling country; the seller has a strong interest not to overestimate emission reductions or use the project mechanism for mitigation actions that would have happened in the absence of the mechanism.

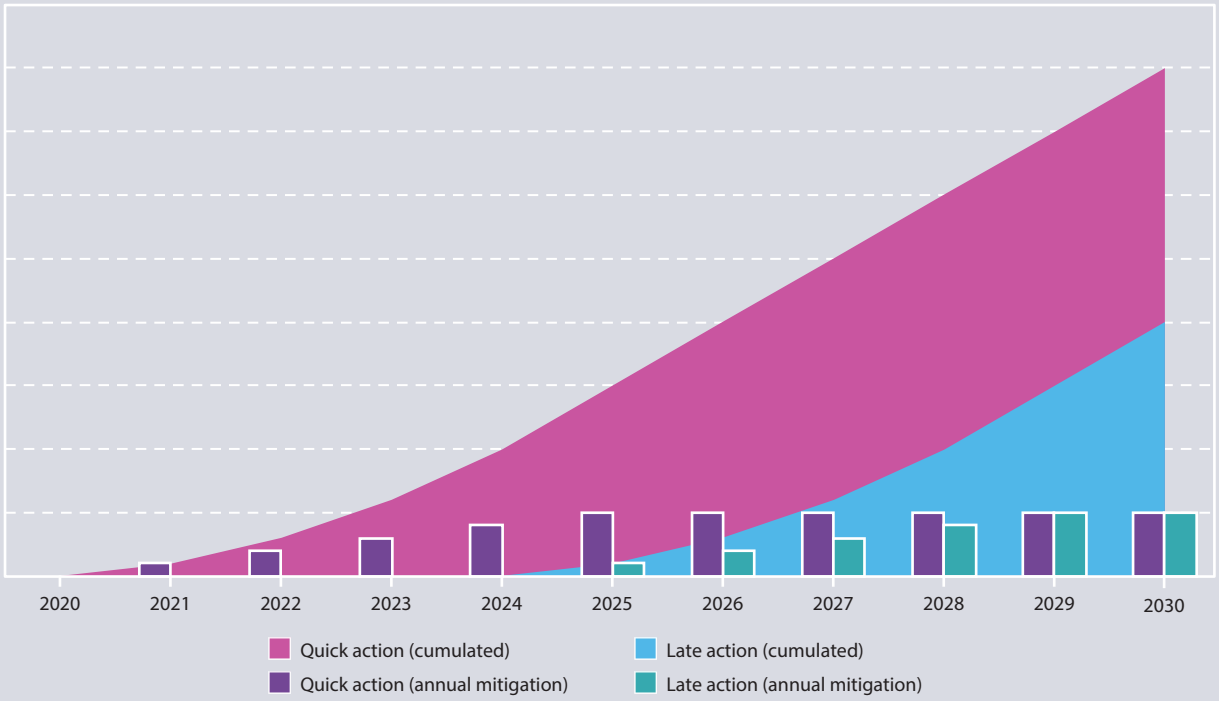
There are two pathways for bilateral projects in the ESR: directly in the ESR or through the mechanism established under Article 24a of the ETS Directive. The first path has no further requirements except that there may be no double counting of AEAs. There are no restrictions concerning the nature of such projects: they can be very specific (e.g. the energetic rehabilitation of specific buildings) or be based on a broader policy (e.g. increasing taxes on fossil fuels). It is up to the buyer and seller to agree on all rules and procedures. The second path has the advantage that some of the rules and procedures would be adopted by the Commission, e.g. on estimating emission reductions. While this takes some of the burden from the participating countries this avenue has not yet been implemented and it is unclear how long it would take to become operational. The inclusion of the private sector under both approaches is also possible. Under the AEA private entities are not able to hold or trade AEAs. Instead, governments could pay for emission reductions from projects implemented by the private sector. This would free more AEAs to be sold to other countries or reduce the need to buy emission quantities. Governments would need to be careful that those private projects do indeed generate the promised emission reductions and that they are in addition to government action. This is a fiscal risk for governments, not a risk for the climate: the government would have less allowances to sell than it planned; it would not affect the total quantity of emissions under the ESR. An established AEA price would greatly facilitate the involvement of the private sector.

The importance of early action

A key factor for projects to be able to provide relevant quantities of AEAs is time. There are few large point source installations covered by the ESR where single projects could lead to significant emission reductions. The sources with the most successful project types under the CDM (HFC incineration, N_2O abatement, solid waste land fill) are either included in the EU ETS or already addressed through other legislation. The main emission sources in the ESR are housing, road transport and agriculture. All these sectors typically have many small sources which means that many activities will be needed. The impact of any reduced action before 2030 depends strongly on the moment of implementation. An illustrative example is given in Figure 14, which shows a measure reducing emissions implemented either for the 2021–2025 period (blue bars) or for the 2025–2029 period (yellow bars). Such a measure could consist, say, of energy efficiency

Illustrative example showing the effect of quick action

Figure 14



Calculations by Öko-Institut e.V. (2020)

retrofits for 1 000 homes per year. The net effect in the fifth year is five times the effect in the first year. In both cases the annual emission reduction in 2030 is identical and identical resources were required. The difference lies in the cumulated reductions over the ten-year period: with early action the cumulated mitigation is twice as high. Over the lifetime total emission reductions will be identical but in the delayed action case most of the effect will not take place until after 2030.

7.5 Flexibility 2: LULUCF

Article 7 of the Effort Sharing Regulation allows the use of net removals for compliance from the combined land accounting categories of afforested land, deforested land, managed cropland, managed grassland, managed forest land and managed wetland (LULUCF). The total amount of flexibility is capped at a maximum level of 280 million units for the whole 2021–2030 period. This total amount is split into maximum amounts by Member State.

Member States can use these so-called Land Mitigation Units (LMUs) for compliance under the Effort Sharing Regulation after compliance under the LULUCF Regulation (Gores et al. 2019). Two compliance cycles will occur: one in 2027/28 for the 2021–2025 period and the other in 2032/33 for the 2026–2030 period. For compliance under the LULUCF Regulation

all accounted LULUCF emissions must be balanced by accounted LULUCF removals. Any remaining removals can be banked for compliance under the LULUCF Regulation in the next period, transferred to other Member States for their compliance under the LULUCF Regulation or used for own compliance under the Effort Sharing Regulation up to the maximum amount allowed.

Under the Effort Sharing Regulation LMU can be used for compliance only to the extent that cumulated ESR emissions exceed cumulated AEAs and only to the extent that emissions exceed AEAs in that year. In addition, Member States are not allowed to have net-purchases of LMUs. This means that Member States with emission reductions exceeding their limit cannot use the excess LMUs for compliance but can transfer it to other Member States for their compliance under the LULUCF Regulation – but not for their compliance under the ESR. There is also some flexibility in the other direction: in the case of net LULUCF emissions, AEAs can be used for compliance.

Compliance under the LULUCF Regulation is based strictly on accounted emissions and removals. This means that the development is calculated against a baseline which has been fixed beforehand (Böttcher et al. 2019). Until now there is no estimate about the expected amount of excess removals: While there are GHG emission projections available for the LULUCF sector, these are often not sufficiently detailed to allow for a reliable calculation. Reporting requirements will be improved under current implementing rules for the governance regulation, but the lack of annual data and options for changing Forest Reference Levels even after they have been set will hinder the calculation of projected emissions and sinks in the sector.

Even under the assumption that removals in all Member States are sufficient, only about 220 million LMUs could be used for national compliance in the case of WEM emission developments projected by Member States under the current 2030 target framework. About 60 million of the total of 280 million LMUs could remain unused because some Member States do not meet the conditions in the ESR: cumulated emissions need to be higher than cumulated AEAs. The use of LMUs would be even lower in the event that additional policy measures are taken, as highlighted by the WAM scenario, where about 180 million LMUs would remain unused.

Following these considerations, in the current setting it seems to be the case that not all potentially available sinks can be used. The flexibility between ESR and LULUCF Regulation is a compensation mechanism driven by the idea that it should be kept to a minimum to ensure emission reductions in sectors covered under the Effort Sharing Regulation.

In the long term it will be necessary to increase LULUCF sinks and to redefine the LULUCF target to become a net sink to compensate remaining emissions from other sectors in 2050 (see also Box 2). In view of the need to guide the way to such a target, to underline the importance of this sector and to smoothen the process of discussion, incremental increases of the LULUCF flexibility seem possible, assuming that robust accounting rules are always safeguarded.

If Effort Sharing targets are enhanced, the role of LULUCF sinks could be strengthened in parallel: This is possible in two ways:

1. The total number of LMUs allowed for compliance under the Effort Sharing Legislation at the European level could be increased. Considering that such an increase could lower incentives for decreasing GHG emissions in ESR sectors, care should be taken when including higher LULUCF flexibilities. Currently, LULUCF flexibility amounts to about 1 per cent of total emissions levels available for compliance. With higher targets, the number of AEA certificates for compliance decreases, automatically increasing the importance of the LULUCF contribution. In order to safeguard the ambition

under the Effort Sharing Regulation, the percentage of LMUs used for compliance should not increase to more than 3 per cent.

2. The flexibility to use LMUs for compliance under the Effort Sharing Regulation could be increased. For example, this could be achieved by permitting Member States to transfer part of the LULUCF flexibility to other Member States if it is not needed for its own compliance. Alternatively, Article 7 (1)c of the Effort Sharing Regulation could be removed, allowing Member States to buy LMUs for compliance under both the LULUCF and the Effort Sharing Regulation. Neither of these flexibility measures would increase the total planned number of LMUs permitted to be used for compliance under the Effort Sharing Regulation. However, these higher flexibilities would incentivize the use of more sinks in the LULUCF sector because LMUs would become as useful as AEAs in helping meet ESR targets. With these changes it is likely that the higher share of LULUCF flexibility would be used.

Most important of all, both for the climate and for the viability of the flexibility, it is important to first ensure the availability of additional sinks in the LULUCF sector. This can be achieved by, say, improved land management or afforestation measures.

Box 2: LULUCF as a third pillar of the EU climate framework

Under the current framework, ESR and ETS are the main contributors to achieve the 2030 NDC. Both regimes have quantified emission targets. In contrast, the land-use sector uses only a 'no-debit' target: no accounted net emissions from the sector are allowed in Member States. If necessary, the country can buy net removals from other Member States or use ESR allowances to compensate a net sink. In addition, Member States can use some net removals for their compliance under the ESR in specific circumstances.

If the EU is to achieve climate neutrality, the land-use sector will have to play a pivotal role in offsetting remaining unavoidable emissions from other sectors. In the long-term proposal "A Clean Planet for All" (EC 2018b) the Commission modelled different scenarios for achieving net-zero emissions by 2050. In these scenarios the net removals from natural and technical sinks need to more than double relative to the reference scenario. In two of the assessed net-zero scenarios this is achieved by doubling the natural sink with a smaller contribution from CCS and by using other technical removal options; in the third scenario the natural sink increases by only one-third. This will only be possible if the removal capacity is gradually increased from now until 2050. This could justify making the land-use sector a separate pillar of the EU's climate framework.

A separate LULUCF pillar could take the form of quantified removal targets for each Member State, differentiated by category. These targets would increase over time and in line with the 2050 objective. It could contribute to the overall reduction of emissions by 2030 beyond 55 per cent relative to 1990 levels or contribute in a moderate way to the 55 per cent target. It is important that the LULUCF pillar does not negatively impact emission reduction efforts in the other sectors. Due to questions of permanence and accounting, avoiding emissions is better for the climate than removing carbon. Most important for achieving carbon neutrality, the remaining emissions need to be as low as possible.

7.6 Flexibility 3: ETS allowances

Article 6 of the ESR allows certain Member States to cancel allowances from the EU ETS to comply with their commitments under the ESR due to their specific abatement costs. For most of the eligible EU Member States, the maximum annual limit for using EU ETS allowance cancellations for compliance under the ESR from 2021 to 2030 is 2 per cent of their Effort Sharing emissions in 2005. For Ireland and Luxembourg a higher threshold of 4 per cent applies. Six out of nine eligible EU-27 Member States (Austria, Denmark, Finland, Ireland, Luxembourg and Malta) notified the Commission that they intend to make use full use of this flexibility. Belgium indicated that it will use its 1.89 per cent flexibility; the Netherlands and Sweden decided not to use their respective flexibilities (DG Clima 2020a).[17] In total, the allowance cancellations by the seven Member States amount to approx. 6 million allowances in 2030.

Cancelling EU ETS allowances works as a soft link between the ESR and the EU ETS. It increases the share of the EU ETS for meeting the overall target by a pre-defined level. It does not affect the functioning of the Market Stability Reserve (MSR) of the EU ETS because the additional cancellations will not be reflected in the calculation of the feed-in to the MSR. A soft link between ESR and ETS can be assessed from different perspectives:

- → it is a relatively simple mechanism and comparatively easy to implement;
- → it can avoid at least some of the challenges that could result from expanding the scope of the EU ETS (see chapter 8.2);
- → due to the need for ex-ante notification of its intended use it is extremely transparent to the market participants in the EU ETS segment;
- → it does not interfere with the functioning of the MSR;
- → it reduces revenues from the auctioning of allowances, thus limiting the potential for the targeted use of these revenues; and
- → it will not deliver additional emissions reductions from carbon pricing in the ESR sectors.

With a view to the emerging revision of EU climate policy architecture, expanding this soft link between the EU ETS and the ESR could be a robust option to increase the flexibility for compliance without going through the potentially complex changes in the different regulatory frameworks. There are two reasons why:

- → each percentage point of total ESR emissions of the EU-27 in 2005 as a general allowance for cancelling EUAs for compliance under the ESR would decrease the cap of the EU ETS in 2030 by approx. 25 million EUAs; and
- → making all EU-27 Member States eligible for this flexibility mechanism and limiting the (additional) maximum use of it to uniform levels in the range between 2 and 4 per cent (lowering the cap in 2030 by 50 and 100 million EUAs, respectively) is a sensible policy option.

However, a complete consideration of this mechanism will require careful assessment of the intended ambition level of the EU ETS, the remaining abatement potential from the emissions regulated by the ETS (without the expanded soft link to the ESR), and the alternative of expanding the scope of the EU ETS.

17 In addition to the EU Member States, Norway and Iceland were also eligible to use this flexibility. Only Iceland intends to use the 2 per cent flexibility from cancelling EU ETS allowances.

8 Reform of the EU ETS

8.1 Adjustment of the EU ETS cap

Raising the EU's GHG emissions reduction target for 2030 to -55 per cent would require a revision of the EU ETS. This revision must find answers to the following four questions:

- How can the EU ETS cap be adjusted to be consistent with the overall target?
- What does this reduced cap imply for annual allocation in 2030 (via auctions or free allocation)?
- How should the parameters of the Market Stability Reserve (MSR) be adjusted to ensure that no additional emissions occur due to the MSR mechanism?
- How do the three dimensions mentioned above fit with the need to reach climate neutrality by 2050?

In the current ETS architecture the cap adjustment for the EU ETS can be implemented by adjusting three parameters:

- adjusting the Linear Reduction Factor (LRF), which defines an annual cap contraction based on a given base level;
- defining the year when the adjusted LRF should be applied for the first time; and
- adjusting the base level for the LRF (rebasing), which is currently defined as the average allocation for the period 2008-2012 (this base level is 152 Mt CO_2 higher than verified emissions from stationary installations regulated by the EU ETS in 2008-2012 for the EU-27).

There is a range of additional factors that can impact the LRF needed to meet certain emission reductions within the EU ETS, e.g. the inclusion of aviation emissions and how the LRF will be applied to the aviation ETS. However, these factors change the following modelling results only across a very narrow range.

Table 4 shows the modelling results for different combinations of options for the cap adjustments. To reach the 55 per cent reduction target of the EU 27, the EU ETS cap needs to be limited to 805 million allowances in 2030, provided that the ESR has a target of 47 per cent below 2005 levels. For LRF levels, this means:

- without rebasing the LRF would need to increase from 2.20 per cent to 4.60 per cent or 5.41 per cent, depending on the year when the revised LRF is to first apply;
- rebasing would lower the LRF adjustments significantly:
  - for a rebasing of 152 Mt CO_2 (adjusting the base level to average 2008/2012 emissions instead of allocation), an updated LRF of 3.64 per cent or 4.11 per cent would be sufficient; and

Options for adjusting the EU ETS cap for 2030 — Table 4

	Rebasing in Mt CO_2	LRF adjustment from ... onwards	New LRF	Total new EUA in million EUA (2021-2030)
"EU ETS cap (for stationary installations) 61% below 2005 (805 million EUA)"	0 0	2023 2025	4,60% 5,41%	12.030 12.405
	152 152	2023 2025	3,64% 4,11%	11.189 11.412
	300 300	2023 2025	2,69% 2,86%	10.370 10.446

Calculations by Öko-Institut e.V. (2020)

- for a rebasing of 300 Mt CO_2, an increase of only 2.69 per cent or 2.86 per cent would deliver the new cap level by 2030.

In addition to the emission ceiling implemented by the EU ETS cap, the mechanisms of the Market Stability Reserve (MSR) need to be considered for assessing the contribution of the EU ETS to the overall compliance with the NDC target. The MSR could change this contribution if the MSR releases a significant quantity of allowances back to the market. Against the background of the recent surplus, the fundamental changes in the European electricity market, the implications for hedging demand and the emerging adjustment of the MSR provisions, it seems unlikely that such a release will take place.

The modelling shows the LRF levels needed to be consistent with the goal of achieving climate neutrality within the EU ETS by 2050:

→ without rebasing, the LRF would need to be adjusted to 3.0 to 3.2 per cent, depending on the starting year for the revised LRF (2023 or 2025), which is significantly lower than the levels needed to reach the 2030 targets;
→ for a rebasing of 152 Mt CO_2, the LRF would need to be adjusted to around 2.5 per cent, mostly irrespective of the year when the revised LRF is to first apply, which, again, is significantly below the LRF levels needed for meeting the 2030 targets; and
→ for a rebasing of 300 Mt CO_2, this range would be reduced to around 2.3 per cent, depending on the starting year of the revised LRF, which would be slightly closer, but still lower than the levels needed for meeting the 2030 target.
→ ompared to an exclusive LRF adjustment, a combination of LRF adjustment and rebasing would significantly reduce the number of new EUAs placed on the market between 2021 and 2030

Applying these LRF levels would thus require higher contributions from the ESR to achieve the 55 per cent target.

These modelling results underline the outstanding role of rebasing for the cap adjustment. A rebasing of approx. 300 Mt CO_2 would fit best for reaching the 2030 targets and would be consistent with the climate neutrality target by 2050. For a contribution of the EU ETS consistent with the 2030 target of 61 per cent below 2005 levels, climate neutrality would be reached around 2050 for emissions from stationary sources that are regulated by the EU ETS in the EU-27.

Based on the significant impact of the LRF adjustment, the recommendable rebasing of the LRF and the long-term consistency of the forthcoming EU ETS revision, this reform should be scheduled as early as possible in the European Green Deal.

8.2 Inclusion of new sectors in the ETS

There is widespread discussion among economists and policy makers about whether the integration of additional sectors into the ETS could lead to more efficient climate policy. The integration would make abatement costs more uniform across sectors and the cheapest climate options would be tapped first across the European economy. Member States would need to adopt fewer or less rigid national policies for these sectors, because the price & cap system of the EU ETS could help to deliver the needed emissions reductions. Moreover, it is assumed that the strict compliance mechanism of the EU ETS could actually strengthen the governance of the EU climate policy architecture. However, expanding the scope of the EU ETS to new sectors could create significant distributional effects between sectors and Member States, which would require significant regulatory changes within the EU ETS and would have to be assessed with a view to the overall policy mix and reform requirements.

The following options for applying emissions trading to new sectors have been intensely discussed in recent debates:

→ **Option A: Europe-wide inclusion of whole new sectors in the EU ETS:** The EU ETS Directive could be amended to include CO_2 emissions from new sectors (e.g. transport, buildings and/or those parts of industry that are not regulated by the EU ETS) in the existing EU ETS. This amendment would define the cap, MRV provisions, a legally robust definition of the point of obligation and potentially new mechanisms for revenue allocation from allowance auctions. Once included, the emissions of these sectors would not fall under the Member States' responsibilities anymore and hence would be deducted from their Effort Sharing targets. The cap in the EU ETS and its contraction mechanism would be adjusted accordingly. A uniform allowance price in the EU ETS would apply to all sectors in all countries that are part of the EU ETS.

→ **Option B: Member State include new new sectors in the EU ETS:** The current Article 24 of the EU Emissions Trading Directive already allows individual Member States to include additional activities and gases of their country in the EU emissions trading scheme on request. However, no Member State has done so to date. After rulings by the European Court in 2017 on the definitions of "installation" and "emission," it is uncertain whether sectors that can only be regulated upstream (as with the transport and building sectors) would actually qualify as activities pursuant to the current Article 24. However, Article 24 could be amended such that it explicitly allows for Member States to include upstream emissions in the EU ETS and provide a legally robust definition for the respective point of obligation. In this case – as provided for in Article 24 – the EU Commission would need to propose a methodology by which some of the individual Member States' Effort Sharing emissions would be moved to the ETS in adjusting the Effort Sharing target of a given Member State and in establishing the respective MRV provisions. It would also be useful and probably necessary to adapt the rules on the allocation of revenues from allowance auctions.

→ **Option C: Introduction of a separate ETS for transport and/or buildings:** A new directive could be drafted to establish a new emissions trading system for CO_2 emissions from fossil fuels used in transport and/or buildings. It would cover all provisions on cap, point of obligation, MRV and revenue distribution from allowance auctions. As in Option A, the emissions of these sectors would not fall under the Member States' responsibilities and hence would be deducted from their Effort Sharing targets. The cap in the new "transport and/or buildings-EU-ETS" would be established accordingly. In contrast to Option A, the allowance prices in the current EU ETS (covering energy and industry emissions) and the separate transport-and-buildings ETS would differ based on the caps and marginal abatement costs in these sectors.

→ **Option D: Member States participate in a separate ETS for transport and/or buildings:** A new ETS for transport and/or buildings could be established (as in Option C), but with voluntary participation by Member States. In this option, a Member State could either vote to include its transport and/or buildings sector in the newly established EU ETS and allow the newly established transport/building ETS system to deliver the emission reductions needed, i.e. the Member States would have no domestic responsibility for these emissions, since they will be deducted from their national effort-sharing targets. The cap for this opt-in model would need to reflect the different emission reduction obligations of the respective Member States under the ESR. The alternative would be for the Member State to keep the emissions of the transport and/or buildings sector under their national responsibility – requiring them to come up with domestic measures or use AEA transfers from other Member States to close the gap between its effort-sharing target and the domestic emissions. From the perspective of the EU's climate policy architecture, the latter type of opt-in would be no more than a special case under national policies and measures.

As part of their domestic climate policies and measures, Member States can introduce a national emissions trading system for transport and/or buildings. For example, Germany has decided to start such an ETS for transport and buildings as of January 2021.[18] It will still have full responsibility for the transport and/or buildings emissions in its jurisdiction but would use a domestic ETS as a means of complying with their effort-sharing targets. Germany can later decide to link its national emissions trading system with those of other nations, so that trades between the transport and/or buildings sectors across countries would correspond to AEA transfers between Member States.

Any assessment of these options needs to take into consideration a range of specific aspects:

- → In contrast to the sectors currently regulated by the EU ETS, the potential new sectors to be included are subject to a very broad range of high-impact EU-wide policies and measures. For example, standards for new cars, trucks, houses and appliances are currently the main – and most effective – instruments implemented EU-wide on transport and buildings.
- → In all Member States there are energy taxation schemes in place with various justifications for rates and uses. These also have a steering effect on CO_2 emissions – like carbon pricing mechanisms – even though they were not intended as such. In some Member States, an explicit carbon pricing system exists for fuels and gases. Adding a uniform ETS price on top of the major tax differences between the Member States and between sectors and/or fuels creates significant distortions and perverse incentives. With sovereignty in the transport and heating sectors, individual Member States could potentially reduce their energy taxes as a consequence of an EU-wide uniform to CO_2 pricing within the framework of an ETS.
- → In some Member States, high-impact policies and measures exist (e.g. building codes, technology bans, purchase and/or motor vehicle taxes, road pricing schemes) that have significant impacts on the emissions of sectors not currently regulated by the EU ETS.

It should also be noted that the descriptions of the four options above only provide a rough sketch of what would be needed to implement them in practice. Putting any one of them in place would require sorting out many questions regarding strategy and implementation and require careful consideration and much further analysis and assessment:

1. Some who argue for making stronger use of ETS see it as a replacement for existing or emerging high-impact measures. For several reasons, this is wrong when it comes to the transport and buildings sectors:
- → The ETS regulates only the use of fossil fuels – it does not regulate the investment. However, in many cases the CO_2 emissions are to a large degree locked in with the investment decision. And there is strong evidence from the transport and construction sectors that investment decisions are rarely based on assessments of total cost of ownership over the lifetimes of the investment, and that such approaches would be subject to very high uncertainties in the case of long-life investment (e.g. in the buildings sector). To get CO_2 emissions down, it is key that standards impacting investment decisions (e.g. EU CO_2 emission performance standards for new cars, as well as Ecodesign and building standards) be continually tightened.
- → Many Member States already have medium-to-high taxes on fuels, especially on diesel and petrol. The income of these taxes is typically key for government budgets – and already today the taxes serve as implicit carbon pricing for emissions in transport and buildings, amounting in many

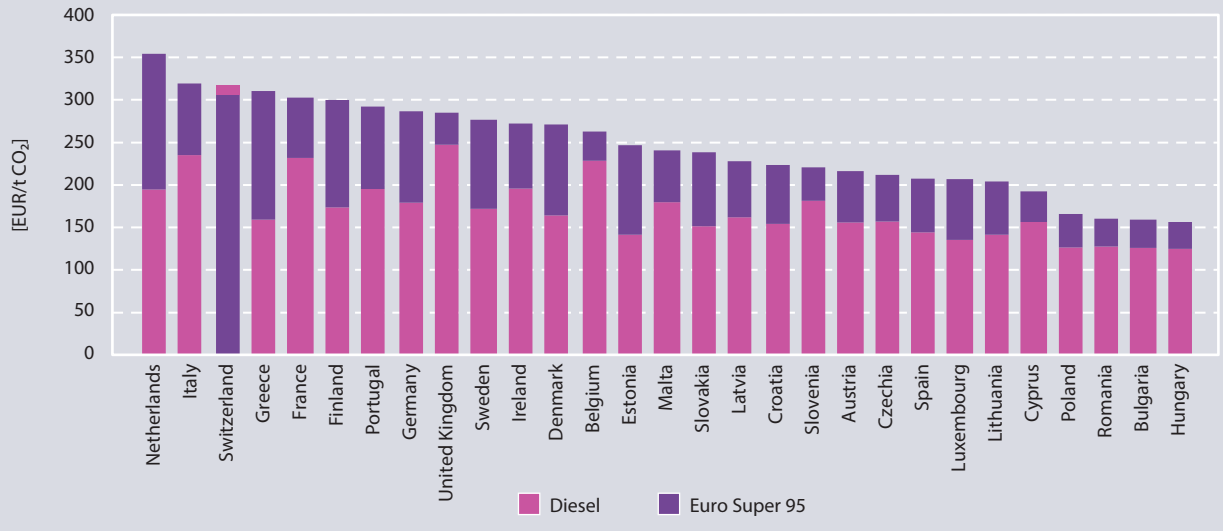
18 The system will start as a fixed price regime: in the first five years, it will function effectively as a continually rising tax. Beyond 2025, price formation shall be left to the market but will be subject to a price corridor at least through 2026. The decision on whether or not a price corridor will continue to apply afterward 2026 will likely occur in 2025 (Matthes 2020).

Member States to an equivalent of 150–350 €/t CO_2 (Figure 15). If the ETS price would come on top of the existing implicit carbon prices in Member States, this would effectively perpetuate very different levels of effective carbon pricing levels with all that that entails. However, experience with other carbon pricing models also shows that some countries have offset the introduction of explicit carbon prices with (significant) reductions in traditional energy taxes. Thus, it is also possible that the transition to a uniform ETS price for transport and heating fuels could result in a race to the bottom in energy taxation unless the EU energy taxation directive mandates appropriate levels of minimum tax rates.

→ If, as some economists prefer, the ETS were the sole instrument to drive down emissions in the transport and/or building sector, the CO_2 price would rise to the marginal abatement cost of these sectors, i.e. the most expensive option to reduce CO_2 given the ETS cap. Especially if the upcoming cap for the current scope of the EU ETS is ambitious (i.e. the low hanging fruits from the coal phase-out are already exploited) the inclusion of new sectors in the EU ETS will lead to massive increases of allowance prices in the EU ETS. In the building sector, carbon prices of 145 to 245 €/t CO_2 would be required in addition to the existing regulatory and taxation system to achieve significant emission reductions in Germany by 2030 (Matthes 2020). With respect to emissions from cars, carbon prices of 250 €/t CO_2 or more in addition to the existing regulatory and taxation framework would be required to achieve significant emissions abatement contributions in Germany by 2030 (Matthes 2020). Thus, standards and other regulatory measures for transport and buildings are key in order to keep the prices in the ETS at levels that are somehow manageable for the industry and power sectors. The more flexible the inclusion of the EU ETS is (Option B), the higher the uncertainty with regard to the resulting allowance price effects, which could have a disruptive impact on the industry and power sector.

→ Lastly, transformative emission abatement options for the transport and building sectors have significant lead times for innovation and upscaling and depend on forward-looking infrastructure roll-outs and adjustments (i.e. charging infrastructure).

Motor fuel taxation and implicit carbon pricing in Europe (June 2020) Figure 15



Calculations by Öko-Institut e.V. based on EC (2020)

Carbon pricing mechanisms will only have a limited impact on these crucial elements of the transformation towards climate neutrality.

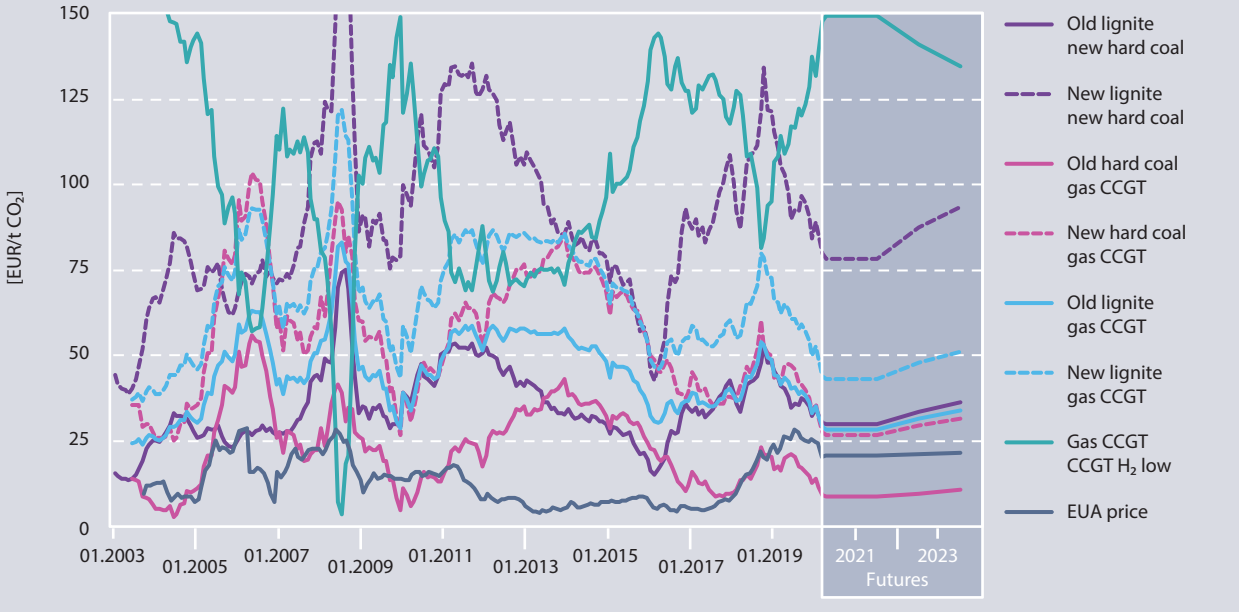
An inclusion of transport and buildings in the EU ETS (options a and b) or even a separate ETS for transport and/or buildings (options c and d, including domestic ETS systems) could only work effectively and efficiently as part of a well-designed broader policy mix, safeguarding existing and new climate measures, e.g. ambitious CO_2 standards for cars and trucks, heating system regulations, building codes, road pricing, fuel taxes, etc.

2. If Option A or B were pursued, i.e. the inclusion of transport and/or buildings sector in the EU ETS, the effect on energy and industry would be massive.[19] For example, the current EU ETS price of around 25 EUR/t of CO_2 – given actual prices for coal and gas – has already substantially changed the landscape of Europe's power sector, driving parts of the coal power fleet all over Europe out of the market since 2019. However, the 25 EUR/t CO_2 rate translates into only a 6-7 cents per litre increase in fuel prices for diesel or petrol – far too little to have any significant impact on emissions in the transport sector. Hence, including the transport sector in the current EU ETS would need to lead to a higher equilibrium price in the EU ETS, at a level where the needed reductions of the enlarged ETS are met. In all likelihood, the carbon price will be much higher than 60 EUR/t CO_2 (see Figure 16). This would be the price level needed for a very fast decarbonisation of the European power sector. Coal would be phased out faster and renewables would be cheaper than any fossil power plant.[20] However, it would

19 In the case of option b) this applies if at least one or more large EU Member States pursues this route.

20 In practice, the market penetration of renewables would face delays and limits resulting from the inertia of planning, permitting and infrastructure roll-out.

Costs for switching fuels in the continental European power market — Figure 16



Calculations by Öko-Institut e.V. based on European Energy Exchange, Intercontinental Exchange

also pose a severe challenge to energy-intensive companies, which would have to contend with massively higher CO_2 prices.

3. Given the price effects described above, a reform of the EU ETS would need to cover much more than just the inclusion of new sectors. Large-scale accompanying measures for coal regions would be needed in order to make sure that the coal-to-clean transition in the power sector would be a just transition. Furthermore, the architecture of the EU ETS would require fundamental reform. Existing carbon leakage protection mechanisms (free allocation of approx. 80 per cent for the average fleets in the respective industrial sectors) would need to be substituted or complemented by additional policy instruments (e.g. carbon border adjustments, investment incentives for transformative production alternatives, standards). Moreover, political pressures to introduce price caps would quickly emerge as a serious issue in the reform debate, threatening to undermine the intended effectiveness of the reform itself (in terms of emission reductions or with a view to the accountability of compliance mechanisms). A robust assessment of these consequences from expanding the scope of the EU ETS with a more or less flexible approach (Options B or A) and exploring the need and the options for respective changes in the EU ETS provisions and the broader regulatory framework is a fundamental prerequisite for any pathway towards Option A or B.

4. Including transport and/or buildings in the EU ETS would require these sectors to be captured upstream (e.g. at the level of fuel suppliers), because it would not be sensible to try to monitor the emissions of individual cars or heating boilers. However, the current EU ETS is a downstream system, i.e. all individual installations and power plants report their emissions, which makes the costs of emissions explicitly visible and transparent. Mixing an upstream and a downstream ETS is complicated and needs a very careful design to avoid double counting or loopholes. It also leads to a situation where some of the decision-making entities (drivers, households) are not exposed directly to the costs of emissions. This could decrease the incentives for changing investment and/or usage behavior because of the other factors that have an impact on energy prices and might obscure the signaling effects of a directly visible price on carbon.

This overview highlights that using the EU ETS as a flexibility mechanism for the EU climate policy architecture is neither a "silver bullet" nor is it assessable at a generic level. An appropriate assessment needs to carefully consider:

- → the emerging ambition level of the EU ETS in its current scope,
- → the effective gains from greater flexibility in the climate policy architecture and the stricter compliance regime of an ETS,
- → the broader policy mix at the EU level (and with regard to energy taxation),
- → the context of existing or emerging national policies (and with a view to energy taxation and/or carbon pricing),
- → the political efforts needed for the different ranges of adjustments to the legislative and regulatory framework,
- → the necessary safeguards for limiting or compensating distributional effects between Member States, as well as preventing carbon leakage and countervailing national policies, and
- → the consistency of the pathway towards climate neutrality by 2050.

In any case, Member States should design their carbon pricing policies in such a way that their further development opens up a path towards more European integration, allowing commitments under the European climate policy architecture to be met more flexibly.

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