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National targets and the ETS in a post-2030 climate target architecture

A quantitative and qualitative discussion of scopes and synergies

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AEA	Annual Emission Allocation, emission rights under the ESR
BioCCS	Carbon capture and storage of biogenic CO2 emissions originated from the combustion of biomass to produce energy (BECCS) or from the processing of biomass in industrial applications
CDR	Carbon Dioxide Removals
DACCS	Direct Air Carbon Capture and Storage
EEA	European Economic Area
ESR	Effort Sharing Regulation
GHG	Greenhouse gases
LULUCF	Land-use, land-use change and forestry
RMU	Removal Unit, tradable right under the LULUCF Regulation

Key findings

- If properly designed, national targets and the EU ETS can complement each other and be an effective contribution to achieving the 90% target by 2040. Currently, the Effort Sharing Regulation, the EU ETS and the LULUCF Regulation are an example for such a combined approach.
- National targets will remain a key element of the EU's climate architecture for the period 2030 to 2050. The ETS is applied uniformly across the EU and ensures convergence towards the long-term target. National targets can reflect solidarity and national circumstances, ensure government action to address non-economic barriers and thereby can avoid excessive ETS prices.
- The 2040 target is a net accounted 90 % reduction target compared to 1990 which allows for a contribution of up to 5 % of international carbon credits; the EU's domestic net target is 85 %.
- One option to use these international credits could be to lower the ambition of the ETS and national targets, i.e. these systems could be designed in a way that they achieve the domestic net reduction target of 85 % below 1990 jointly. As one alternative, (a share of) international credits could be used by Member States on a voluntary basis to achieve their national targets. It would be left to each Member States whether they intend to achieve their target through domestic action alone or complement action with the purchase of credits. In such a case, national targets and ETS would need to achieve a higher emission reduction than just 85 %. For the quantified assessment in this paper, we assume that ETS and national targets are designed to jointly achieve a net domestic reduction of 86 %. Member States may use another 1 % of 1990 emissions for the achievement of their national targets.[1]
- There are different possible scopes for national targets post-2030: a continuation of the current system, economy-wide targets, only for non-ETS emissions or sectoral approaches. These scopes can be classified as gross emission targets addressing only emissions, gross removal targets addressing only emission removals or as net targets combining emissions and removals in one target.
- The scope of the ETS and national targets should ensure that all relevant sources of emissions are covered at least by one system or an alternative effective limitation such as the F-Gas Regulation. Overlaps can provide synergies but need to be designed carefully.
- Economy-wide gross emission targets together with a LULUCF target or a continuation of the current system with ESR and LULUCF targets have clear advantages compared to the other options discussed in this paper:
    - A reduced ESR only covering non-ETS emissions would evolve into an agriculture-only target over time. Agriculture is one of the most politically charged sectors and emissions are very unevenly distributed across the EU. It would be very difficult to agree a distribution key for national agriculture targets.

[1] Other options for the relationship between the overall target and the use of Article 6 credits are also possible, e.g. designing EU climate policy to achieve 90% domestic emission reductions and only use international credits as a failsafe if policies and measures do not deliver sufficiently. Such options are not further explored in this paper but would not impact the overall conclusions.

  - Net targets containing emission reductions and removals conflate short-term and uncertain removals from the land-use sector with permanent greenhouse gas emissions. This contravenes the like-for-like principle which states that removals and compensated emissions should have the same characteristics.

- National targets should reflect solidarity between Member States. With current assumptions there remains a large gap in wealth between the poorest and richest country within the Union after 2030. A continuation of the GDP/capita approach to distribute the overall reduction commitment to Member States remains feasible post-2030 and could also be applied to gross economy-wide targets.

- Emission reductions are key to ensure the achievement of the 2050 net zero target and negative emissions afterwards. On the other hand, the contribution of removals is important but uncertain: The development of the land-use sink is under stress partially due to the increased harvesting levels. In addition, it has proven unpredictable, and this will worsen with the impacts of climate change on forests and other lands. The development of technical removals is just starting and for the foreseeable future the overall amount of these removals will be small. Net targets are important to show the overall ambition, but clear minimum emission reductions requirements have to be implemented as well.

- Flexibilities are an important element to increase cost-efficiency and support Member States in achieving their national targets. Flexibilities can either be within the scope of a target or as an exchange between instruments. If targets are defined to cover multiple sectors, full flexibility within these sectors is possible. Nevertheless, the aggregation of sectors should take into account the different characteristics of sectors, regarding their size, expected development in a mid- and long-term view and requirements to reduce GHG emissions. This becomes especially important for net and removal targets where non-permanence in the land-use sector is a major concern.

1 Background

The current European climate target architecture started with the introduction of the EU ETS in 2005. The first national greenhouse gas emission targets followed with the so called “Kyoto targets” for the years 2008 to 2012 which were economy-wide targets encompassing all sectors. This changed with the Effort Sharing legislation which came into effect in 2013: it sets nationally binding targets for those emissions which are not covered by the ETS 1 and which are not allocated under the land-use, land-use change and forestry (LULUCF) sector[2]. The latter are covered by the LULUCF Regulation since 2021 which sets national targets for these emissions and removals. Starting in 2028, a large proportion of the emissions covered by the Effort Sharing Regulation (ESR) will also be included in the ETS 2 which limits emissions from road transport, buildings and small installations. At this point, the ETS regulation will overlap with national targets to create synergies, due to the different distribution of targets: ESR targets are differentiated mainly based on wealth in terms of GDP per capita whereas the ETS 2 provides a flat target across all Member States, like under the ETS 1.

Currently, both the ESR as well as the LULUCF Regulation and the targets they contain end in 2030. In contrast, the ETS Directive does not contain an end-date; both ETS 1 and ETS 2 will continue and require annual greenhouse gas emission reductions unless lawmakers change the relevant legislation. In July 2025 the Commission published its proposal for amending the European Climate law[3]. This proposal has been discussed with the European Council and the Parliament until a Trilogue Decision has been agreed in December 2025. This decision still needs to be formally adopted. This paper is based on this compromise text of 19th December 2025[4].

Apart from the setting of the 2040 target (see section 2), the agreed amendment also includes a list of twenty issues which need to be reflected in the legislative proposals to implement the 2040 target. These issues are especially important for the following analysis as they include the continued existence of national targets as well as the need for “fairness and solidarity” which shows that European co-legislators also see the need for national targets post-2030 in parallel to the ETS.

The ETS will remain a pillar of the European climate target system, but it will have to be accompanied by other Regulations and national targets for Member States. While a price on CO_2 and other GHG is of utmost importance for the information on future investments, behavioural change and fuel switching, its impact is limited due to non-economic barriers and irrational market actors. A carbon price alone will also not lead to the adoption of necessary but high-cost mitigation options such as e-fuels or technical removals which will be necessary to achieve net-zero. The current changes to the ETS 2 – its postponement and lowered ambition – show that effective climate policy needs a broader base than just one instrument. For a more in-depth discussion of the need for national targets see Meyer-Ohlendorf et al. (2025).

With this paper possible post-2030 climate target architectures are discussed with a special focus on synergies between the EU ETS and the design of national targets. We only touch upon flexibilities between and within national targets but do not address governance questions. Importantly, national targets -especially those covering a broad range of sectors and activities – leave considerable room for Member States on how to achieve them. This provides a high level of flexibility and follows the

[2] Some other exceptions apply, most importantly CO_2 emissions from aviation and shipping outside of the ETS 1 are not included in the ESR either.

[3] https://climate.ec.europa.eu/document/download/e1b5a957-c6b9-4cb2-a247-bd28bf675db6_en

[4] https://data.consilium.europa.eu/doc/document/ST-17086-2025-INIT/en/pdf

principle of subsidiarity. In addition, national targets can be formulated in a way that is short and easy to understand.

2 Understanding of the 2040 target

The European Law currently sets European wide climate targets for 2030 and 2050 and will now be amended to include an intermediate 2040 target: A binding reduction of net greenhouse gas emissions by 90 % compared to 1990 levels by 2040. Net emissions means that emissions and natural and technical removals are included in one target. Different to the 2030 target, there is no limitation for the contribution of removals. And in contrast to the 2030 and 2050 targets, the 2040 target is not defined to be a domestic target: A certain number of international certificates might be used for the achievement of the 2040 target (for an in-depth assessment of the 2040 target see Graichen et al. (2025)).

In the following, these points will be reflected in more detail to set the basis for the quantified analysis.

2.1 Scope and use of international certificates

The scope of emissions covered under the European Law includes net GHG emissions and international transport emissions regulated under EU law, namely those covered by the EU Emissions Trading System (EU ETS)[5]. For the analysis we use the latest GHG inventory data (European Environment Agency (EEA) 2025a) and GHG emissions related to international aviation and maritime activities in the target scope as used by the EEA and the European Commission in latest reports (EEA 2025). **Net 1990 emissions in this scope are 4 726 Mt CO_2eq**. With this, the binding **2040 net accounted target is 473 Mt CO_2eq**.

The proposal states that “high-quality international credits under Article 6 of the Paris Agreement” of up to 5% of 1990 EU net emissions can be used, starting from 2036. The absolute number of international certificates which can be used for the achievement of the 2040 target **amounts to 236 Mt CO_2eq**. This means, that the 2040 target is a **net domestic reduction of 85 % or about 709 Mt CO_2eq**. Amendment 2(5a) states that the use of these certificates corresponds “to a domestic reduction of net greenhouse gas emissions by 85% compared to 1990 levels by 2040”. Co-legislators also amended the review paragraph of the European Climate Law under Article 11: In the review on the operation of this Regulation which is due within six months of each global stocktake, “flexibility for Member States to use high-quality international credits to fulfil up to 5% of their post-2030 targets and efforts” has to be taken into account, amongst others. We understand that this potential use of international credits is part of the total amount and does not reduce the ambition of the net domestic target. The amended ECL clearly states that the “binding Union target for 2040” will include international credits of up to 5% which corresponds “to a domestic reduction of net greenhouse gas emissions by 85% compared to 1990 levels”. In addition, this percentage with regard to national targets relates to the 2040 target value and not 1990 emissions.

With the usage of carbon credits, the 2040 target is an **accounted 90 % net reduction target**. In the following, we do not discuss the potential availability of certificates with respective quality nor the (dis-)advantages of their usage. For an in-depth assessment on the conditions for using Article 6 in the EU’s climate target see Schneider et al. (2025) and Johnstone et al. (2025).

[5] These are CO_2-emissions from intra-EU aviation and flights to the United Kingdom, Norway and Iceland; intra-EU navigation and 50% of emissions from shipping emission between EU and non-EU ports.

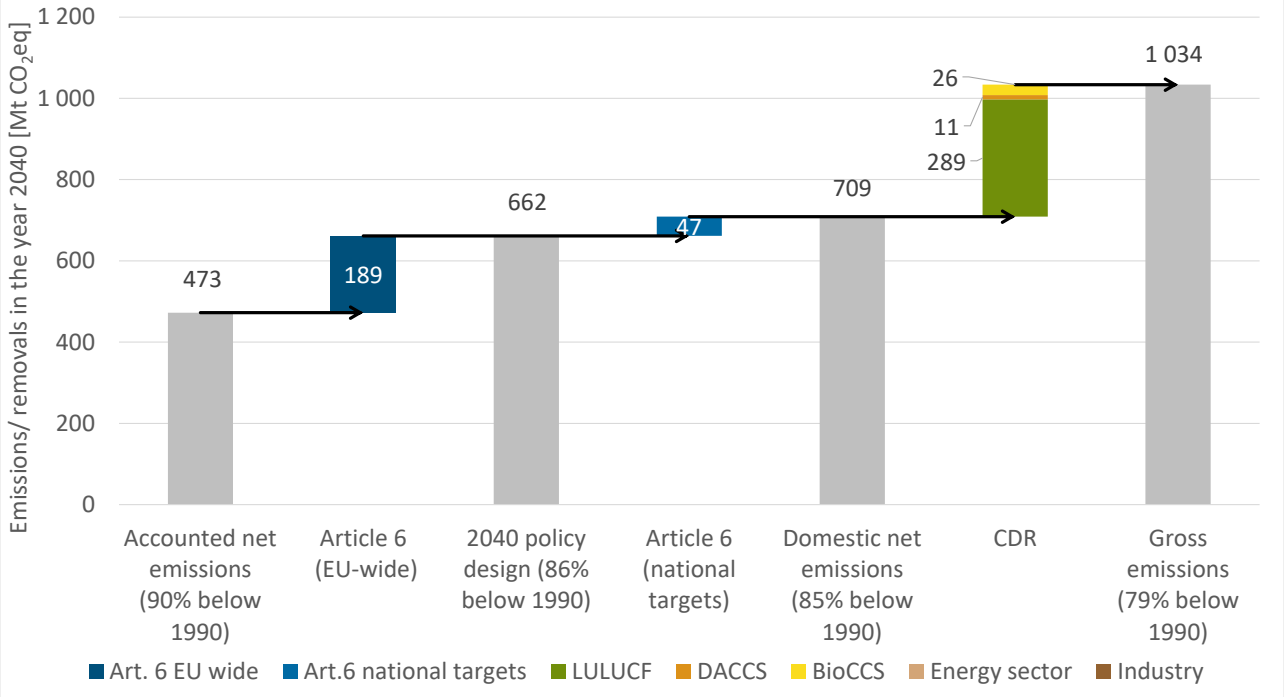
The use of international certificates will start in 2036 (amendment 2(5a)). We assume a linear increase of the usage of these certificates up to the maximum amount in 2040. For the period **2036 to 2040 these are 709 Mt CO_2eq** of international certificates in the climate target architecture. Credits which might be purchased in a potential pilot period 2031-2035 can't be accounted in the phase 2036-2040: the rules for Article 6 under the Paris Agreement require that emission reductions which are credited take place in the same NDC period for which the credits are used. In other words, credits which are generated for the period 2031 to 2035 cannot be used for the NDC period 2036 to 2040.

2.2 Allocation of carbon credits in the climate target architecture

The 2040 targets of different climate instruments need to add up to the overall climate ambition of an accounted net reduction of 90% below 1990. For the following discussion of architecture options, we assume that Article 6 credits are used to the maximum quantity, i.e. 5% of 1990 net emissions, which is 236 Mt CO_2eq. We also assume that one fifth of the total Article 6 quantity (or 1% of 1990 net emissions) is reserved for the achievement of national targets by Member States (see chapter 3.4 for more information on this). We therefore calibrate the domestic emission reductions of instruments (ETS, national targets) to achieve a domestic net reduction of 86 %. This means that the design of the different 2040 targets/ instruments discussed below already factors in the use of 189 Mt CO_2eq of international carbon credits which are under EU responsibility, while 47 Mt CO_2eq are available for Member State compliance of national targets. As will be shown in section 3, this matches well with a possible use of 5 % of the 2040 target for several national target options. Alternative approaches for target setting such as a lower overall share of Article 6 credits to reflect that the ECL only gives a maximum value, higher shares for national targets or restricting credits as a safeguard mechanism if domestic policy fails are not further discussed in this paper. These alternatives would change the absolute 2040 target level but our impact the qualitative assessment of the options and main conclusions.

In Figure 1 the relationship between the 2040 accounted net target, the usage of international carbon credits, and domestic net emissions is explained. In addition, we show the potential magnitude of gross emissions calculated based on the results of the impact assessment for the 2040 target (EC 2024). To do this, we interpolated the results of two scenarios to estimate emissions by sectors/instrument and to estimate natural and technical carbon dioxide removals (CDR) and CCS (see Annex I).

Figure 1: The 90% target and greenhouse gas emissions in 2040



Notes: The quantity of CDRs and fossil CCS is taken from the 2024 impact assessment, calculated as an interpolation between the S1 and S2 scenarios which results in a net domestic reduction of 85 % (see Annex I).
Source: Oeko-Institut

3 Climate architecture options post 2030

The agreed amendment of the European Climate Law mentions twenty elements which shall be reflected by the Commission during the review of relevant Union legislation in order to enable the achievement of the post-2030 targets. Some of these elements point directly to national targets:

- (d): Member States post-2030 targets and efforts should reflect cost-efficiency and solidarity […];
- (n): fairness and solidarity between and within Member States;
- (o): the need to ensure environmental effectiveness and progression over time, while also safeguarding social cohesion as well as ensuring food security and a just transition.

The amendments to the ECL also address the continuation of the ETS and it seems clear that the co-legislators intend to continue the current parallel system of ETS and national targets, albeit potentially in different scopes. Carbon pricing and national targets can support each other creating synergies and addressing different barriers which would be hard to overcome in one system alone. This is further discussed in chapter 4.3.

In the following, we discuss several options for designing post-2030 national targets and their interaction with ETS. In addition, the overall coverage of emissions under national target systems and the ETS will be discussed.

3.1 Different options for national targets

National climate targets can either be defined as gross emission or gross removal targets or net emission and removal targets. With this general specification in mind, we see the following general options to implement a framework for the achievement of the net domestic target:

(a) Continuation of the current system: ESR targets are set in parallel to ETS 2, separate LULUCF targets;

(b) Reduced ESR: The ESR continues but only for emissions outside of both ETS, i.e. agriculture, waste, non-CO_2 emissions from energy combustion, fugitive emissions and F-gases. This could be combined with targets for the LULUCF sector;

(c) Economy-wide targets for gross emissions: Targeting emissions from all sources apart from emissions in the LULUCF sector;

(d) Net removal target: Targeting natural net removals and gross technical removals;

(e) AFOLU: Combined national targets for agriculture and LULUCF.

(f) Net economy-wide targets: Return to Kyoto-style targets for Member States covering net emissions including natural and technical removals.

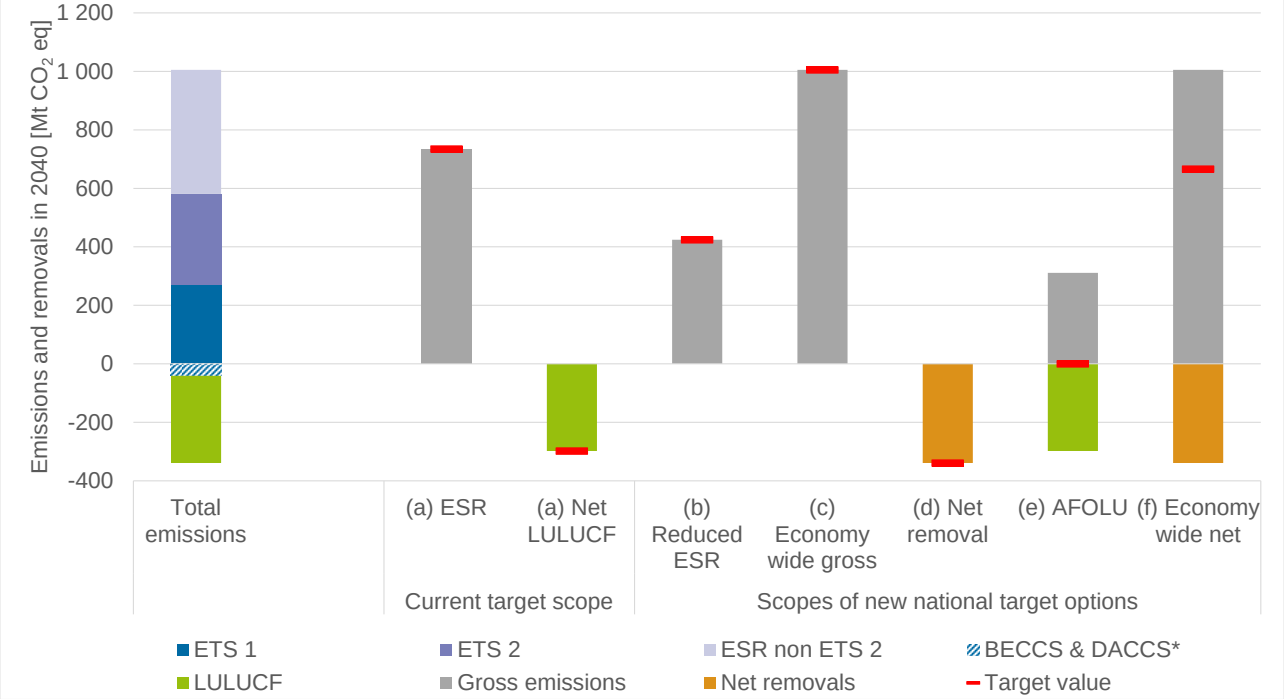
(g) Climate targets for specific sources or sinks: These can be based on gross emissions, like sectoral targets e.g. for agriculture or the transport sector, or on gross removals, like a potential new target for technical sinks (BioCCS, DACCS, biochar, enhanced weathering etc.). The current LULUCF target is a net sectoral target.

In Figure 2 options (b) to (f) are compared to the current system (a), which aggregates national ESR and LULUCF targets as well as ETS 1 and 2 emissions. The figure displays the status of emissions and removals in the year 2040 based on results from the impact assessment for the 2040 target (EC 2024), see Annex I for more information on the methodology). With the assumption that negative emissions from technical sinks are fully covered under the ETS 1 (see discussion in section 3.2), the system a) would fully address all emissions and removals under the target scope.

We focus here on the discussion of the target year 2040. It is also crucial for the general setting of national targets if and how the pathways to these target years are treated: ETS and ESR set emission limits for the entire period 2021-30, not only the target year. Both the ESR and the ETS set annual emission limits. The LULUCF Regulation sets various targets depending on activity and subsector, some of which are cumulative limits for a period of years. This ensures that action to reduce emissions/increase removals is taken continuously and sets a limit on the overall GHG emissions over the entire period. When deciding national targets post-2030 the rules for the trajectory will be a key consideration but this issue is beyond the scope of this paper.

For the post-2030 architecture we assume that the target instruments should cover all emissions and removals within the scope of the ECL. Therefore, some options will have to be implemented in parallel. This means, **national targets could be designed and aggregated in a way that systematically all non-ETS emissions are included**. With this, ESR in the current (a) or reduced (b) scope or an economy wide gross emissions target (c) would have to be implemented together with a separate LULUCF target, which both need to be distributed into Member State contributions. If emissions are not addressed by any climate instrument, these must be addressed by other effective EU-wide instruments, like the F-Gas Regulation (see section 3.3.7). In the next section, the coverage-concept will be discussed in more detail.

Figure 2 Coverage of emissions and removals in 2040 by different target options



Notes: The specific scope of instruments is discussed in more detail below. Emissions and respective target values are based on the Commissions's 2040 impact assessment and explained in Annex I. Please note that there are uncertainties around the values, especially concerning the development of technical and natural removals.
Source: Oeko-Institut

3.2 Coverage of emissions

The scope of the overall EU target is defined in the Climate Law. The climate target architecture for the achievement of these targets needs to cover the whole scope, to ensure that the target can be achieved. For the discussion in this paper, we use the following wording:

- Gap: If emissions or removals of the target scope are not targeted by any climate target instrument (e.g. domestic aviation below the ETS thresholds),
- Overlap: Instruments are designed in a way that emissions or removals are targeted by more than one instrument to benefit from synergies (e.g. ETS 2 emissions under the ESR);
- Not included in national targets: Emissions or removals which are not targeted by national target instruments (e.g. ETS 1 emissions).

With the current climate target system until 2030, **all emissions** which are included in the European target scope are covered. This was not the case for the 2020 target, where a relevant gap occurred between the scope, which included international aviation, and the scope of the instruments, which did not cover all emissions from international aviation. With the European Climate law, all emissions from international transport which are regulated in Union law are included in the overall target. This means, that the 2030 target for the first time includes international shipping emissions as far as they are covered under the EU ETS. For international aviation on the other hand, the scope is reduced compared to 2020. Emissions from flights which are leaving the European Economic Area (EEA), like Paris-New York, are no longer included. However, the EU and its Member States are the cause

of these emissions and should therefore also take responsibility for them. They should therefore be included in the European target scope and accordingly in the climate target architecture. The difference between international aviation emissions in the target scope and those as reported in GHG inventories by Member States is currently 67 Mt CO_2eq and is estimated to be 51 Mt CO_2eq in 2040. This amount becomes more and more important: While outgoing international aviation represents 2 % of total net domestic emissions in 2024, they would account for 8 % of net domestic emissions in 2040. Another source of emissions which could be discussed related to the target scope is the accounting of emissions from non-sustainable biomass. While these are relevant for compliance of operators under the EU ETS, they are accounted as zero emissions in the target scope, assuming that all biomass burned is directly counterbalanced by removals in the LULUCF sector. On the positive side the current definition of the target scope ensures that any additional emission source which might be covered under the ETS will be automatically included in this scope (see below in this section). In this report, we take the scope of the European Climate law as a given and will discuss the coverage of instruments according to this limit.

While emissions are clearly covered by the current targe Jörß (2024)t architecture, a gap might become relevant on the **removal side**: Negative emissions from BioCCS (Biogenic Carbon Capture and Storage) and DACCS (Direct Air Carbon Capture and Storage) as well as from biochar and enhanced weathering are not clearly located in any current climate target instrument. Under the ETS, CCS is a viable way to reduce verified emissions and is already allowed as a mitigation measure. But the costs of technical capture and long-term storage of CO_2 are currently much higher than the CO_2 price. Especially in the case of DACCS, there is the possibility that these installations would not be incentivised to operate under the EU ETS, even if they were to be included in it (Jörß 2024). Negative emissions from BioCCS are explicitly excluded from ESR emissions (see Annex III EU - European Union (2024)). Negative emissions from other processes, such as biochar or enhanced weathering, might become included under a future LULUCF Regulation, as their effects might best be allocated to this sector (see Jörß (2024).

For the purpose of this paper, we allocate negative emissions from BioCCS and DACCS to the ETS 1 scope. Those from other processes are not further considered as they are not quantified in the 2040 Impact Assessment. If these additional removals will play a role by 2040, a clear inclusion in the different climate instruments and targets is necessary to ensure overall consistency and transparency.

The **scope of the EU ETS** increased since its beginning, additional sources and gases were included in several stages. Three options are already under discussion for the next review of the ETS Directive: The integration of emissions from waste, the non-CO_2 emissions from aviation and an extension of the ETS to extra-EU flights. There are several additional options to further increase the scope and to reduce the amount of GHG emissions from fossil fuels without a price signal, like e.g.

- The integration of all remaining fossil fuel related CO_2 emissions into the ETS 2;
- The integration of energy related non-CO_2 emissions into both ETS: Methane and N_2O emissions from combustion are already included in the navigation sector. This approach could be extended to more/all fossil fuels in the ETS.
- The closure of regulation gaps due to exemptions for aviation;
- The integration of fugitive emissions from oil and gas transportation.

Apart from the integration of non-CO_2 and extra-EU emissions from aviation, **all these emissions would be covered by the ESR (if not included under ETS) or by economy wide targets**. There would be a considerable need to increase the scope of the ETS, if only an AFOLU target (c) would be implemented, because a considerable amount of emissions would otherwise not be regulated in Union law.

3.3 Discussion of options for national targets

In the following, the options for national targets are discussed in more detail, always assuming that the ETS stays in place:

3.3.1 (a) Continuation of the current system

National ESR and Net LULUCF targets are designed in a way that nearly all emissions of the target scope are automatically covered, if they do not fall into the scope of the ETS 1. In addition, 61 % of total ESR emissions in 2024 are covered under the ETS 2.

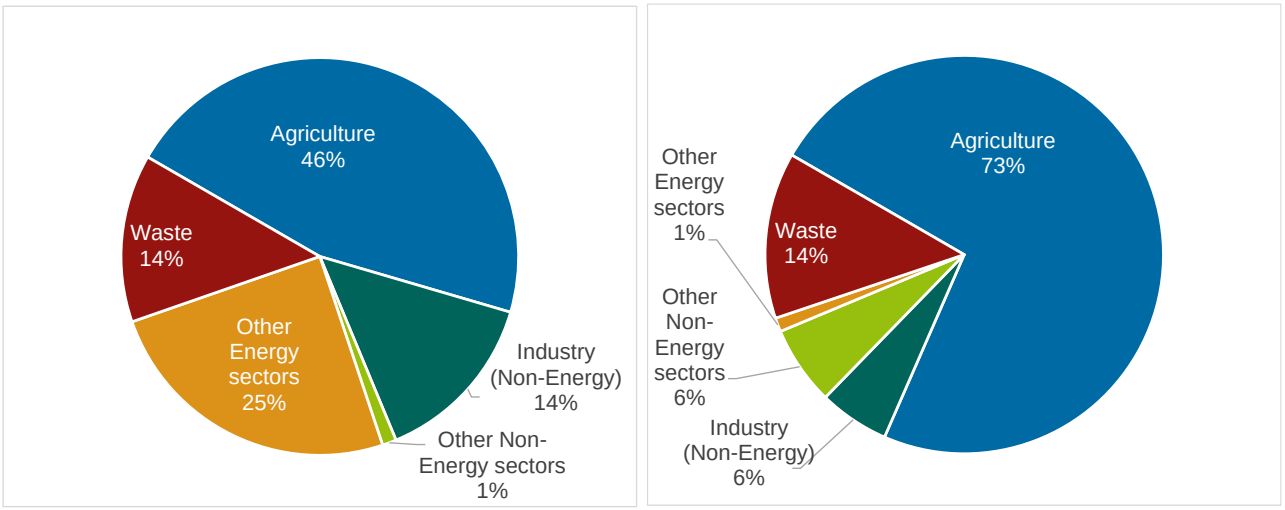
- ⇨ Gap: Possibly technical removals, if not addressed under ETS 1 or added to ESR.
- ⇨ Overlap: ETS 2 and ESR
- ⇨ Not included in national targets: ETS 1

3.3.2 (b) Reduced ESR

Currently, there is a considerable overlap between ESR emissions and ETS 2. The ESR scope could be reduced to emissions outside of the ETS, which is mainly agriculture, waste, non-CO_2 emissions from energy combustion, fugitive emissions and F-gases. In total, these sectors emitted 774 Mt CO_2eq in 2024, nearly half coming from agriculture (Figure 3, left). If such a target would be chosen, a different distribution parameter than for the continuation of the ESR needs to be considered, to take into account the specific, agriculture based, scope of the target.

The sum of non-ETS emissions apart from agriculture is decreasing, either due to other Regulations (F-gases and waste) or due to their direct relation to fossil fuel use (non-CO_2 from energy combustion and fugitive emissions). Based on the Commission scenario, emissions from these sectors decline to 424 Mt CO_2eq and a share of 73 % of agriculture by 2040 (Figure 3, right).

Figure 3 Share of ESR emissions outside of the ETS 2 in 2019 (left) and 2040 (right)



Source: Graichen et al. (2024) (left) and Oeko-Institut with data from EEA (2025)

This means option (b) would be mainly a target to address emission reductions in the agriculture sector, the coverage of total emissions would be relatively low (see Figure 2).

- ⇨ Gap: LULUCF sector; Possibly technical removals, if not addressed under ETS 1;
- ⇨ Overlap: None;
- ⇨ Not included in national targets: Total ETS and negative emissions.

A reduced ESR could be combined with removal-targets closing the main gap.

3.3.3 (c) Gross economy wide targets

These national targets would cover gross emissions under the target scope, excluding emission from the LULUCF sector. International transport emissions within the target scope would need to be disaggregated by Member State to ensure complete coverage of gross emissions. Such a target systems allows for a maximum of flexibility between sectors.

- ⇨ Gap: LULUCF sector; Possibly technical removals, if not addressed under ETS 1;
- ⇨ Overlap: ETS 1& 2;
- ⇨ Not included in national targets: negative emissions.

This option could be combined with removal-targets closing the main gap.

3.3.4 (d) Net removal targets

Such a national target system would address all types of negative emissions. With this, it aggregates technical and natural removals, which constitute very different types of removals and costs. As the LULUCF target is a net target, such an overall removal target, is a net target, too. Natural sinks often have massive co-benefits but are more vulnerable and less permanent than technical sinks. Therefore, it does not seem to be a reasonable target scope and has mainly been added for completeness.

- ⇨ Gap: Non-ETS gross emissions;
- ⇨ Overlap: None;
- ⇨ Not included in national targets: Gross emissions.

This option could be combined with ESR-targets closing the main gap.

3.3.5 (e) AFOLU

This is in fact a two-sector target, aggregating emissions and removals of the agriculture and the LULUCF sector. Such a target mixes emissions and removals from land use even more than the current LULUCF Regulation. While the target value of all other options before has been gross, this would be a net target which gives flexibility for the decrease of emissions or increase of removals. With a long-term view it is of utmost importance to achieve both, i.e. a decrease of all emissions and an increase of removals. Therefore, it does not seem helpful to include both objectives in one instrument and to allow a flexibility between them. With such an approach, especially emissions from organic soils would be hidden. Measures to address such emissions can have a short-term effect, while enhancing sinks usually has medium to long-term effects (e.g. afforestation). Thus, more disaggregation is needed addressing emissions from organic soils separate from natural sinks.

- ⇨ Gap: Non-ETS emissions;
- ⇨ Overlap: None;
- ⇨ Not included in national targets: Emissions outside of AFOLU, technical removals.

This option could be combined with ESR-targets closing the main gap.

3.3.6 (f) Net economy wide targets

This is a combination of (c) and (d). It is a net target system which provides the utmost sectoral flexibility and a clear view to the overall long-term target of net-zero emissions in 2050 on the EU level. It is consistent with the definition of the EU's 2040 target but conflates emission reductions and removals. Long-term CO_2 emissions could be counterbalanced by uncertain and non-permanent removals from the land-use sector. This would contravene the like-for-like principle which states that removals and compensated emissions should have the same characteristics. To ensure that both emission reductions and removals are addressed sufficiently, such a target should be designed as a combination of two or three separate sub-targets avoiding a mixture of emissions and (net and technical) removals.

- ⇨ Gap: None;
- ⇨ Overlap: Total ETS;
- ⇨ Not included in national targets: Nothing.

Not only the EU but also many Member States have set economy-wide net targets in national legislation (Lang et al. 2024):[6]

[6] These targets are not always directly comparable, not all Member States use the national greenhouse gas inventory as the only basis for the target achievement. Especially the treatment of net influx/outflow of ETS 1 units might differ, but also the definition of net zero and covered gases/activities.

- 2030: Finland
- 2040: Austria
- 2045: Germany, Sweden
- 2050: Belgium, Czech Republic, France, Greece, Hungary, Ireland, Italy, Luxembourg, Netherlands, Portugal, Slovakia and Spain.

A target distribution based between Member States for such net targets could build upon these national targets. One major concern with this target type is the large uncertainty around natural removals. Many Member States are currently struggling to achieve their 2030 LULUCF targets due to higher harvesting rates, ageing forests but also the impacts of climate change especially on forests, all under the light of both uncertain and changing data. In the light of these complexities, Member States added a provision in the ECL that any shortfall of natural removals shall 'not be at the expense of other economic sectors'. National targets only based on net emissions would require a compensation through other sectors in the case of underperforming natural removals . Due to these uncertainties and the provision in the ECL we do not try to quantify economy-wide net targets in this paper. An obvious option to avoid these issues would be to set a net target politically but implement it through two separate binding targets, a gross economy-wide emission target and a net reduction target. This would ensure that any shortfall from LULUCF would not impact other sectors. The risk of such an approach is, that the overall target will not be achieved if no other safeguards such as using international carbon credits to compensate shortfalls are implemented.

3.3.7 (g) Climate targets for specific sources or sinks

Such a system could formulate targets for specific sectors. Such targets could be combined to allow flexibility between selected sectors (e.g. AFOLU). As an alternative, (limited) flexibility between sector targets could also be allowed. An alternative option is to set emission reduction targets in an indirect way, as is the case in the F-Gas Regulation or the Waste Directive, the Renewable Energy Directive (RED) or the Energy Efficiency Directive (EED). The Common Agricultural Policy (CAP) could in fact also be designed in such a way, that the reduction of agriculture emissions is addressed. These instruments partly include national targets. Different new kind of parameters could be used, like the use of CRCF credits or the increase of certain installations, e.g. DACCS. These elements would not always need to directly relate to measurable effects in GHG inventories, for example in the case of purchasing CRCF credits. They could also incentivise actions that lead either to emission removals or reduced emissions, like e.g. renewable targets under the RED.

⇨ Potential gaps, overlaps and exclusion depend on the scopes of the sector targets.

3.4 Use of international credits for compliance in national targets

With the assumption, that up to 5 % of 2040 emissions can be used for compliance in national targets, the amounts for the different target options are displayed in Table 1. It is assumed, that the certificates are calculated on the basis of absolute emissions and removals. As shown in Figure 1, a total of 47 Mt CO_2eq are available for national targets. This relates quite well to the amount of the current system or of the economy wide gross target.

Table 1 Use of international credits in national target systems

	2040							
	(a) Continuation of current system			b) Reduced ESR	c) Economy wide gross	d) Net removal	e) AFOLU	f) Economy wide net
	ESR	LULUCF	Total					
Total gross emissions	735	0	1.006	424	1.006	0	311	1.006
Removals	0	-298	-339	0	0	-339	-298	-339
Use of carbon credits	37	15	52	21	50	17	30	67

Source: Oeko-Institut

4 Distribution of emission reduction targets

Due to the considerations in above, we focus in the following on options for (a) ESR targets in the current scope and (d) gross economy-wide targets to discuss possible distribution approaches as examples. Both would need to be complemented with a separate approach to address the technical and natural removals.

Current national targets are based on historic emissions and sinks, historic GDP and the area of managed land in a country. Chapter 4.1 explains these current distribution keys with an emphasis on the solidarity-elements included in them. This can serve as a blueprint for reflecting solidarity for the 2040 targets as well. Chapter 4.2 provides results of a quantitative assessment for selected target options.

4.1 Current distribution keys in EU legislation

4.1.1 ETS 1

The main solidarity mechanisms during the fourth trading period of the EU ETS (ETS1) work through how allowances and resulting revenues are distributed between Member States either directly or via funds, with a focus on supporting lower-income countries. Three main solidarity mechanisms are incorporated into the ETS1 during the fourth trading period:

- A 10% solidarity provision in the redistribution of auction shares
- The Modernisation Fund
- And the Article 10c derogation from full auctioning for free allocation to electricity generators

Table 2 details the size of the three mechanisms in million EUA showing both the initial allocation, as well as the actual possible / planned usage of the three mechanisms.

Table 2 Size of solidarity mechanisms in the ETS1 during the fourth trading period

	Initial allocation	Actual / planned usage
Auction share redistributed for solidarity, growth and interconnections (Art. 10(2)(b))	1 300 million EUA	Depending on MSR activity (and transfers to Modernisation Fund)
Modernisation Fund	438 million EUA	758 million EUA after transfers from Art. 10(2)(b) and Art. 10c

Article 10c derogation from full auctioning for free allocation to electricity generators	Max derogation of 638 million EUA	Actual planned use of 88 million EUA

Source: ETS Directive; Modernisation Fund - Climate Action - European Commission; Allocation to modernise the energy sector - Climate Action

Distinct lower-income Member States are eligible for the three mechanisms as detailed in Table 3.

Table 3 Member States eligible for ETS1 solidarity mechanisms

Member State	10% solidarity provision	Modernisation Fund	Article 10c
Bulgaria	✓	✓	✓
Croatia	✓	✓	✓
Cyprus	✓	-	-
Czechia	✓	✓	✓
Estonia	✓	✓	✓
Greece	✓	✓	-
Hungary	✓	✓	✓
Latvia	✓	✓	✓
Lithuania	✓	✓	✓
Malta	✓	-	-
Poland	✓	✓	✓
Portugal	✓	✓	-
Romania	✓	✓	✓
Slovakia	✓	✓	✓
Slovenia	✓	✓	-
Spain	✓	-	-

The core auctioning rule in the ETS1 during its fourth trading period is that of the allowances to be auctioned, 90% are distributed to Member States in proportion to their verified emissions in 2005 or 2005-2007 (whichever is highest), while 10% are reallocated to lower-income Member States under a "**solidarity, growth and interconnections**" provision (**Article 10(2)(b)** of the ETS Directive). Annex IIa of the ETS Directive details by what percentage the auction volumes of the 16 eligible Member States[7] increase. Initially, the 10% for solidarity where protected from the MSR, i.e. the

[7] Bulgaria, Czechia, Estonia, Greece, Spain, Croatia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Portugal, Romania, Slovenia and Slovakia

reduction of auctioning volumes in case of a high surplus of allowances was limited to the quantities based on historic emissions. See Table 7 in the Annex for percentages by countries.

In addition, the **Modernisation Fund** is explicitly designed as a solidarity instrument financed by a dedicated share of EU ETS allowances; it supports lower-income Member States in modernising their energy systems, increasing energy efficiency and facilitating a just transition. The fund is financed using 4.5% of the total auctioning quantity of ETS 1 allowances (2% before 2024). Annex IIb of the ETS Directive details how the funds are distributed to the 13 eligible Member States[8]. See Table 8 in the Annex the quantitative information for eligible Member States.

The eligible Member States can also decide to transfer additional allowances to their Modernisation Fund budget. Those transfers can be made from allowances distributed for the purposes of solidarity, growth and interconnections (Article 10(2)(b) of the ETS Directive), as well as allowancesallocated for free to electricity generation (Article 10c of the ETS Directive).[9] Investments that are to be financed through the Modernisation Fund are assessed and confirmed by the European Investment Bank (EIB) and the Investment Committee consisting of representatives from beneficiary and non-beneficiary Member States and the EIB.

Article 10c of the EU ETS Directive allows 10 lower-income Member States[10] to derogate from full auctioning by allocating up to 40% of their auction share for free to electricity generators for energy sector modernisation. Only Bulgaria, Hungary, and Romania opted for direct free allocation, while Czechia, Croatia, Lithuania, Romania, and Slovakia transferred most or all of the eligible amounts to the Modernisation Fund with Estonia, Latvia, and Poland choosing full auctioning of the eligible amounts. Article 10c free allocation supports diversification, clean technologies, infrastructure upgrades, and grid modernisation via competitive bidding or transparent criteria (smaller projects), covering up to 70% of costs with private co-financing required.

4.1.2 ETS 2

The **Social Climate Fund (SCF)** serves as the primary solidarity mechanism for ETS2, redistributing EUR 65 billion (2026–2032) from ETS 2 auction revenues to support vulnerable households, transport users and micro-enterprises, mitigate carbon price impacts and support the transition away from fossil fuels (Eden et al. 2023). Allocations to Member States are calculated based on a number of criteria, including the size of the population at risk of poverty or social exclusion in rural areas, CO_2 emissions from household fuel combustion and the share of low-income households with utility bill arrears. The remaining auction revenues are distributed according to the countries' 2016-2018 emissions in ETS 2 sectors. Table 8 in the Annex compares the SCF share per Member State with the share in remaining auction revenues.

Member States access the SCF via Social Climate Plans (SCPs) approved by the Commission. Funds are distributed as performance-based payments tied to milestones. 25% national co-financing is mandatory leveraging the EUR 65 billion from the SCF to a total of EUR 87 billion in investments and support.

[8] Bulgaria, Czechia, Estonia, Greece, Croatia, Latvia, Lithuania, Hungary, Poland, Portugal, Romania, Slovenia and Slovakia

[9] For the exact amounts transferred, refer to https://climate.ec.europa.eu/eu-action/eu-funding-climate-action/modernisation-fund_en.

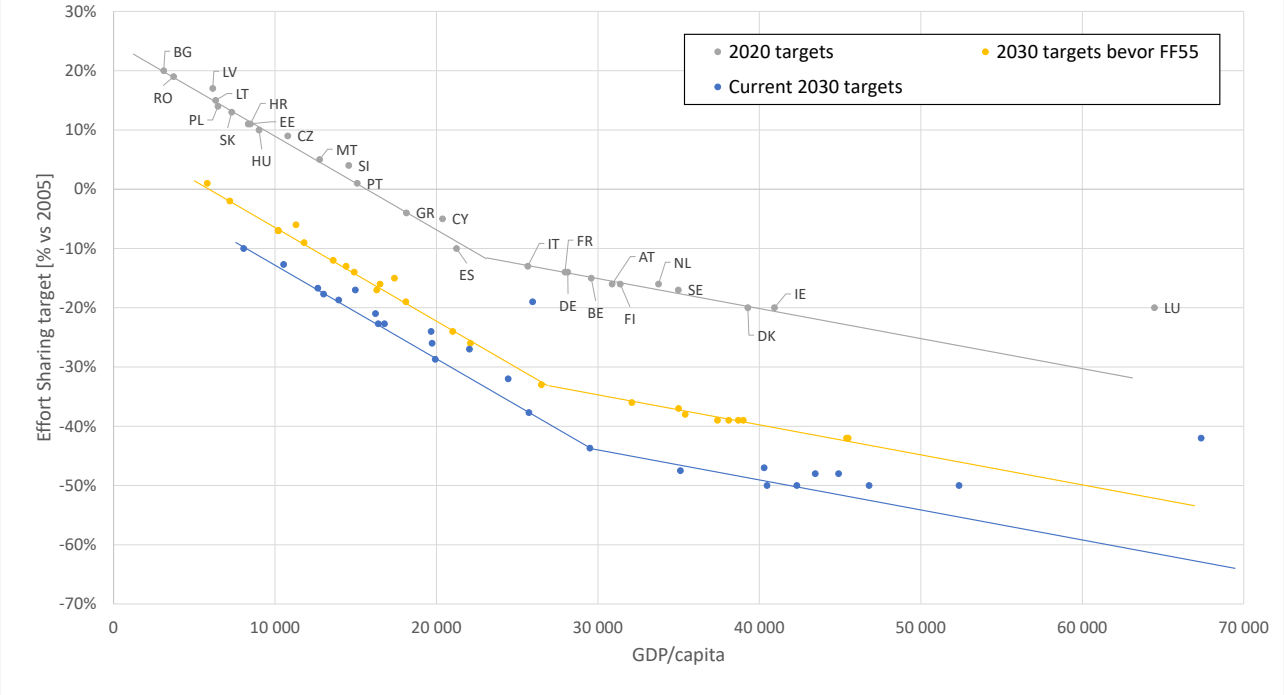
[10] Bulgaria, Croatia, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia

4.1.3 ESR

The Effort Sharing legislation sets annual emission reduction targets for emissions outside the ETS and the LULUCF regulation for all Member States. The target for 2020 and 2030 was mainly based on the relative GDP/capita in each country. For 2020 the poorest Member State, Bulgaria, was allowed to increase emissions by 20% compared to 2005 levels whereas the richest Member States had a reduction target of 20%. For the year 2030, Bulgaria needs to achieve a reduction of 10% compared to 2005, whereas Denmark, Finland, Germany, Luxembourg and Sweden have a target of 50%. In both instances (as well as the initial 2030 targets before the Fit-for-55 package was adopted) the spread between the poorest and the richest country was kept at 40 percentage points. In addition to this distribution there are minor changes for cost-efficiency for some Member States as well as major deviations for Malta and Ireland to account for their specific national circumstances.

2030 targets have been set by keeping the slope of the target distribution, i.e. the parameters to calculate MS targets remains unchanged. This can be seen in Figure 4 where the slope (grey, yellow and blue lines) is parallel for all target settings. Under the current targets, most high-income Member States are capped at 50%, i.e. there is little differentiation within the group of countries with above-average GDP/capita (blue dots). This is due to the maximum spread of 40 percentage points and the unchanged slopes. With a recalculation of the distribution more differentiation between higher-income countries would still be possible (see below).

Figure 4 Effort Sharing targets for 2020 and 2030



Source: Oeko-Institut

An additional but indirect solidarity element is linked to **transfers of Annual Emission Allocations** (AEA) under the ESR and the ETS 2. ESR targets are differentiated by GDP/capita which means that the poorest Member States receive the lowest emission reduction target. At the same time, the ETS 2 is a uniform instrument but initially will most likely lead to higher emission reductions in poorer Member States where any price increase is felt more steeply (Fiedler et al. 2024). As a result, those

Member States are expected to achieve a surplus of AEA which can be sold to other Member States (Graichen und Ludig 2024).

4.1.4 LULUCF

The LULUCF Regulation sets an EU-wide target of net LULUCF removals of -310 Mt CO_2eq, covering the whole LULUCF sector. This is a targeted increase of land-based net removals in the EU by an additional –42 Mt CO_2eq by 2030 as compared to the yearly average over the period 2016-2018.This EU-wide target is distributed among Member States through individual targets in a way that requires each Member State to increase its climate ambition in this sector. There are three different target elements implemented under the LULUCF Regulation:

- In the period of 2021 to 2025, each Member State needs to comply with the 'no-debit' rule. That means they need to ensure that within their LULUCF sector, accounted emissions do not exceed accounted removals.
- In the period 2026 to 2030, there are two different systems, similar to the ESR:
  - There are binding national 2030 targets for each Member State. The targets are specified in Annex IIa of the LULUCF Regulation as absolute additional removals compared to 2016-2018 net LULUCF emissions or removals – adding up to -42 Mt CO_2eq. These 2030 targets are distributed proportional to the size of managed land in each Member State.
  - From 2026 to 2029, there is a 'budget' defined as the total aggregate net removals that are required to reach the target in 2030. The budget is calculated on the base of 2021-2023 net LULUCF emissions or removals and a preliminary 2030 value.

There are a number of flexibilities for compliance, some are dependent on EU performance, some on MS performance and some which can always be used (e.g. banking and borrowing). For more information see European Environment Agency (EEA) (2024).

There are several challenges occurring with this target setting:

- The historic net LULUCF emissions are not stable, they still change quite considerably mainly due to ongoing methodological improvements. This results in
  - the impossibility to calculate reliable draft results for the first accounting period 2021-2025 before the final compliance in 2027. Especially the highly relevant MS specific forest refence level will be revised again in 2027;
  - an unclarity on the value of the final national 2030 absolute target, which will only be available in 2032;
  - considerable changes in projections, which are amongst others based on historic numbers.
- The detailed accounting system as implemented for the period 2021-2025 is extremely complex and should not be pursued further;
- The LULUCF target is defined as a net value, although a differentiation into emissions and removals would be needed to better address these different elements by policies and measures.

The target setting on EU level for net LULUCF emissions is challenging due to inventory reasons but also due to an intensive interest for increased biomass use, high uncertainties resulting from effects of climate change like nature disturbances, the necessary restructuring of the European forest for adaptation and the general complexity of the accounting of effects of policies and measures in this sector. Based on the latest inventory numbers, there is a considerable gap between the current

European sink and the target (see EEA (2025)) of about 100 Mt CO_2eq. The stabilisation of the European natural sink is crucial for the achievement of the 2040 target and a fair distribution between Member States.

The current uncertainty of LULUCF inventories has also effects for the setting of potential net targets on Member States level, which have to be taken into account.

4.2 Distribution options for selected national targets

4.2.1 (a) Effort Sharing targets for the year 2040

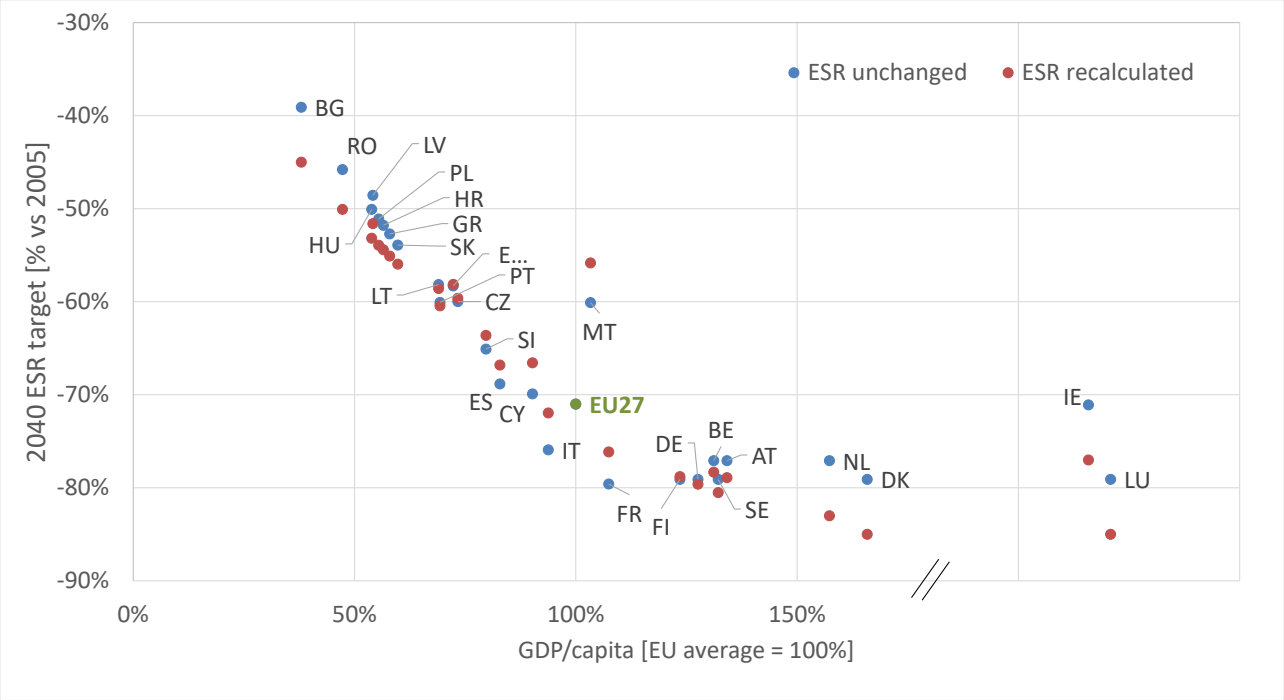
To achieve the 86% net domestic emission reduction compared to 1990 in the current climate architecture, ESR emissions would need to decline to ≈ 735 Mt CO_2eq or 71% below 2005 levels. This can be achieved both by keeping the current parameters as used since the 2020 ESD target has been set or by updating the distribution. Figure 5 shows both of these approaches:

- The blue distribution uses the unchanged parameters. Bulgaria as the poorest Member State has a target of 39% below 2005, all MS with above average GDP/capita a target of 79%. This is then adjusted to reflect cost-efficiency and national circumstances as for the year 2030.
- The red distribution shows a recalculated distribution with a -45% target for Bulgaria and -85% for Luxembourg and Ireland, the two richest Member States. In this scenario both the richest as well as the poorest Member States would need to reduce emissions to a higher degree, whereas MS closer to the EU-average would have less ambitious targets. This distribution is also adjusted to reflect cost-efficiency and national circumstances.

We intentionally kept the spread between the richest and poorest Member State at 40 percentage points. This spread complements the uniform application of the ETS 2 and is an important element to ensure solidarity and moderate carbon prices. High-income countries have a strong incentive to act in addition to the carbon pricing to fulfil their obligations under the ESR. Lower income countries will likely exceed their ESR targets due to the ETS 2 and have an addition source of finance through the trade of AEA. These revenues can then be used to especially support vulnerable households to ensure that the ETS 2 does not create an undue burden. At the same time the ETS 2 ensures the required convergence between Member States to meet the net zero target by 2050.

Alternative distributions with smaller spreads or other minimum targets for Bulgaria could be calculated as well.

Figure 5 2040 ESR targets



Source: Oeko-Institut

4.2.2 (c) Economy-wide gross targets for the year 2040

Figure 6 shows the result of a distribution for an economy-wide gross target between Member States in relation to the 2005 emissions. Overall, gross emissions need to decline by 78% below 2005 levels. Together with a removal target of ≈340 Mt CO_2 (Option (d) above) this would achieve the net target of 86% below 1990 levels. The distribution follows the same logic as the ESR but we only used a spread of 30 percentage points to account for the uniform application of the ETS 1. In the example in Figure 6, Bulgaria has a target of -60% compared to 2005 levels. The richest Member States – Denmark, Luxembourg, Ireland – would need to decrease their emissions by 90%. Again, this distribution could be adjusted to reflect cost-efficiency and national circumstances such as share of agricultural emissions. Using GDP per capita as the basis for setting national targets is only one of many options. We used it here because it is an established principle in EU climate law. An alternative approach would be to base the differentiation on the share of hard to abate emissions in a country. This would require defining which emissions are hard to abate. Criteria for defining hard-to-abate include:

- The technical difficulty of abating emissions (e.g. in cement production);
- High abatement costs per reduced tonne of CO_2eq (e.g. e-fuels for international transport); and
- Political difficulties when addressing certain emissions (such as the number of animals which are the main source of agricultural emissions).

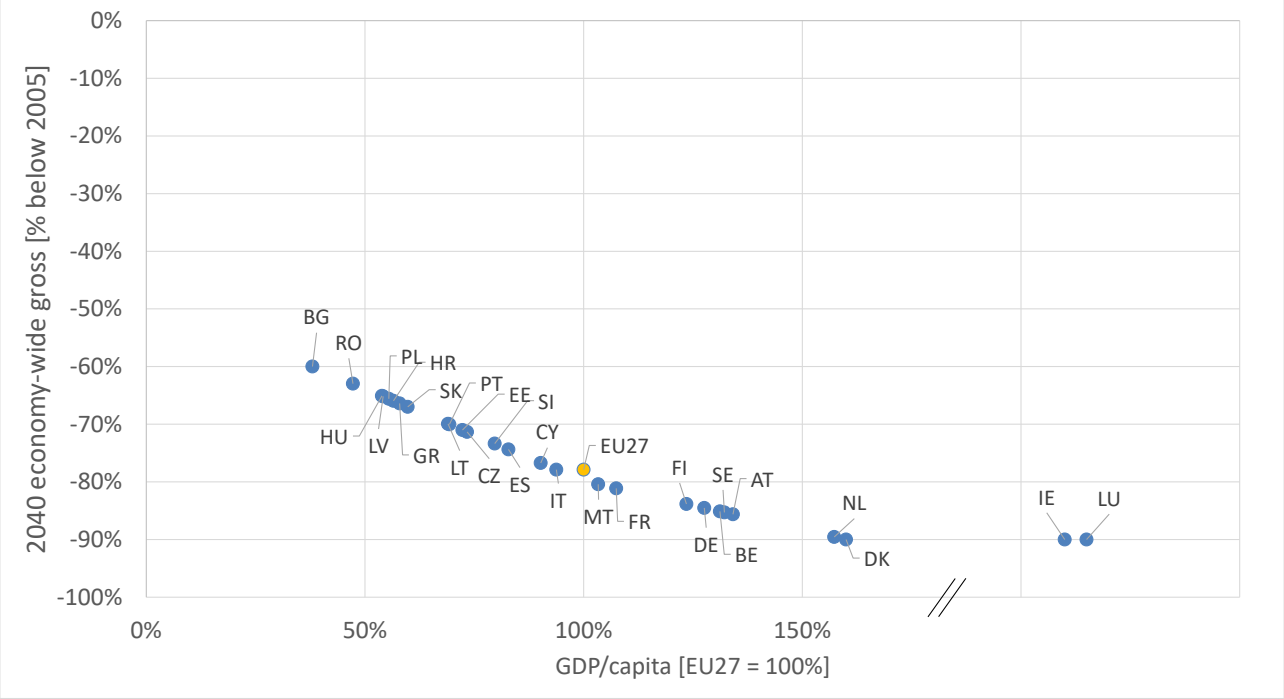
Figure 7 shows the emission reduction pathway between 2030 and 2050 by Member State for the economy-wide gross target. The pathway starts at the projected 2030 emission level and ends in 2050 at a gross emission level that is consistent with the EU-wide net zero target, for which it is not

necessary that each Member State achieves net zero emissions itself. Overall, gross emissions from the EU need to decline by 56% below 2030 until 2040 and by 82% until 2050.

In this representation, Greece has the least ambitious pathway until 2030. This is due to the already achieved emission reductions since 2005, i.e. Greece expects to be already close to the required 2040 target by 2030. This corresponds with steeper necessary emission reductions after 2040 in Greece to achieve net zero emissions in the EU. Bulgaria needs to follow a similar pathway. On the other extreme is Ireland with the steepest emission reduction in the decade after 2030. This is due to a combination of the maximum target level due to the Irish GDP/capita, but also to the higher 2030 starting level than other Member States. Denmark, which would have the same target in this distribution, has a more moderate required reduction until 2040. Flexibility between Member States would play an important role in such a target distribution: Greece and Bulgaria would still continue to reduce GHG emissions even in the absence of further national action due to the ETS 1 and EU Regulations such as the emission standards for cars. Such additional reductions could then be sold to other MS such as Ireland who might find it challenging to achieve their target due to the level of the target but also the high share of emissions from agriculture in the country.

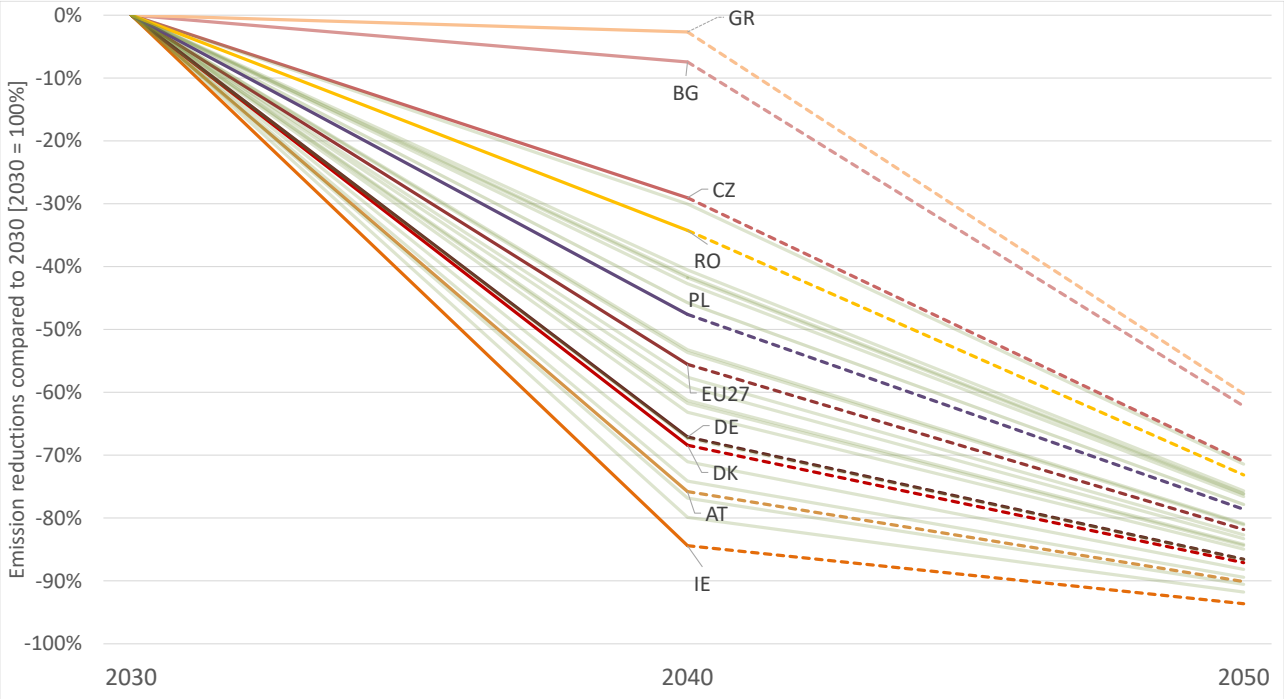
The distribution of the 2040 gross economy-wide target strongly depends on the choice of the base year and the spread between Member States. Earlier base years take any historic emission reduction into account. This is especially relevant for eastern European countries that transitioned to a market economy after 1990 which was accompanied by a strong decline of industrial production and GHG emissions. Consequently, setting national targets compared to 1990 levels benefits those countries. Another crucial parameter is the target spread between poorest and richest Member States. In Annex III we show the results for alternative target distributions using 1990, 2005 and 2023 as base year with a spread of 20 and 30 percentage points.

Figure 6: 2040 economy-wide gross targets compared to 2005



Source: Oeko-Institut

Figure 7: Emission reductions between 2030 and 2050 by Member State for economy-wide targets (gross)



Note: The pathways starts in 2030 at the projected emission level as reported by each Member State (EEA 2025). The pathway from 2040 to 2050 is illustrative only. For each Member State, we assumed that their emission share of EU-wide total gross emissions is kept constant between 2040 and 2050. Based on the Commission's modelling (EC 2024), gross emissions in 2050 are at 411 Mt CO_2eq which are offset by natural and technical removals.
Source: Oeko-Institut

5 National targets and the EU ETS

If properly designed, national targets and the EU ETS can complement each other and be an effective contribution to achieving the 90% target by 2040. Emissions in the ETS 1 have declined by more than 50% since its start in 2005 (European Environment Agency (EEA) 2025b) which was achieved through a combination of carbon pricing and other policies and measures addressing energy supply and partially also industrial emissions. The example of renewable energy makes this clear: While it has become abundant and cheap, this was not the case at the start of the ETS when costs for photovoltaic were in the order of 200 to 500 EUR/t of avoided CO_2 (International Renewable Energy Agency (IRENA) 2024), more than ten times higher than the ETS price. National policies, partially driven by the targets and objectives of the Renewable Energy Directive, ensured the deployment of photovoltaic and wind which led to the sharp decline in costs and ETS emissions seen today. The same holds true for the ETS 2 sectors, where non-economic barriers limit the effectiveness of the carbon price signal: Private end-consumers might lack knowledge, have no access to finance, might not own the dwelling they live in and face a limited capacity for energetic rehabilitation of buildings in a country. To overcome these barriers in the absence of complementary policies, very high CO_2 prices would be required (Hünecke et al. 2025).

Another draw-back of an "ETS only" approach is the limited solidarity between Member States. The ETS applies uniformly across the whole EU. While some solidarity elements especially with regards to financial transfers have been implemented (see section 4.1), it still mainly treats all covered entities equally. National targets allow for a greater reflection of ability to pay and also special

circumstances of individual Member States such as Ireland with a very high share of agriculture in national emissions or Malta as a small island state. National targets also ensure that national governments take action beyond the carbon pricing to overcome non-economic barriers and to ensure steadily decreasing emissions. In addition, several required technologies and solutions such as technical removals and e-fuels for aviation and shipping are (still) much more costly than current and expected carbon prices.

While there are clear advantages to national targets in parallel to carbon pricing, the relationship between these systems is complex and needs to be well-designed. Currently, emission in the ETS 2 are completely covered by the ESR as well. In addition, there is a very small overlap between ETS 1 and the ESR in the shipping sector. A net flux of ETS 2 allowances from one country to another is not mirrored by transfers of emission budgets under the ESR (AEA). This means that Member States might have to pay again for the same emission quantity that has already been bought and paid for by regulated entities under the ETS 2. This was intentional to ensure solidarity between countries and to provide a strong incentive for high-income Member States to take domestic action (Graichen und Ludig 2024). During the years 2008 to 2012, the first commitment period under the Kyoto Protocol, the ETS 1 was within Member States' targets but any transfer of ETS allowances from one country to another was directly mirrored by a transfer of units for national compliance under the Kyoto protocol between these countries. Above average emission reductions in the ETS in a country did not support its Kyoto achievement from an accounting perspective.

One major advantage of copying the Kyoto-approach also for the ESR and the ETS 2 in the future would be the clear and direct price signal for AEAs through the ETS. Currently, there are no platforms or services that trade national target units like AEAs under ESR and RMUs under the LULUCF Regulation. Any deal is concluded bilaterally between Member States. Prices agreed in these deals are generally not public and there is a large uncertainty how much it will cost Member States to fill any ESR shortfalls by AEA purchases from other countries. If Member States could always just buy ETS 2 allowances on the market and automatically receive an AEA for each allowance to comply under the ESR, this would set an upper price for AEAs. This does still leave open the possibility for individual Member States to sell surplus AEA for less than the ETS 2 price. There are two strong arguments against such an approach:

- Linking ETS 2 allowances with AEA would remove the solidarity mechanism under the ESR for all emissions under the ETS.
- Governments buying ETS 2 allowances to achieve their ESR targets would drive up the carbon price in the ETS 2 which might affect vulnerable households negatively.

If a Kyoto-style approach for ETS 2 allowances would be chosen, alternative ways to strengthen solidarity between Member States would need to be explored. This could be done by extending and strengthening the Social Climate Fund or by changing the distribution key used to allocate auction quantities to Member States

An alternative would be to keep the separation between AEA and ETS allowances but have auctions for some or all AEA instead of allocating them for free to Member States. This would directly ensure a price finding for AEA (see Bart et al. (2019)). Further AEA price finding mechanisms include the inclusion of the private sector in AEA trade and the implementation of project-based mechanisms between Member States which is a foreseen but so far unused option in the ESR.

Another key issue to consider is the possible linkage or even integration of both ETS. As long as ETS 1 and ETS 2 remain separate, the current approach could continue. One of the options under discussion for the post-2030 climate architecture is some kind of (limited) interaction between the

two trading schemes. If this is allowed to a relevant extent, national targets based on the current ESR-scope are no longer a reasonable scope: Performance of ETS 1 installations, outside the scope of the national target, would impact Member States target achievement. In such a situation, some kind of accounting approach would have to be developed to compensate for the emission development of ETS 1 installations, adding a new complexity to the system. Obviously, if an integration of the two ETS systems is planned, it would be simpler and clearer to either have economy-wide targets (options (d) or (f)) or a reduced ESR target (option (b)).

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Annex

Annex I. Calculation of emissions and removals in 2040 by sectors

This analysis is based on the results from the impact assessment for the 2040 target (EC 2024). There, emissions and removals are provided for four scenarios. We use these results to design a situation of emissions and removals in the year 2040 which results in a 86 % reduction of net domestic emissions compared to 1990. This is done through a linear interpolation between the results of the scenarios S1 and S2. See the result by sources in Table 4.

Table 4: 2040 emissions and removals by sources

[Mt CO_2 eq]	2030	2040		
		S1	86% net domestic	S2
Total gross emissions	**2301**	**1273**	**1006**	**943**
Power and district heating	339	123	57	42
Other Energy sectors	133	71	61	59
Industry (Energy)	232	126	100	94
Domestic Transport	583	190	151	143
Residential and Services	221	119	97	92
Industry (Non-Energy)	157	139	97	88
Other Non-Energy sectors	56	33	27	26
International transport (target scope)	43	31	0	29
Aviation	25	7	29	6
Navigation	44	14	18	11
Agriculture	361	351	311	302
Waste	87	68	57	55
Removals		**-222**	**-339**	**-365**
Net LULUCF	-310	-218	-298	-316
BECCS & DACCS	-4	-4	-41	-49
Total domestic net	**2301**	**1051**	**666**	**578**
compared to 1990	51%	78%	86%	88%

Quelle: Oeko-Institut based on (EC 2024)

For the quantification of the scope of instruments, it is necessary to differentiate emissions from different sources into ETS 1, ETS 2 and ESR. For ETS emissions, assumptions for sectoral shares have been applied. ESR emissions are calculated as differences between total emissions and ETS 1 emissions in respective sectors. The aggregated results are displayed in Table 5.

Table 5: 2040 emissions separated in ETS and ESR emissions

2040 [Mt CO_2 eq]	S1	86% net domestic	S2
ETS 1	385	271	246
stationary	*333*	*224*	*200*
aviation	*31*	*29*	*29*
shipping	*21*	*18*	*17*
ESR	887	735	701
ETS 2	*395*	*310*	*292*
other	*492*	*424*	*410*

Quelle: Oeko-Institut based on (EC 2024)

Annex II. Current distribution elements under the ETS

Table 6 Percentage increase of ETS1 auction volumes due to "solidarity, growth and interconnections" provision for 16 eligible Member States

Member State	% increase in auction volumes due to 10% solidarity provision
Bulgaria	53%
Croatia	26%
Cyprus	20%
Czechia	31%
Estonia	42%
Greece	17%
Hungary	28%
Latvia	56%
Lithuania	46%
Malta	23%
Poland	39%
Portugal	16%
Romania	53%
Slovakia	41%
Slovenia	20%
Spain	13%

Source: ETS Directive Annex IIa

Table 7: Distribution key of the Modernisation Fund

Member State	Distribution of Modernisation Fund financed by 2% of auctioning proceeds	Distribution of Modernisation Fund financed by an additional 2.5% of auctioning proceeds
Bulgaria	5.84%	4.9%
Croatia	3.14%	2.3%
Czechia	15.59%	12.6%
Estonia	2.78%	2.1%

Greece	-	10.1%
Hungary	7.12%	5.8%
Latvia	1.44%	1.0%
Lithuania	2.57%	1.9%
Poland	43.41%	34.2%
Portugal	-	8.6%
Romania	11.98%	9.7%
Slovakia	6.13%	4.8%
Slovenia	-	2.0%

Source: ETS Directive Annex IIb

Table 8 Distribution key for the Social Climate Fund (SCF) and remaining ETS 2 auction revenues

Member State	Share SCF	Share remaining auction revenue
Austria	0.89%	2.6%
Belgium	2.55%	3.6%
Bulgaria	3.85%	0.8%
Croatia	1.94%	0.7%
Cyprus	0.20%	0.2%
Czechia	2.40%	2.7%
Denmark	0.50%	1.2%
Estonia	0.29%	0.2%
Finland	0.54%	1.1%
France	11.19%	15.3%
Germany	8.18%	22.8%
Greece	5.52%	1.6%
Hungary	4.33%	1.9%
Ireland	1.02%	1.5%
Italy	10.81%	13.1%

Latvia	0.71%	0.3%
Lithuania	1.02%	0.5%
Luxembourg	0.10%	0.6%
Malta	0.07%	0.1%
Netherlands	1.11%	4.3%
Poland	17.60%	8.4%
Portugal	1.88%	1.6%
Romania	9.25%	2.6%
Slovakia	2.35%	1.0%
Slovenia	0.55%	0.6%
Spain	10.52%	8.6%
Sweden	0.62%	1.4%

Source: Social Climate Fund Regulation Annex II, own calculations Oeko-Institut.

Annex III. Alternative target distributions for economy-wide gross targets

Table 9: 2040 gross economy-wide targets under different parameters

	Spread 30 pp			Spread 20 pp		
	BY 1990	BY 2005	BY 2023	BY 1990	BY 2005	BY 2023
EU27	1 034.0	1 034.0	1 034.0	1 034.0	1 034.0	1 034.0
AT	10.6	13.9	17.2	12.9	16.5	19.2
BE	19.9	22.3	25.2	23.7	26.0	27.8
BG	39.6	25.0	22.7	34.7	21.8	20.4
HR	10.5	10.3	11.3	9.4	9.2	10.4
CY	1.2	2.2	2.9	1.1	2.2	2.9
CZ	53.5	43.4	40.6	49.3	40.1	38.4
DK	7.2	6.9	7.9	10.9	10.3	9.8
EE	11.1	5.7	4.3	10.2	5.2	4.1
FI	10.5	11.8	11.2	11.9	13.1	12.0
FR	91.3	110.3	114.1	94.7	113.1	116.5
DE	177.0	159.2	177.2	205.8	181.2	192.7
GR	34.1	46.5	31.8	30.6	41.8	29.3
HU	32.5	27.2	24.6	29.0	24.3	22.6
IE	5.6	7.0	11.0	8.4	10.5	13.7
IT	104.0	138.0	129.3	101.4	134.2	127.4
LV	8.9	3.9	4.5	7.9	3.5	4.1
LT	13.7	6.7	7.3	12.5	6.2	6.9
LU	1.3	1.3	1.6	1.9	2.0	1.9
MT	0.5	0.6	0.7	0.5	0.6	0.7
NL	23.1	22.6	29.3	33.7	32.9	36.1
PL	160.5	139.1	156.3	143.4	124.5	143.8
PT	16.9	26.3	21.7	15.5	24.1	20.4
RO	94.1	55.9	49.1	83.2	49.5	44.7
SK	23.6	16.8	15.7	21.2	15.2	14.6
SI	4.7	5.6	5.6	4.4	5.3	5.3
ES	68.3	115.4	99.4	64.4	108.9	95.7
SE	9.6	10.1	11.3	11.6	11.8	12.5

Quelle: Oeko-Institut