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EU effort sharing for the 2021-2030 period

Setting GHG emission targets for EU Member States

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List of Abbreviations

AEA	Annual Emission Allocation (the annual emission limits established in the ESD)
ESD I	Effort Sharing Decision for the 2013-2020 period
ESD II	Effort Sharing Decision for the 2021-2030 period
ETS	Emissions Trading System
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GWP	Global Warming Potential
LULUCF	Land-use, land-use change and forestry
MS	Member States
WEM	With existing measures

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Key points

The paper analyses different options for determining annual emission allocations by Member State under a new Effort Sharing Decision for the 2021 to 2030 period based on the conclusions of the European Council of October 2014. To do so, both the starting point as well as the end point of a linear target path need to be agreed upon.

Environmental effectiveness of ESD

- The individual 2030 targets by Member State do not affect the environmental effectiveness of the ESD as long as the overall EU target of 30% below 2005 levels in the non-ETS sectors is achieved. The question is therefore more an issue of fair allocation of the total emission budgets. This should be carried out in such a way that minimises costs while setting incentives for early and significant domestic emission reductions.
- In contrast, the choice of the starting point has the potential to change the total emission budget for the 10-year period by 5-6%.

Starting point of the linear 2021-2030 target path

- Based on the following considerations the 2021 starting point should be the lower of the average actual emissions 2016-18 and the 2020 ESD target:
  i. Early and significant domestic reductions should not be penalized.
  ii. The annual emission limits for all Member States should decrease continuously.
  iii. The EU emission budget needs to reflect the outcome of the Paris Climate Conference.

Endpoint of the linear target path in 2030

- For Member States with GDP/capita below the EU average, the Conclusions of the European Council have already set all the necessary parameters to determine the 2030 ESD targets.
- The adjustment of the target based on the cost-effective potential for the 11 Member States with above-average GDP/cap has not yet been fully decided. It can be based on the full cost-effective potential or just the additional effort necessary to achieve the target. The adjustment needs to comply with the following criteria:
  i. The adjustment should not penalise early movers.
  ii. Targets should not be lower than those of Member State with below-average GDP/cap.
- The **cost-effective adjustment of the GDP/cap target distributions should be based on the additional potential** only. If an approach based on the full potential is used, the relative weight of the adjustment should be no larger than 25%.
  - The **full cost-effective potential** includes all policies already in place as well as those necessary to achieve the 2030 target. It mainly depends on the reductions already achieved in the reference scenario. Any option based on the full cost-effective potential penalizes early movers and rewards inaction, which would contravene a general principle of EU environmental action. Giving the criterion of cost-effectiveness a lower weight would reduce this bias.
  - Targets based on the **additional cost-effective potential** minimise the necessary costs to achieve the difference between the EU's target and the reductions in the baseline scenario. It is a forward-looking approach which neither favours, nor penalises early action.

1. Background

On 23/24 October 2014 the European Council (EC) adopted conclusions on a 2030 Climate and Energy Policy Framework. As part of the conclusions, the EC laid down some principles for an EU Effort Sharing Decision for the 2021-2030 period (European Council, 2014):

- Target setting:
    - a binding domestic EU target of a reduction of at least 40% below 1990 and a target of 30% below 2005 levels for the sectors covered by the ESD;
    - the methodology for setting the national reduction targets with all the elements as applied in the Effort Sharing Decision for 2020 will be continued;
    - distribution of efforts of the non-ETS sectors according to GDP per capita ranging from 0% to 40% below 2005 levels;
    - targets for the Member States with a GDP per capita above the EU average will be relatively adjusted to reflect cost-effectiveness in a fair and balanced manner;
- Flexibilities:
    - the availability and use of existing flexibility instruments within the non-ETS sectors will be significantly enhanced; and
    - a new one-off flexibility between the ETS and the ESD will be established for certain Member States.

The purpose of this paper is to explore the different options for determining the 2030 targets and the total emission budget for the 2021-2030 period by Member State under a new Effort Sharing Decision (ESD II). It analyses two key questions:

- **2021 starting point**
  The Effort Sharing Decision not only sets emissions limits for the last year of a period but also establishes annual targets. To do so, the starting point for a linear trajectory in 2021 needs to be determined.
- **2030 target**
  The principles for determining the mitigation targets of Member States for 2030 have been laid down by the EC. While the distribution of efforts according to GDP/capita is relatively straightforward, the adjustment for richer Member States is still open to interpretation.

Iceland and Norway have announced their intention to join the ESD II and to achieve their 2030 target in line with the EU (Government of Iceland, 2015; Government of Norway, 2015). Both countries already partake in the EU ETS and participating in the ESD is a logical next step. Correspondingly both have announced reduction commitments for 2030 which are identical to the EU's. If included, they would be part of the countries with above-average GDP/capita. They are not included in this paper due to a lack of data on cost-effective potentials consistent with the data used for EU Member States. Their eventual inclusion could have an impact on the targets of the other Member States but the effect would be minimal due to their low absolute emission levels compared to the EU 28.

For a discussion of the different flexibility options, see Graichen et al. (2015) and for an analysis of the potential role of LULUCF in a 2030 Effort Sharing Decision, see Böttcher and Graichen (2015).

2. The starting point of the 2021-2030 linear target path

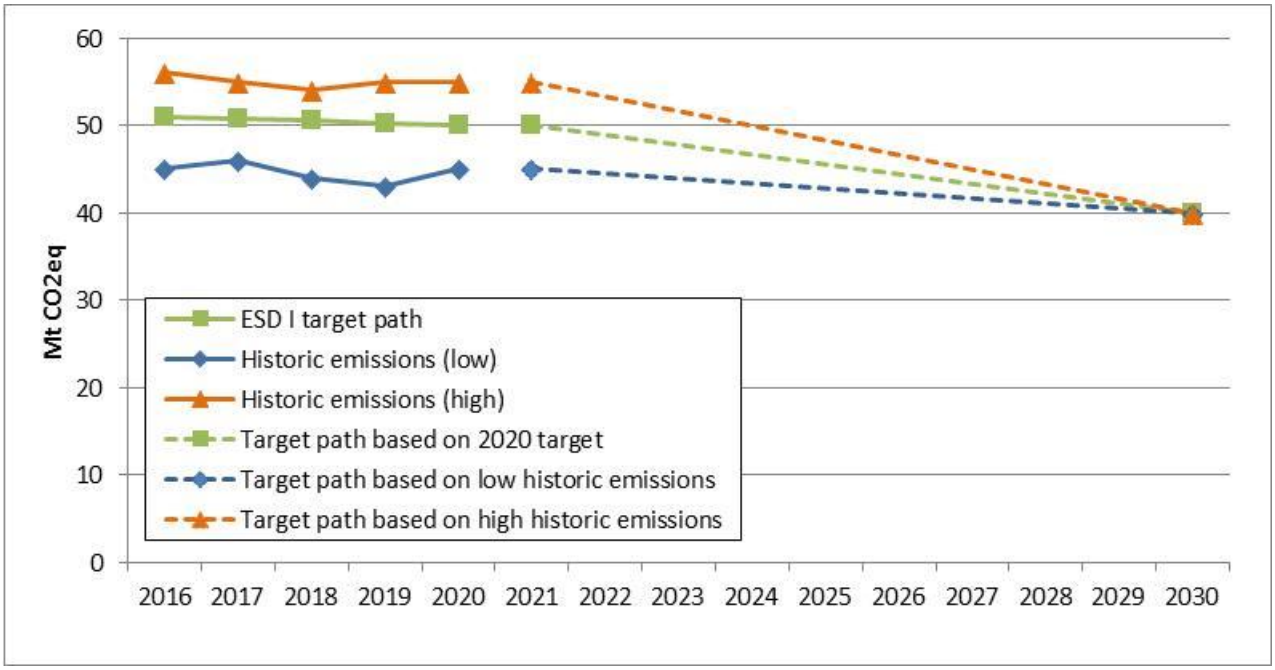
Key points

- The choice of 2021 as the starting point should be based on the following criteria:
  i. To incentivise early and significant domestic reductions.
  ii. The annual emission limits for all Member States should decrease continuously also across ESD periods.
  iii. The EU emission budget needs to reflect the outcome of the Paris Climate Conference.
- Based on these criteria the starting point needs to be the lower of the average emissions 2016-18 and the 2020 target.

Member States will have to comply with annual emission reduction targets for all years in the period 2021-2030. The annual targets are set by drawing a linear target path between a starting point in 2021 and the 2030 target (European Union, 2009). This raises the question of where this target path should actually start. There are basically two options: a) each Member State's ESD target for 2020 or b) the most recently reviewed ESD emissions level of Member States that is available.

Figure 1 illustrates the difference between the two approaches. It shows the 2020 target and two scenarios of emission developments in the past – resulting in emissions 10% above or below the 2020 target. The dotted lines show the resulting target paths to 2030 depending on whether the ESD target or historic emissions are chosen as the starting point.

Figure 1: Illustration of the implications of different starting points



Source: Authors' own illustration

For ESD I the starting point was the average emission level in the ESD sectors in 2008-10 – the last three years for which inventories were available on 1 January 2013. Applying the same approach, the starting point for 2021 would be based on the average ESD emissions in 2016-18.[1] These three years are the last years for which ESD emission inventories will be published and reviewed on 1 January 2021. As its main advantage, this methodology would allow all Member States to start the second ESD commitment period with targets close to their current emissions. No Member State would have a substantial deficit or surplus in 2021. Additionally, it would reduce the total quantity of AEA during the ten year period compared to using the 2020 targets because the EU as a whole is projected to overachieve its 2020 target. Table 1 shows the resulting starting points by Member State. Table 7 and Table 8 in the Annex show the cumulated budget of the different options for 2021-2030. This methodology also has two important drawbacks: Firstly, it provides a perverse incentive to increase emissions in 2016-18 to maximise the total ESD II budget for the ten year period up to 2030. Secondly, it penalises early action: Member States that have achieved emission levels below their 2020 target will receive a lower allocation for the 2021-2030 period. In contrast, Member States which will not meet their 2020 targets by means of domestic emission reductions will be rewarded with additional AEA. In addition, it sets a negative precedent by favouring the use of flexibilities instead of domestic reductions in a Member State[2].

Using the 2020 targets as the starting point for the 2030 target path could help overcome some of these problems. There would be no incentive for Member States to increase their baseline emissions in 2016-18. At the same time we can expect, based on current projections, that this approach would create a large surplus – 20 of 28 Member States project that their emissions in 2016-2018 will already be below their 2020 targets, taking only existing policies and measures into account. Emissions will decrease even further up to 2020. Three additional Member States project that by 2020 their emissions will be below the target in 2020 (EEA, 2015). Using the 2020 targets as the starting point would increase EU-wide emissions in the 2021-2030 period by approx. 5-6% compared to using actual emissions.

In light of the international climate conference in Paris and the EU's commitment to limiting global warming "to well below 2°C below pre-industrial levels" (UNFCCC. Conference of the Parties, 2015) it would be inconsistent to use a starting point which would increase emissions by 5-6% compared to other options. Additionally, the approach based on the actual emissions in 2016-18 is in line with the EC conclusions ("all the elements as applied in the Effort Sharing Decision for 2020"). We therefore propose basing the starting point on historic emissions but to cap these at the 2020 target value for Member States which will have emissions higher than their target. The reason for capping the 2021 AEA at the 2020 target is that the ESD target path should always decrease. Without the cap, certain Member States would have higher budgets in 2021 than 2020. This would avoid creating a substantial surplus and discourage Member States to rely on emission reductions elsewhere rather than implementing national policies and measures. Table 1 shows the

[1] Under the ESD I some Member States had positive targets, i.e. they were allowed to increase their emissions up to 2020 compared to 2005. The linear trajectory for these Member States was calculated slightly differently and it could be argued that this approach should be used for those Member States whose emission targets in 2030 are higher than the 2016-18 average. Based on the *with existing measures (WEM*) projections, this could be the case for 6 Member States. The differences between the two calculation approaches for the EU as a whole are negligible and this option is not further investigated in this paper.

[2] Under the assumption that any approach determined for the ESD II will be applied for EDS III as well, it would also set an additional barrier for a host country of a community-level emission reduction project if the project duration is long enough. For example, a project which starts in 2025 and has a duration of 15 years will reduce the available AEA for the period of 2031 onwards due to lower emission levels in 2026-28. The corresponding reductions in the period of 2031 onwards will not be (fully) available to the host country because they will belong to the project developer. The host country then has a lower AEA budget but no additional reductions which can then be used for compliance with the ESD.

2021 starting points using this combined historic emissions / 2020 target approach. The cap would be applied to eight Member States reducing the total 2021 emission budget by 25-31 million AEA compared to using 2016-18 emissions only.

Table 1: Starting point for the target path (2021 AEA)

	Ø 2016-18 Emission Projections [Mt CO2eq]	2020 Target [mn AEA]	2021 Starting Point
Austria	49.0 - 51.4	**48.8**	2020 target
Belgium	73.0	**67.7**	2020 target
Bulgaria	**23.2**	28.8	Ø 2016-18 emissions
Croatia	**16.5 - 16.9**	21.0	Ø 2016-18 emissions
Cyprus	**2.9 - 2.9**	5.9	Ø 2016-18 emissions
Czech Republic	**57.2 - 59.6**	67.7	Ø 2016-18 emissions
Denmark	31.3	**30.5**	2020 target
Estonia	**5.4 - 5.6**	6.5	Ø 2016-18 emissions
Finland	29.3 - 29.5	**28.4**	2020 target
France	**353.8**	359.3	Ø 2016-18 emissions
Germany	435.4	**425.6**	2020 target
Greece	**45.7**	61.2	Ø 2016-18 emissions
Hungary	**36.5 - 38.8**	58.2	Ø 2016-18 emissions
Ireland	41.5 - 42.9	**39.0**	2020 target
Italy	**265.4 - 273.7**	294.4	Ø 2016-18 emissions
Latvia	**8.3 - 8.8**	9.9	Ø 2016-18 emissions
Lithuania	**12.5 - 12.8**	15.5	Ø 2016-18 emissions
Luxembourg	9.9	**8.1**	2020 target
Malta	**0.9 - 0.9**	1.2	Ø 2016-18 emissions
Netherlands	**105.0 - 105.4**	107.0	Ø 2016-18 emissions
Poland	**188.5**	202.3	Ø 2016-18 emissions
Portugal	**39.3 - 39.4**	51.2	Ø 2016-18 emissions
Romania	**70.9 - 72.9**	88.4	Ø 2016-18 emissions
Slovakia	**21.8 - 22.5**	26.5	Ø 2016-18 emissions
Slovenia	**11.1**	12.5	Ø 2016-18 emissions
Spain	**198.8 - 203.0**	214.2	Ø 2016-18 emissions
Sweden	**33.3**	37.2	Ø 2016-18 emissions
United Kingdom	331.8 - 332.9	**327.1**	2020 target
EU-28	2 498.5 - 2 525.3	2 644.2	**2 472.3 - 2 494.1**

Notes: Average 2016-18 emissions are based on Member State projections in the "with existing measures" and "with additional measures" scenarios as reported by the EEA.
Values in bold show the emission level which is selected for the 2021 starting point.

Source: EEA (2015), authors' own calculations

3. 2030 ESD targets

Key points

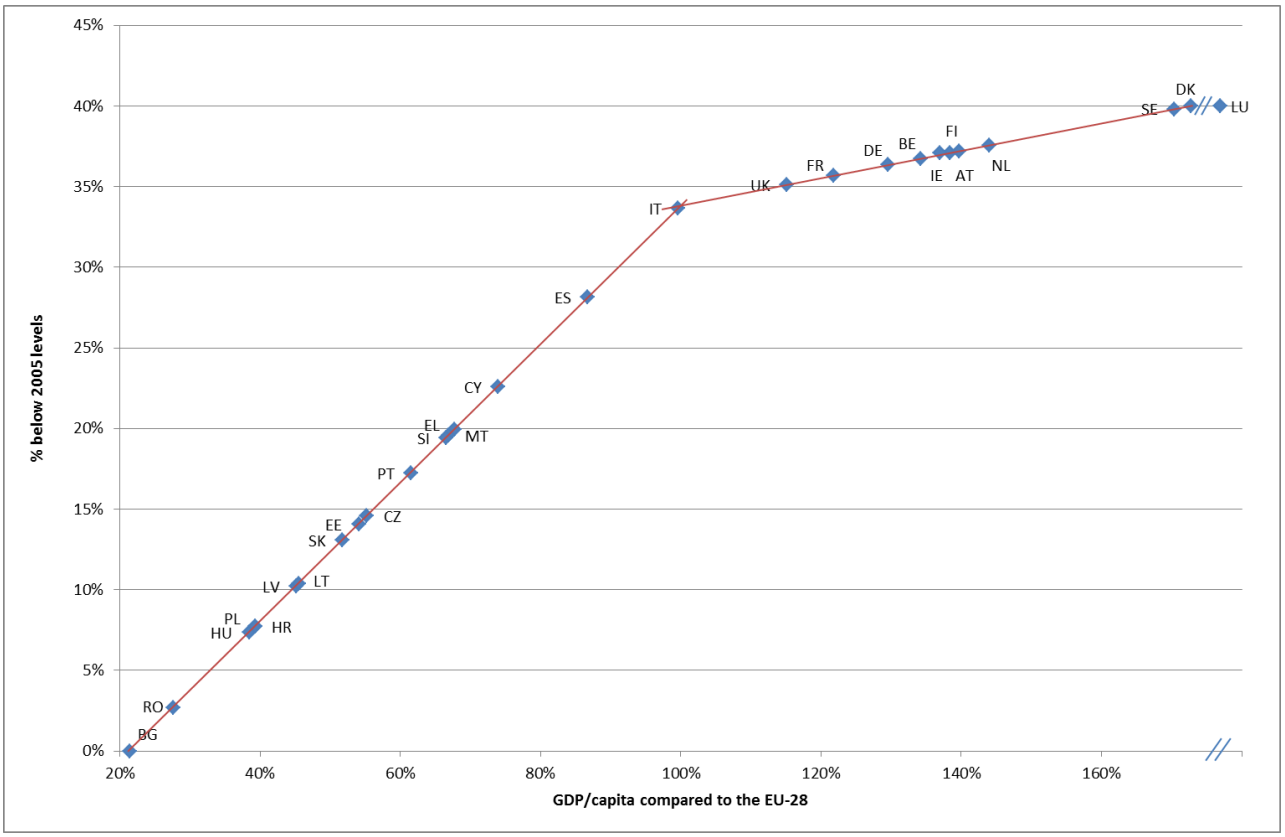
- For Member States with GDP/capita below the EU average, the Conclusions of the European Council have already set all the necessary parameters for determining the 2030 targets under the ESD II.
- The adjustment of the target based on the cost-effective potential for the 11 Member States with above-average GDP/cap has not yet been fully decided but should comply with the following criteria:
  i. The adjustment should not penalise early movers.
  ii. It should not lead to targets lower than that required of any Member State with a below-average GDP/cap.
- The **full cost-effective potential** mainly depends on the reductions already achieved in the reference scenario. Any adjustments based on the full cost-effective potential penalise early movers and reward inaction, which would contravene a general principle of EU environmental action. Giving the criterion of cost-effectiveness a lower weight would reduce this bias.
- Targets based on the **additional cost-effective potential** minimise the necessary costs to achieve the difference between the EU's target and the reductions in the baseline scenario. It is a forward-looking approach which neither favours, nor penalises early action.
- The **cost-effective adjustment of the GDP/cap target distributions should be based on the additional potential** only. If an approach based on the full potential is used, the relative weight of the adjustment should be no larger than 25%.

3.1. Distribution according to GDP/capita

2030 targets are to be distributed according GDP/capita applying the ESD I methodology with a range of targets of 0%-40% below 2005 emissions levels for all Member States. Bulgaria has the lowest GDP/capita in the EU and receives the stabilisation target, while Denmark, as the second richest Member State, needs to reduce emissions by 40%. Luxembourg is excluded from this analysis because it has a GDP/capita almost twice as high as Denmark. Instead, Luxembourg automatically receives a target of 40% below 2005.[3] All other Member States are distributed according to their GDP/capita on a line between Bulgaria and Denmark. This would lead to an overall reduction of 22% below 2005 levels, i.e. it would fall short of the EU target. To ensure that the overall reduction of 30% of the EU-28 is met, the line is lifted at the EU average GDP/capita value until the sum of the individual reductions equals the EU target. This leads to two separate lines with different slopes along which the Member States are positioned. The lines intersect at the average EU GDP/capita (Figure 2). For Member States with below-average GDP/capita, this distribution determines the 2030 emission targets: the methodology was defined for the ESD I and the EC conclusions provide all the necessary details for its application for the period up to 2030.

[3] Iceland and Norway have a GDP/capita which is close to Luxembourg's. If both countries join the ESD II, they would most likely be treated similarly to Luxembourg, i.e. they would receive a 40% target and not be included in the distribution according to GDP/capita.

Figure 2: Member States' 2030 targets based on a GDP/capita distribution



Notes: GDP/capita is based on 2013 market prices. GDP/capita in Luxembourg is 325% of the EU average. The GDP/cap values of IE, FI and AT have been slightly spread apart to enhance the clarity of the graph.

Source: Eurostat (2015), authors' own calculations

3.2. Distribution according to cost-effectiveness

3.2.1. Understanding the concept of cost-effectiveness

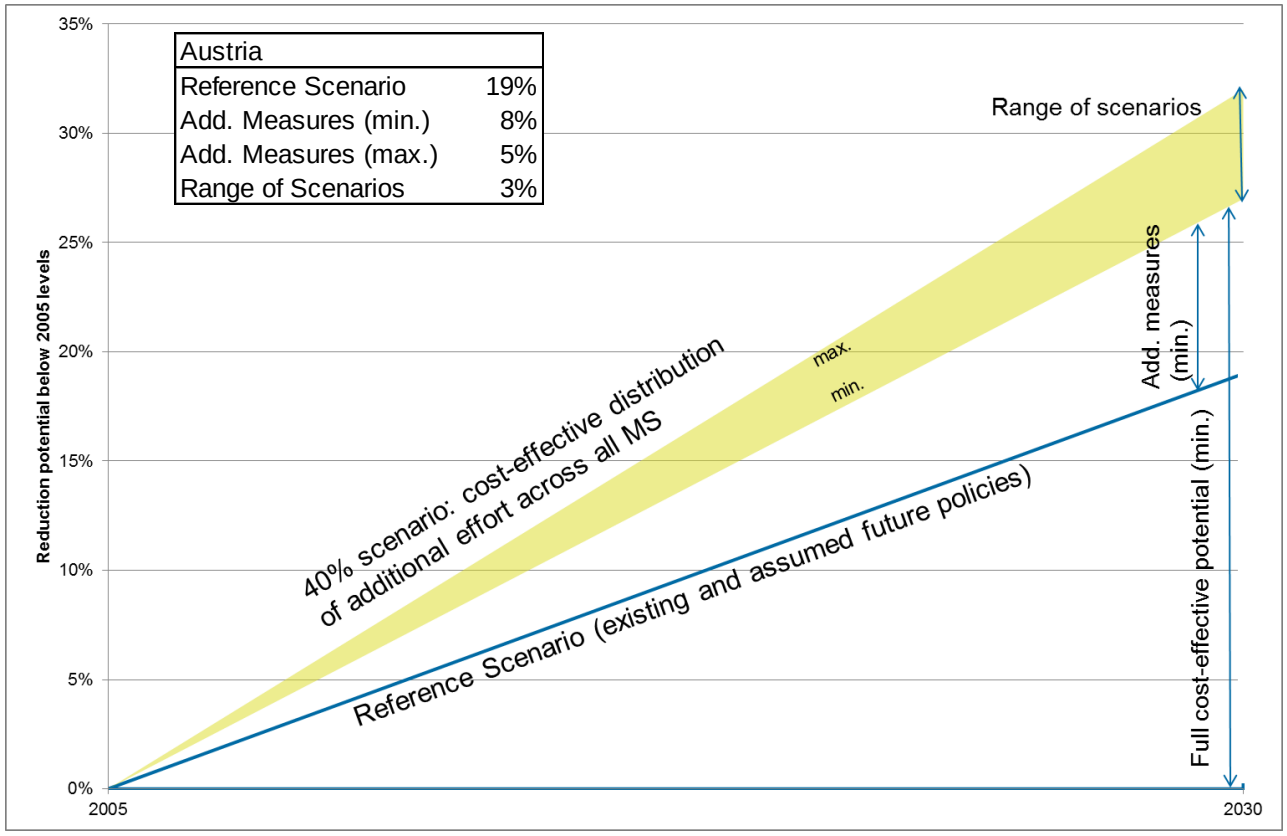
Eleven Member States (as well as Iceland and Norway) had a GDP/capita above the EU average in 2013. The 2030 target for these Member States "will be relatively adjusted to reflect cost-effectiveness in a fair and balanced manner" (European Council, 2014). So far, no further guidance on the interpretation of this provision has been provided or agreed upon. The general assumption is that the cost-effective GHG emission reduction potential for the non-ETS sectors will be taken from the Impact Assessment accompanying the Commission Communication *A policy framework for climate and energy in the period from 2020 up to 2030* (European Commission, 2014)[4]. In the document the GHG emissions from the sectors covered by the ESD are projected in two different scenarios. In the **reference scenario** 2030 emissions are based on the trends including full implementation of policies adopted by late spring 2012 in each Member State (European Commission, 2014). It is a scenario that by definition achieves the 2020 targets because the ESD is one of the adopted policies. For the purpose of cost-effectiveness, the Impact Assessment

[4] A new reference scenario for the EU and its Member States is currently under development but it does not contain all the calculations necessary to replace the Impact Assessment. However, it might be possible that some aspects of the new reference scenario will be used. The new scenario is not yet available and this option is therefore not further considered.

assumes the costs of these measures to be zero. The underlying assumption is that these costs have already been paid for and/or that these measures were the most cost-effective measures available to a government. These measures would result in an overall EU mitigation in the ESD sectors in 2030 of 20% compared to 2005. The **policy scenario** of the Commission's Impact Assessment assumes a cost-efficient distribution of the remaining effort across all Member States that is necessary in order to achieve an overall reduction of 30% below 2005 levels. According to the calculations, the marginal abatement costs would be 40 EUR/t CO_2 across all Member States in the policy scenario. The Impact Assessment includes a range of policy options compatible with the overall EU target, which lead to minimum/maximum potentials by Member State. Figure 3 illustrates the concept used in the Impact Assessment and the terms used in this study based on the example of Austria:

- **Full cost-effective potential (min./max.):** the sum of the reference scenario and the additional reductions in the policy scenarios using the lower/higher variant of the policy scenario. It represents the total reduction in 2030 compared to 2005.
- **Additional effort or additional measures (min./max.):** the difference between the reference scenario and the additional reductions in the policy scenario, using the lower/higher variant of the policy scenario. It represents the additional cost-effective effort which is necessary following the reductions already achieved in the reference scenario.

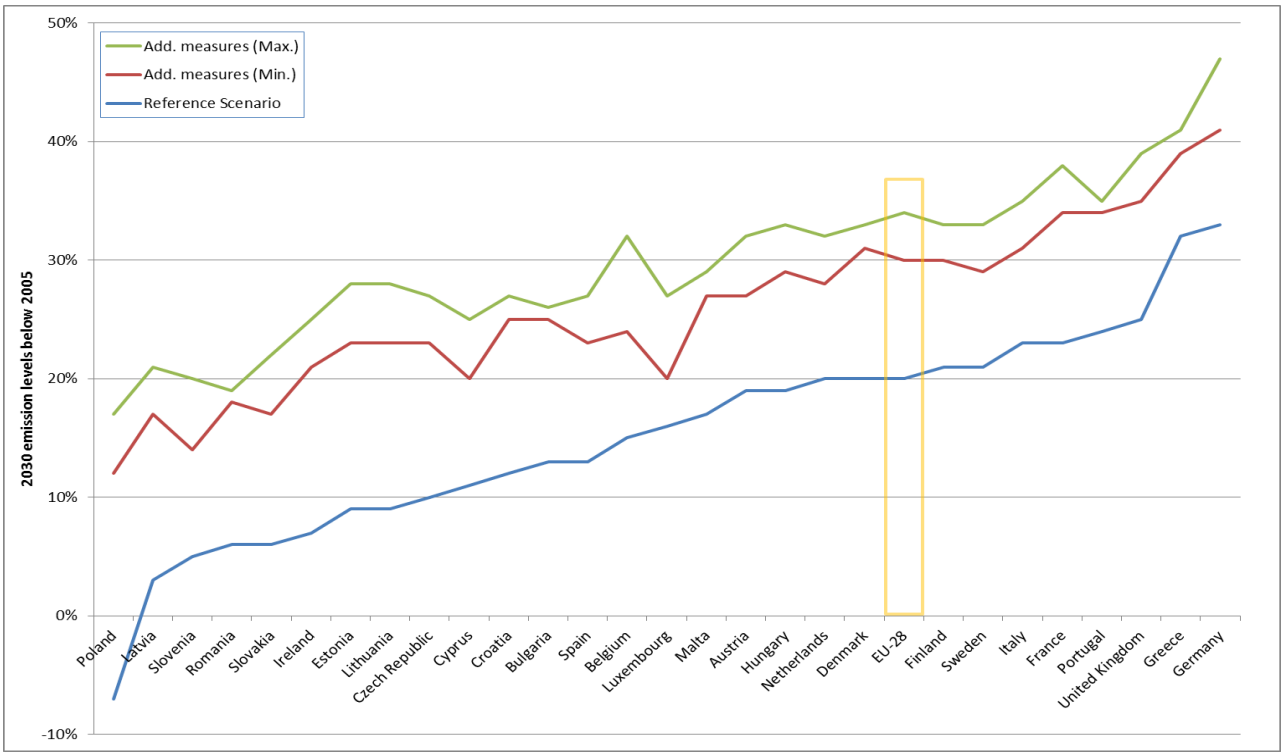
Figure 3: Austria: Cost-effective reduction potential in 2030 compared to 2005



Source: European Commission (2014), authors' own illustration

The reference scenario and the range of additional measures by Member States in 2030 are shown in Figure 4. The 2030 emissions levels in the reference scenario range from +7% in Poland to -33% in Germany compared to 2005. Accordingly, the potential for additional reductions is higher in Poland but the Polish full cost-effective potential is nevertheless still lower than the reference scenario in most Member States. The influence of the reference scenario on the full cost-effective potential is so strong that even countries with very cheap mitigation potentials (such as Poland or Romania) are deemed to have a lower full cost-effective potential than Member States with much more expensive additional potentials but high reductions in the reference scenario (like Sweden or Germany). In other words, the full cost-effective potential calculated in the Commission's Impact Assessment mainly depends on the reference scenario, i.e. the emission reductions that have already been achieved. The differences between Member States due to the additional efforts are much smaller than due to the baseline. This means that early movers among Member States obtain a much higher "cost-effective" potential due to a higher reference scenario. The factual distribution of additional low-cost mitigation potentials across Member States is only secondary.

Figure 4: Cost-effective 2030 reduction potential by Member State



Source: European Commission (2014), authors' own illustration

Table 2 shows the reduction potential in the reference scenario, for the additional measures and the full cost-effective potential for Member States with a GDP/capita above the EU average. In sections 3.2.2 and 3.2.3 two different approaches for including cost-effectiveness are discussed. The first one is based on the full cost-effective potential while the second is based only on the additional effort necessary to achieve the 2030 target. There are also other parameters which impact the distribution of effort across Member States and which are still open to discussion. These include the relative weight of the cost-effective potential compared to the target according to GDP/capita and the use of the higher or lower range for the additional measures. These will be discussed in the next two sections.

Table 2: Cost-effective reduction potential in 2030 of Member States with above-average GDP/capita

	Reference	Additional measures		Full cost-effective potential	
	Scenario	Min.	Max.	Min.	Max.
Austria	19%	8%	13%	27%	32%
Belgium	15%	9%	17%	24%	32%
Denmark	20%	11%	13%	31%	33%
Finland	21%	9%	12%	30%	33%
France	23%	11%	15%	34%	38%
Germany	33%	8%	14%	41%	47%
Ireland	7%	14%	18%	21%	25%
Luxembourg	16%	4%	11%	20%	27%
Netherlands	20%	8%	12%	28%	32%
Sweden	21%	8%	12%	29%	33%
United Kingdom	25%	10%	14%	35%	39%

Source: European Commission (2014)

3.2.2. Distribution according to the full cost-effective potential

The basis for this option is the full cost-effective reduction potential below 2005. The approach is to combine the target according to the GDP/capita distribution with the full cost-effective potential, applying the following steps:

1. Selection of a cost-effectiveness calculation:
   The target $Target_{CostEff}$ can be based on the minimum or maximum full cost-effective potential (i.e. reference scenario plus additional measures).

2. Raw combination of cost-effective potential with GDP/capita distribution:
   The combined target is $Target_{raw} = x \times Target_{GDP} + (1 - x) \times Target_{CostEff}$. The factor x determines the relative weight of the two terms. In line with the Council, the cost-effective potential should only "relatively adjust" the distribution according to wealth (European Council, 2014). This implies that the weight of the cost-effective term should not exceed 50% but could also be lower.

3. Setting upper and lower bounds:
   Depending on the policy scenario and the weighting factor, the resulting targets might not be "fair and balanced" as mandated by the EC. This would obviously be the case if the combined target is more ambitious than 40% below 2005. This would also be the case if the combined target is less ambitious than that required of Member States with a GDP/capita below the EU average. A Member State with a GDP/cap identical to the EU would need to reduce emissions by 33.8%. Italy has a GDP/cap just below the EU average and a target of 33.7%. To comply with the criteria of fairness, all wealthier Member States need to reduce their emissions more than Italy but by no more than 40%, effectively leaving a range of 33.8-40.0% below 2005.

4. Meeting the EU-28 target:
   The sum of the resulting targets will not necessarily be equal to an EU-wide reduction of 30% in 2030. The combined targets of the wealthier Member States therefore need to be adjusted again to ensure the overall target. This adjustment is carried out by distributing any over-/underachievement across the eleven Member States based on their emissions in 2005 and their GDP/capita and taking the boundaries into account. Alternative distributions of the difference are also possible (e.g. equal quantity of AEA/MS) but do not significantly affect the final results and are not further discussed in this paper.

The input data for step 1 and 2 and the results from step 2 and 4 are shown in Table 3 for both policy scenarios and with two different weighting factors.[5]

Belgium has proposed the use of the full cost-effective potential to determine the 2030 targets using the lower policy scenario (min.) and a weighting factor of 50% each (Belgian Government, 2015). The main difference to the approach presented here is that no lower bounds are applied, i.e. six Member States would have a lower target than Italy despite having a higher GDP/cap. Austria, Luxembourg, the Netherlands and Slovenia supported this approach in their responses to the Commission's consultation on the ESD II.

Table 3: Possible 2030 targets based on the full-cost-effective reduction potential

	Input values			Raw 2030 targets (Step 2)				Final 2030 targets (Step 4)			
	GDP/cap distribution	Full cost-eff. potential		25% cost-effective, 75% GDP/cap		50% cost-effective, 50% GDP/cap		25% cost-effective, 75% GDP/cap		50% cost-effective, 50% GDP/cap	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Austria	37.6%	27%	32%	34.9%	36.2%	32.3%	34.8%	35.4%	35.4%	33.8%	33.8%
Belgium	36.7%	24%	32%	33.5%	35.5%	30.4%	34.4%	33.8%	34.8%	33.8%	33.8%
Denmark	40.0%	31%	33%	37.8%	38.3%	35.5%	36.5%	38.4%	37.3%	36.3%	34.0%
Finland	37.1%	30%	33%	35.3%	36.1%	33.5%	35.0%	35.8%	35.3%	33.8%	33.8%
France	35.7%	34%	38%	35.3%	36.3%	34.8%	36.8%	35.7%	35.6%	35.4%	35.1%
Germany	36.3%	41%	47%	37.5%	39.0%	38.7%	41.7%	38.0%	38.3%	39.3%	40.0%
Ireland	37.1%	21%	25%	33.1%	34.1%	29.0%	31.0%	33.8%	33.8%	33.8%	33.8%
Luxembourg	40.0%	20%	27%	35.0%	36.8%	30.0%	33.5%	36.2%	34.9%	33.8%	33.8%
LU (alt. approach)	52.9%	20%	27%	44.7%	46.4%	36.5%	40.0%	40.0%	40.0%	36.5%	40.0%
Netherlands	37.2%	28%	32%	34.9%	35.9%	32.6%	34.6%	35.4%	35.1%	33.8%	33.8%
Sweden	39.8%	29%	33%	37.1%	38.1%	34.4%	36.4%	37.7%	37.1%	35.2%	34.0%
United Kingdom	35.1%	35%	39%	35.1%	36.1%	35.1%	37.1%	35.5%	35.4%	35.6%	35.4%
Italy	33.7%	31%	38%	33.0%	34.7%	33.3%	34.2%				

Notes: - Highlighted cells exceed the upper/ lower bounds.
- Italy has a GDP/capita just below the EU average and is shown as a reference for the lower bound.
- The alternative approach for Luxembourg is explained in footnote 5.
- The raw targets lead to an EU reduction of 29.4%-30.9% below 2005 levels in the different variants. The two options based on the minimum policy scenario do not achieve the EU target whereas the two options based on the maximum policy scenario lead to an overachievement. The final targets are adjusted to ensure an overall reduction of 30%.

Source: Authors' own calculations

[5] The table also includes an alternative approach for Luxembourg: The input value for the target based on GDP/cap is not capped at 40% but the original value of 52.9% is used. It has been calculated based on the linear distribution for wealthier Member States shown in Figure 2. The reason for this is again the requirement of "fair and balanced" targets: capping the GDP/capita before step 2 would not reflect the true wealth of Luxembourg compared to the other Member States. The same considerations would hold true for Iceland and Norway.

3.2.3. Distribution according to additional efforts only

In this option only the additional measures necessary to achieve the 30% target (see section 3.2.1) are included in the cost-effectiveness. The reference scenario is not considered. The idea is that only the additional efforts beyond the policy scenario are still open for redistribution across Member States. The reductions already achieved under the policy scenario have no impact on the costs of the additional measures needed and are therefore not further considered. The following approach is used to calculate targets:

1. Selection of a policy scenario:
   The target can be calculated either based on the minimum or maximum additional effort (i.e. not taking the reference scenario into account).

2. Raw combination of cost-effective potential with GDP/capita distribution:
   In a first step, the average additional cost-effective reduction potential $AddMeasures_{AvgAllRich\ MS}$ of the wealthier Member States needs to be calculated. The combined target is $Target_{raw} = Target_{GDP} + AddMeasures - AddMeasures_{AvgAllRich\ MS}$.
   The difference between the cost-effective additional potential of a Member State and the average additional cost-effective potential of the richer Member States is used to relatively adjust the distribution based on GDP/capita. Member States with an additional potential above the average of all the richer Member States need to reduce emissions to a greater extent than those with a lower potential.

3. Setting upper and lower bounds:
   Again the potential range of reductions below 2005 is 33.8-40.0% for the wealthier Member States (see section 3.2.2).

4. Meeting the EU-28 target:
   The combined targets need to be adjusted slightly to achieve the overall EU target. The adjustment is carried out by distributing any over-/underachievement across the eleven Member States based on their emissions in 2005 and their GDP/capita, taking the boundaries into account.

The results of this approach are shown in Table 4. No Member State would be below the lower bound and the raw result is therefore not shown. Under this approach there is no need for a weighting factor and the adjustment in the last step is rather moderate.

Table 4: Possible 2030 targets based on the additional reduction potential

	Input values					Final 2030 targets	
	GDP/cap distribution	Additional potential Min.	Additional potential Max.	Difference to average Min.	Difference to average Max.	GDP/cap + difference Min.	GDP/cap + difference Max.
Austria	37.6%	8%	13%	-1.4%	-1.2%	36.2%	36.4%
Belgium	36.7%	9%	17%	-0.4%	2.8%	36.4%	39.6%
Denmark	40.0%	11%	13%	1.6%	-1.2%	40.0%	38.9%
Finland	37.1%	9%	12%	-0.4%	-2.2%	36.7%	34.9%
France	35.7%	11%	15%	1.6%	0.8%	37.3%	36.5%
Germany	36.3%	8%	14%	-1.4%	-0.2%	35.0%	36.2%
Ireland	37.1%	14%	18%	4.6%	3.8%	40.0%	40.0%
Luxembourg	40.0%	4%	11%	-5.4%	-3.2%	34.8%	36.9%
Netherlands	37.2%	8%	12%	-1.4%	-2.2%	35.8%	35.0%
Sweden	39.8%	8%	12%	-1.4%	-2.2%	38.5%	37.7%
United Kingdom	35.1%	10%	14%	0.6%	-0.2%	35.7%	35.0%
Weighted average		9.4%	14.2%				

Notes: For the weighted average the 2005 ESD emissions were used to scale the additional reduction potential of the eleven countries. The final targets are adjusted slightly to ensure an overall reduction of 30% for the EU-28.

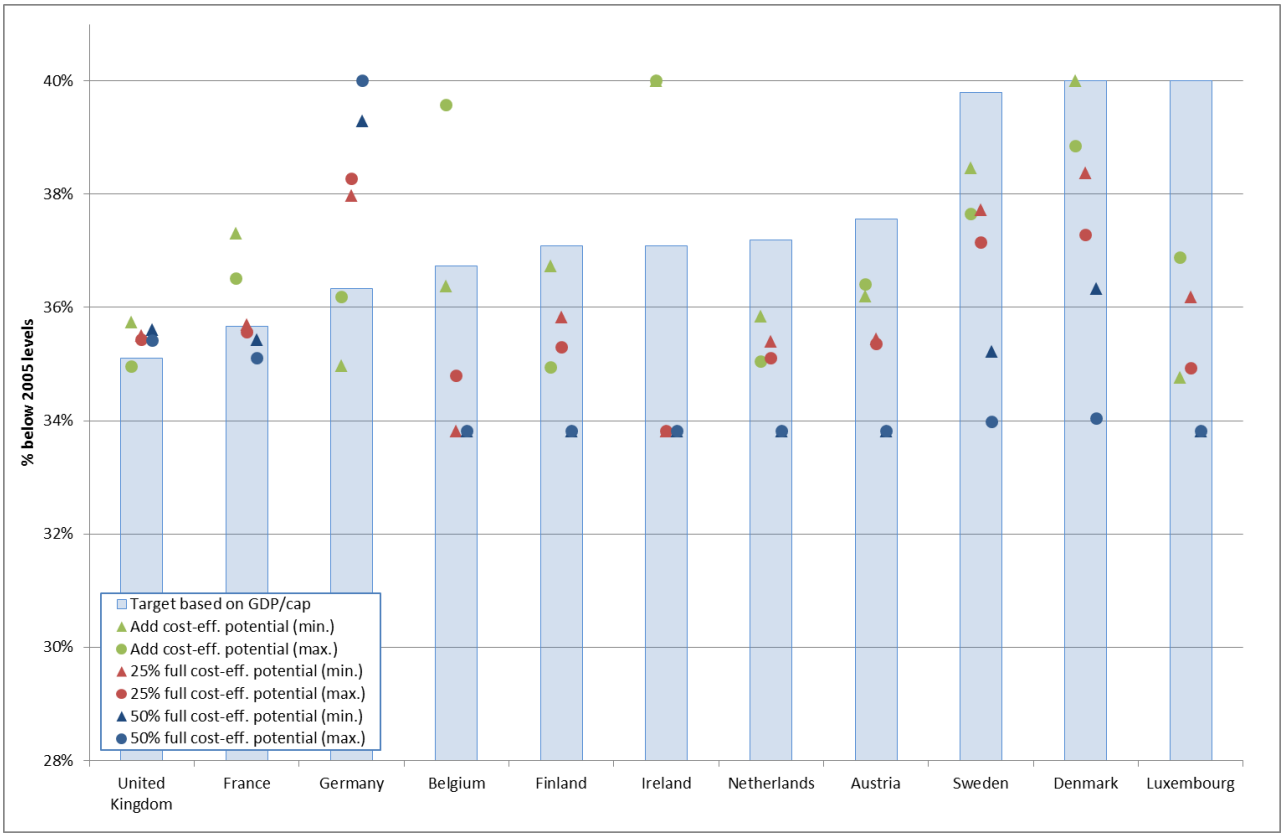
Source: Authors' own calculations

3.2.4. Discussion of the different options

Six different possibilities using two distinct approaches have been identified to adjust the targets based on cost-effectiveness criteria for Member States with a GDP/capita above the EU average. Each of these options can be calculated using the upper or lower values for the cost-effective potential leading to 12 different distributions. While both distinct approaches (using the full cost-effective potential or only the additional potential) can be interpreted as being in line with the EC conclusions and will result in the same 2030 emissions for the EU, they do lead to large differences for individual Member States. Importantly, they reward/penalise different groups of countries. The 12 distributions are shown in Figure 5 along with the targets based only on a GDP distribution.

Approaches which are based on the **full cost-effective potential** look backwards and effectively punish early action: Member States with high reductions in the reference scenario automatically receive higher 2030 targets than those which have not yet achieved similar reductions domestically. Of the eleven Member States involved in the adjustment based on cost-effectiveness, Ireland has the lowest reductions in the reference scenario at 7% below 2005 levels. At the other end of the spectrum is Germany with a reduction of 33%. Correspondingly, Ireland also has the highest additional reduction potential (min.) but it amounts to only 14% compared to Germany's additional potential of 8%; the difference in the additional potential is not nearly as large as the differences between the reference scenarios of the two countries. The three Member States with the highest reductions in the reference scenario also have the highest full cost-effective potential (DE, FR, UK). In contrast, of the wealthier Member States the three with the lowest reductions in the reference scenario are also the three Member States with the lowest full cost-effective potential in 2030 (BE, IE, LU). Another point not reflected in this approach are the costs of the measures already included in the reference scenario. The Impact Assessment applies the underlying assumption that all of these reductions were more cost-efficient than the remaining options, i.e. they had marginal abatement costs below 40 EUR/t CO_2. While this holds true for some measures, it is not necessarily the case for all of them. Any measures which had higher costs increase the 2030 target independently of the remaining cost-effective potential in a country.

Figure 5: Overview of the potential 2030 ESD targets for Member States with above-average GDP/capita



Notes: Values are given in Table 6 in the Annex.
Source: Authors' own calculations

All approaches based on the **full cost-effective potential** contradict a general principle of EU environmental action: early movers should not be penalised. The UK highlighted this in their response to the public consultation on the ESD II (UK Government, 2015): "In order to ensure the cost-effective adjustment is fair and balanced the methodology used should not penalise countries that already have in place domestic policies that are expected to provide considerable GHG reductions to 2030." Giving the criterion of cost-effectiveness a lower weight would reduce this bias towards rewarding inaction. Despite this, all of the Member States in favour of this approach proposed a weighting factor of 50% in their responses to the consultation. Several of these countries reasoned that equal treatment of "both targets seems to be best in line with the prescribed principle of 'a fair and balanced manner', as it does not favour one criterion over the other" (The Netherlands, 2015). While it can be argued that a 50% weighting is balanced between the two criteria, it certainly does not lead to a fair adjustment between Member States: Firstly, the eight countries with the highest GDP/capita in the EU would be allowed to emit more. Only Germany and the UK would have higher targets despite having GDP/capita values much closer to the EU average. Germany and the UK are also the two countries with the highest reductions in the reference scenario. Secondly, the Belgian proposal as well as the general outline given by other Member States would result in targets for six richer Member States (AT, BE, FI, IE, LU, NL) that are lower than the effort expected of Italy, a country with a below-average GDP/capita. Thus, the approach would need an additional adjustment to ensure that all Member States are required to reduce emissions at least as much as Italy and by no more than 40%.

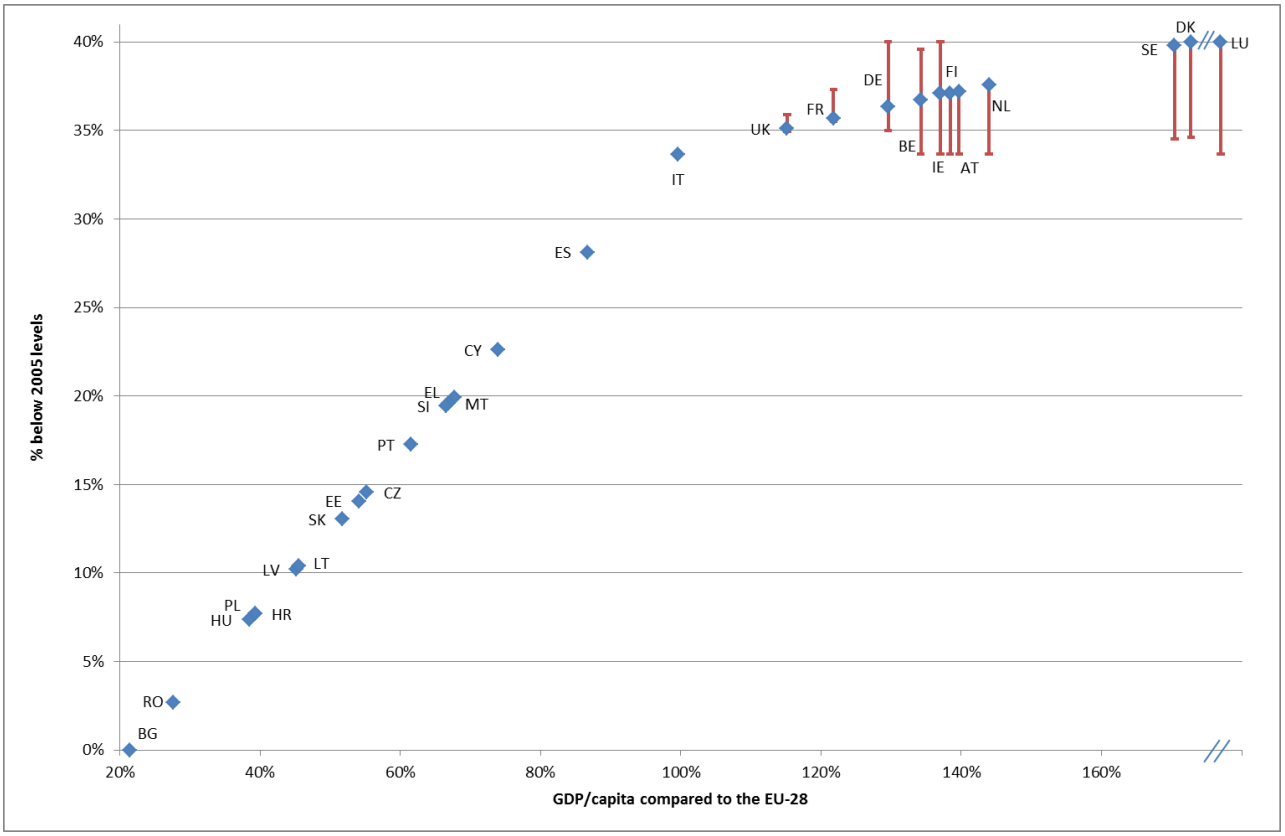
In contrast, approaches which are based only on the **additional cost-effective effort** necessary to achieve the EU target after the reductions already achieved in the reference scenario do not penalise early action. Instead of looking at the overall reduction below 2005 levels, only the remaining effort is included in the distribution according to cost-effectiveness. Member States with a higher additional cost-effective reduction potential than the average potential of the eleven wealthiest Member States need to do more; those with a lower additional potential need to do less. It is a forward-looking approach in which only the available remaining potential is included. It does not clearly favour Member States with high/low reductions in the reference scenario: Luxembourg has the lowest additional potential of only 4% despite a moderate reduction of 16% in the reference scenario. While Belgium has very similar reductions in the reference scenario, its additional potential is more than twice as high. Another advantage of the methodology is that it is relatively simple and only requires very limited redistribution of efforts to achieve the total overall reduction of 30% below 2005.

4. Conclusions

The Conclusions of the European Council of October 2014 have set the rules for determining Member States 2030 emission targets under an Effort Sharing Decision. Despite this, several options remain for both the initial AEA at the beginning of the period in 2021 as well as the 2030 targets by Member State. The initial AEA can be based on the 2020 ESD target, average emissions in the most recent years before the start of the period or a combination of both approaches (see section 2). The different options have an impact on the total AEA and therefore allowable emissions during the 10 years up to 2030. In contrast, the different options for setting 2030 targets for Member States have no direct impact on EU emission levels because total emissions in 2030 are equal in all the analysed scenarios.

For Member States with a GDP/capita below the EU average, the EC conclusions clearly provide all the provisions necessary to determine the targets (see section 3). For the eleven Member States with a GDP/capita above the EU average, several options that are in line with the EC have been identified in this paper (Figure 6). These options are based on two distinct approaches: either on the full cost-effective potential including all emission reductions that have already been achieved or on the additional potential only. Within the approach based on full cost-effectiveness, there are still several options concerning the relative weight of the GDP/cap and cost-effectiveness components.

Figure 6: Overview of the 2030 ESD targets by GDP/capita and range of the potential cost-effective adjustments



Source: Authors' own calculations

The results of the evaluation of the different options are summarised in Table 5. It is clear that not all options are equally desirable. For the **selection of the 2021 starting point** the advantage of using the 2020 target is that it would reward early action and set an incentive for domestic efforts to stay below this target before 2020. Unfortunately, the approach would increase the overall emission budget of the EU by 5-6% compared to the approaches based on historic emissions due to the lax 2020 targets. In light of the outcome of the international climate conference in Paris and the EU's commitment to limit global warming to well below 2°C, the starting point therefore needs to be based on the actual emissions for 2016-18. The drawback is that using historic emissions sets a much weaker signal for early action domestically. The best option is, therefore, to use the 2020 target as the upper limit for those Member States whose emissions levels in 2016-18 will be above their target. Another reason for capping the 2021 AEA with the 2020 target is that the ESD target path should always decrease. Without the cap, some Member States would have higher budgets in 2021 than in 2020.

The question of **setting 2030 targets for Member States** is more complex. In general it can be said that the higher the influence of the cost-effective potential is, the more that early action and strong domestic reductions are penalised. This is due to the way in which emission reductions in the reference scenario are treated in the cost-effectiveness calculations: the full cost-effective potential calculated in the Commission's Impact Assessment mainly depends on the reference scenario, i.e. the emission reductions that have already been achieved. The differences between Member States due to the additional efforts are much smaller than due to the baseline. This means that early movers among Member States obtain a much higher full "cost-effective" potential due to a higher reference scenario. Coincidentally the UK, France and Germany – the three Member States with the lowest GDP/cap of this group of eleven – are also the three Member States with the highest reductions in the reference scenario and have the highest cost-effective potential. The effect is that the richest EU Member States could significantly reduce their ambition whereas those Member States with a GDP/cap close to the EU average would need to compensate for them. In the case of the Belgian proposal (full cost-effectiveness, 50% weighting and no lower limit), the resulting targets for six of the eleven richest Member States would be below the target required of Italy – the Member State closest but just below the EU average GDP/capita. With this in mind, only two options really comply with the EC requirement of a fair and balanced adjustment of the GDP/capita targets and do not (overly) penalise early action: the approach based on additional effort only and the approach which gives the full cost-effective potential a weight of only 25%.

Table 5: Possible 2030 targets based on the full-cost-effective reduction potential

		Environmental integrity	Reward early action	Encourage domestic reduction	Fair compared to poorer MS	Balanced reflection of cost-effectiveness
Starting point	2020 target	--	+	+		
	Ø2016-18 emissions	+	-	-		
	Capped Ø2016-18 emissions	++	o	o		
2030 target (rich MS)	Add. cost-effective potential		+	+	+	+
	Full cost-effective potential (25% weighting)		o	o	o	+
	Full cost-effective potential (50% weighting)		-	-	-	-
	Full cost-effective potential (Belgian proposal)		--	--	--	--

Notes: The distribution of 2030 targets based on GDP/capita is not included because there are no alternative options in line with the EC for doing so.

Source: Authors' own assessment

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Annex

Table 6: Member States' 2030 targets under the different options

	Input data		2030 targets															
	GDP/cap		GDP/cap distribution		Additional cost-eff. potential				25% full cost-eff. potential				50% full cost-eff. potential				50% full cost-eff. potential (Belgian proposal)			
					Min.		Max.		Min.		Max.		Min.		Max.		Min.		Max.	
	[EUR]	[% of EU]	[%]	[mn AEA]	[%]	[mn AEA]	[%]	[mn AEA]	[%]	[mn AEA]	[%]	[mn AEA]	[%]	[mn AEA]	[%]	[mn AEA]	[%]	[mn AEA]	[%]	[mn AEA]
EU-28	25 700	100%	30%	2 039.8																
Austria	37 000	144%	37.6%	36.3	36.2%	37.1	36.4%	36.9	35.4%	37.5	35.4%	37.6	33.8%	38.4	33.8%	38.4	33.3%	38.7	33.2%	38.8
Belgium	34 500	134%	36.7%	50.4	36.4%	50.7	39.6%	48.1	33.8%	52.7	34.8%	51.9	33.8%	52.7	33.8%	52.7	31.3%	54.7	32.9%	53.4
Bulgaria	5 500	21%	0.0%	24.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Croatia	10 100	39%	7.7%	17.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyprus	19 000	74%	22.6%	4.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Czech Rep.	14 200	55%	14.6%	53.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Denmark	44 400	173%	40.0%	22.9	40.0%	22.9	38.9%	23.3	38.4%	23.5	37.3%	23.9	36.3%	24.3	34.0%	25.1	36.8%	24.1	34.6%	24.9
Estonia	13 900	54%	14.1%	5.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Finland	35 600	139%	37.1%	21.2	36.7%	21.4	34.9%	22.0	35.8%	21.7	35.3%	21.8	33.8%	22.3	33.8%	22.3	34.6%	22.1	33.5%	22.4
France	31 300	122%	35.7%	268.8	37.3%	261.9	36.5%	265.2	35.7%	268.6	35.6%	269.2	35.4%	269.8	35.1%	271.1	35.7%	268.5	35.5%	269.5
Germany	33 300	130%	36.3%	315.1	35.0%	321.9	36.2%	315.9	38.0%	307.0	38.3%	305.5	39.3%	300.5	40.0%	297.0	39.6%	298.9	40.2%	295.8
Greece	17 400	68%	19.9%	51.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hungary	9 900	39%	7.4%	49.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ireland	35 600	139%	37.1%	30.6	40.0%	29.2	40.0%	29.2	33.8%	32.2	33.8%	32.2	33.8%	32.2	33.8%	32.2	30.1%	34.1	29.5%	34.3
Italy	25 600	100%	33.7%	224.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Latvia	11 600	45%	10.2%	7.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lithuania	11 700	46%	10.4%	12.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Luxembourg	83 400	325%	40.0%	6.1	34.8%	6.6	36.9%	6.4	36.2%	6.5	34.9%	6.6	33.8%	6.7	33.8%	6.7	32.4%	6.9	29.9%	7.1
Malta	17 200	67%	19.6%	0.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Netherlands	35 900	140%	37.2%	80.0	35.8%	81.8	35.0%	82.8	35.4%	82.3	35.1%	82.7	33.8%	84.3	33.8%	84.3	33.6%	84.6	33.1%	85.3
Poland	10 100	39%	7.7%	163.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Portugal	15 800	61%	17.2%	42.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Romania	7 100	28%	2.7%	72.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Slovakia	13 300	52%	13.1%	20.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Slovenia	17 100	67%	19.4%	9.7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Spain	22 300	87%	28.1%	171.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sweden	43 800	170%	39.8%	27.0	38.5%	27.6	37.7%	27.9	37.7%	27.9	37.1%	28.2	35.2%	29.0	34.0%	29.6	35.6%	28.8	34.5%	29.3
UK	29 600	115%	35.1%	252.7	35.7%	250.2	35.0%	253.3	35.5%	251.2	35.4%	251.4	35.6%	250.7	35.4%	251.5	35.9%	249.6	35.8%	250.1

Source: Authors' own calculations with data from European Commission (2014), EEA (2015) and Eurostat (2015)

Table 7: Cumulated emissions budgets for 2021–2030 under the different options for the EU and Member States with above-average GDP/capita

				2030 Target Option				
				GDP/cap	Add. cost-eff. Potential (min.)	Full cost-eff. potential (25% weight, min.)	Full cost-eff. Potential (50% weight, min.)	Full cost-eff. Potential (Belgian proposal)
			[mn AEA]	[mn AEA]	[mn AEA]	[mn AEA]	[mn AEA]	[mn AEA]
Starting Point in 2021	EU-28	2020 target	2 644.2	23 420.0	23 420.4	23 420.0	23 420.0	23 420.0
		Ø 2016-18 emissions (WEM)	2 525.3	22 825.9	22 826.3	22 825.9	22 825.9	22 825.9
		Capped Ø 2016-18 emissions	**2 494.1**	**22 669.7**	**22 670.2**	**22 669.7**	**22 669.7**	**22 669.7**
	Austria	2020 target	48.8	425.4	429.3	431.6	436.3	437.7
		Ø 2016-18 emissions (WEM)	51.4	438.6	442.5	444.7	449.4	450.9
		Capped Ø 2016-18 emissions	**48.8**	**425.4**	**429.3**	**431.6**	**436.3**	**437.7**
	Belgium	2020 target	67.7	590.3	591.7	601.9	601.9	611.7
		Ø 2016-18 emissions (WEM)	73.0	616.8	618.3	628.4	628.4	638.3
		Capped Ø 2016-18 emissions	**67.7**	**590.3**	**591.7**	**601.9**	**601.9**	**611.7**
	Denmark	2020 target	30.5	266.9	266.9	270.0	273.9	273.1
		Ø 2016-18 emissions (WEM)	31.3	271.0	271.0	274.1	278.0	277.2
		Capped Ø 2016-18 emissions	**30.5**	**266.9**	**266.9**	**270.0**	**273.9**	**273.1**
	Finland	2020 target	28.4	248.0	248.6	250.1	253.5	252.3
		Ø 2016-18 emissions (WEM)	29.5	253.5	254.1	255.6	259.0	257.8
		Capped Ø 2016-18 emissions	**28.4**	**248.0**	**248.6**	**250.1**	**253.5**	**252.3**
	France	2020 target	359.3	3 140.2	3 106.1	3 139.7	3 145.4	3 139.2
		Ø 2016-18 emissions (WEM)	353.8	3 113.0	3 078.9	3 112.4	3 118.2	3 112.0
		Capped Ø 2016-18 emissions	**353.8**	**3 113.0**	**3 078.9**	**3 112.4**	**3 118.2**	**3 112.0**
	Germany	2020 target	425.6	3 703.8	3 737.5	3 663.2	3 630.6	3 622.8
		Ø 2016-18 emissions (WEM)	435.4	3 752.8	3 786.4	3 712.2	3 679.5	3 671.7
		Capped Ø 2016-18 emissions	**425.6**	**3 703.8**	**3 737.5**	**3 663.2**	**3 630.6**	**3 622.8**
	Ireland	2020 target	39.0	348.1	341.0	356.1	356.1	365.3
		Ø 2016-18 emissions (WEM)	42.9	367.9	360.8	375.9	375.9	385.1
		Capped Ø 2016-18 emissions	**39.0**	**348.1**	**341.0**	**356.1**	**356.1**	**365.3**
	Luxemb.	2020 target	8.1	71.3	73.9	73.2	74.4	75.2
		Ø 2016-18 emissions (WEM)	9.9	80.2	82.8	82.1	83.3	84.0
		Capped Ø 2016-18 emissions	**8.1**	**71.3**	**73.9**	**73.2**	**74.4**	**75.2**
	Netherl.	2020 target	107.0	935.4	944.0	946.8	956.9	958.2
		Ø 2016-18 emissions (WEM)	105.4	927.0	935.6	938.4	948.5	949.8
		Capped Ø 2016-18 emissions	**105.4**	**927.0**	**935.6**	**938.4**	**948.5**	**949.8**
	Sweden	2020 target	37.2	320.9	323.9	325.6	331.2	330.3
		Ø 2016-18 emissions (WEM)	33.3	301.5	304.5	306.2	311.8	310.9
		Capped Ø 2016-18 emissions	**33.3**	**301.5**	**304.5**	**306.2**	**311.8**	**310.9**
	UK	2020 target	327.1	2 898.9	2 886.7	2 891.3	2 889.2	2 883.7
		Ø 2016-18 emissions (WEM)	332.9	2 928.1	2 915.9	2 920.5	2 918.4	2 912.9
		Capped Ø 2016-18 emissions	**327.1**	**2 898.9**	**2 886.7**	**2 891.3**	**2 889.2**	**2 883.7**

Source: Authors' own calculations

Table 8: Cumulated emissions budgets for 2021–2030 in the different options for Member States with below-average GDP/capita

			[mn AEA]	GDP/cap [mn AEA]
Starting Point in 2021	Bulgaria	2020 target	28.8	264.0
		Ø 2016-18 emissions (WEM)	23.2	235.9
		Capped Ø 2016-18 emissions	**23.2**	**235.9**
	Croatia	2020 target	21.0	191.9
		Ø 2016-18 emissions (WEM)	16.9	171.8
		Capped Ø 2016-18 emissions	**16.9**	**171.8**
	Cyprus	2020 target	5.9	53.9
		Ø 2016-18 emissions (WEM)	2.9	38.7
		Capped Ø 2016-18 emissions	**2.9**	**38.7**
	Czech R.	2020 target	67.7	603.4
		Ø 2016-18 emissions (WEM)	59.6	563.1
		Capped Ø 2016-18 emissions	**59.6**	**563.1**
	Estonia	2020 target	6.5	57.4
		Ø 2016-18 emissions (WEM)	5.6	53.3
		Capped Ø 2016-18 emissions	**5.6**	**53.3**
	Greece	2020 target	61.2	561.6
		Ø 2016-18 emissions (WEM)	45.7	484.1
		Capped Ø 2016-18 emissions	**45.7**	**484.1**
	Hungary	2020 target	58.2	536.3
		Ø 2016-18 emissions (WEM)	38.8	439.4
		Capped Ø 2016-18 emissions	**38.8**	**439.4**
	Italy	2020 target	294.4	2 594.7
		Ø 2016-18 emissions (WEM)	273.7	2 491.1
		Capped Ø 2016-18 emissions	**273.7**	**2 491.1**
	Latvia	2020 target	9.9	87.5
		Ø 2016-18 emissions (WEM)	8.8	81.9
		Capped Ø 2016-18 emissions	**8.8**	**81.9**
	Lith.	2020 target	15.5	137.6
		Ø 2016-18 emissions (WEM)	12.8	124.3
		Capped Ø 2016-18 emissions	**12.8**	**124.3**
	Malta	2020 target	1.2	10.2
		Ø 2016-18 emissions (WEM)	0.9	9.0
		Capped Ø 2016-18 emissions	**0.9**	**9.0**
	Poland	2020 target	202.3	1 830.8
		Ø 2016-18 emissions (WEM)	188.5	1 761.6
		Capped Ø 2016-18 emissions	**188.5**	**1 761.6**
	Portugal	2020 target	51.2	466.1
		Ø 2016-18 emissions (WEM)	39.4	406.7
		Capped Ø 2016-18 emissions	**39.4**	**406.7**
	Romania	2020 target	88.4	803.3
		Ø 2016-18 emissions (WEM)	72.9	726.1
		Capped Ø 2016-18 emissions	**72.9**	**726.1**
	Slovakia	2020 target	26.5	234.8
		Ø 2016-18 emissions (WEM)	22.5	214.4
		Capped Ø 2016-18 emissions	**22.5**	**214.4**
	Slovenia	2020 target	12.5	111.2
		Ø 2016-18 emissions (WEM)	11.1	104.2
		Capped Ø 2016-18 emissions	**11.1**	**104.2**
	Spain	2020 target	214.2	1 925.9
		Ø 2016-18 emissions (WEM)	203.0	1 869.9
		Capped Ø 2016-18 emissions	**203.0**	**1 869.9**

Source: Authors' own calculations