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## Green Deal Emission Reduction Targets for 2030

Karl W. Steininger, Lukas H. Meyer, Stefan Schleicher,
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Short version, October 2020

Climate Change Graz
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# Effort Sharing among EU Member States
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Authors:

Karl W. Steininger[1)], Lukas H. Meyer[2)], Stefan Schleicher[1)],
Keywan Riahi[3)], Keith Williges[1)], Florian Maczek[3)]

[1)] University of Graz, Wegener Center for Climate and Global Change, Graz, Austria

[2)] University of Graz, Department of Philosophy, Graz, Austria

[3)] International Institute for Applied Systems Analysis, Laxenburg, Austria

Short version, October 2020

Reviewed by:

Marian Leimbach
Potsdam Institute of Climate Impact Research, Potsdam, Germany
Thomas Schinko
International Institute for Applied Systems Analysis, Laxenburg, Austria

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Responsible for the content:
Wegener Center for Climate and Global Change, University of Graz
Brandhofgasse 5, 8010 Graz
Contact: karl.steininger@uni-graz.at

# Summary for Policy Makers

After having agreed in the European Council of December 2019 on transforming the European Union to climate neutrality by 2050, the next step requires adjusting the 2030 targets on climate and energy accordingly.

This Research Brief focuses on the effort sharing (ES) sector, which covers all greenhouse gas (GHG) emissions that are neither included in the EU Emissions Trading Scheme (EU ETS) nor covered under "land use and land use change"[1]. Starting from the Effort Sharing Decision of 2018, this Brief frames the issue in the broader context of global emission budgets that are compatible with the Paris Agreement climate targets and considers criteria for allocating the respective EU budget among the EU-27.

These are the key messages of our analysis:

**Global effort sharing with a focus on the remaining global carbon emission budget and equivalent reductions of non-$CO_2$ gases indicates that the EU-27 need to reduce their GHG emissions by at least 55% in 2030 compared to 1990. For the 1.5 degree target, a reduction well beyond 60% is required.**

Targets for climate policy need to focus on the remaining carbon emission budgets and non-$CO_2$ emissions reductions that are in line with the ambitions of the Paris Agreement. Fairness considerations are important for allocating these global $CO_2$ budgets and non-$CO_2$ emissions reductions among countries.

Such a mixed budget approach indicates that the EU-27 would need to reduce their GHG emissions by at least 55% in 2030 compared to 1990. This target is consistent with a steady path towards the EU climate neutrality objective, which calls for net zero GHG emissions by 2050.

With greenhouse gases having very different residence times in the atmosphere, the significantly longer one of $CO_2$ has made $CO_2$ emission budgets ("carbon budgets") the focal issue for robust long-term global emission budget evaluations, which do take into account respective pathways of emissions of the other greenhouse gases. Based on the EU target of climate neutrality, we can interpret EU-27 greenhouse gas emission reduction targets (all gases) to reflect $CO_2$ emission reduction at least at equivalent scale.

The objective of 55% emission reduction by 2030 (relative to 1990) and climate neutrality by 2050 at the latest [1], [2] would require a budget of 40.3 Gt $CO_2$ for 2020-2050 (see Figure SPM-1). Conversely, when allocating the remaining global carbon budget that ensures a global temperature rise at "well below 2 degrees" on a simple per capita basis (current population) across the globe, the EU-27 budget amounts to 34.1 Gt $CO_2$ only, implying a required emission reduction rate at 58% by 2030 (see Figure SPM-1). If the stricter target of 1.5 degrees were sought to be achieved the reduction rate would increase to 63% (for a 50% likelihood of achieving) or 78% (66% likelihood).[2] If the global allocation mechanism would take into account only one of the widely accepted fairness

[1] A fourth emission category kept distinct (and not covered by effort sharing) is international transport (accounted for as "bunker fuels"). Thereof air travel that takes place within the EU is covered under the EU ETS.

[2] The underlying allocation of the remaining global budget to countries worldwide (and the EU-27) here is based on equal shares per capita (current population). The "In-depth analysis in support of the EU Communication ´A Clean planet for all´"[3] conversely is based on a per capita emission convergence concept, thus allocating a larger share of the remaining global budget to current high emitters, such as the EU-27. Under the latter allocation achieving a global 1.5 degree target is consistent with climate neutrality of the EU-27 if achieved by 2050, and correspondingly also with a 55% reduction by 2030. In addition, note that climate neutrality implies negative net $CO_2$ emissions (i.e. net sinks) to balance non-$CO_2$ GHG emissions, also shifting net zero $CO_2$ emissions to earlier than achieving climate neutrality. Thus, while the overall target is identical, it is made explicit not only applying different allocation concepts but also using different indicators. We here derive the net $CO_2$ emission path from the global $CO_2$ budget assuming respective reductions of non-$CO_2$ GHGs, while the EU report assumes per capita convergence of aggregate GHG emissions by 2050. The estimates are well within the uncertainties of the global $CO_2$ emissions budget and the associated GHG mitigation pathways

concerns (future population share, provision of basic needs, past emissions, or inherited benefits) the corresponding emission reduction requirement for the EU-27 would increase in each of the above cases.

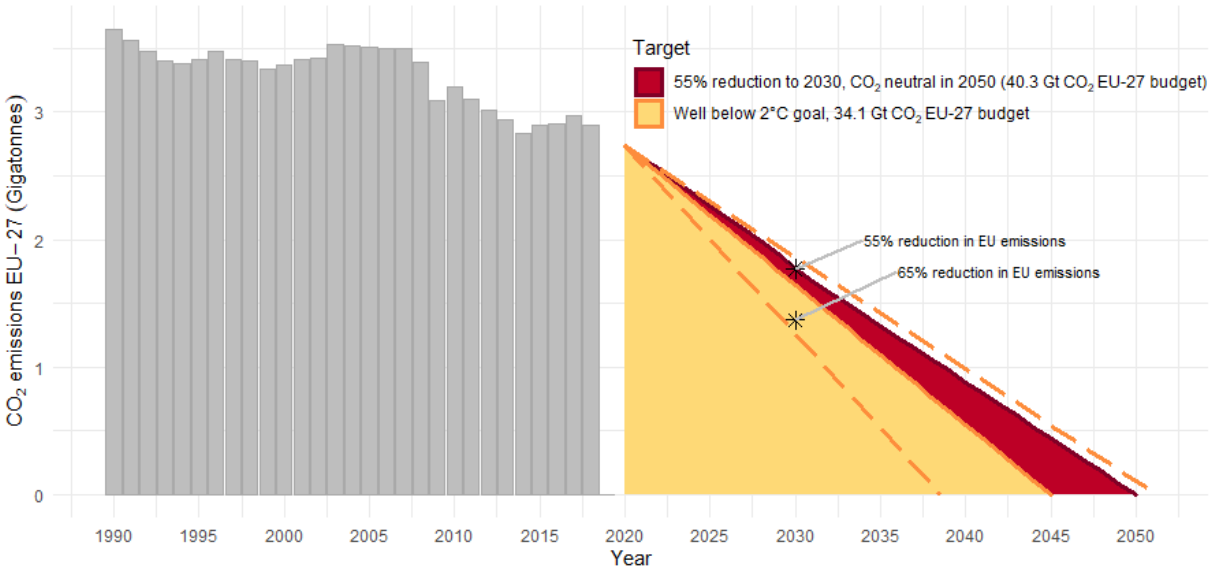



*Figure SPM-1: The EU-27 2030 emission reduction target (dark red pathway) in light of its share in the global carbon budget ('well below 2 degrees'-budget shaded yellow, uncertainty range (15th and 85th percentile) given by dashed lines). Climate neutrality requires that carbon sinks balance any remaining $CO_2$ and non-$CO_2$ GHG emissions.*

**Effort sharing with a view on fairness criteria suggests acknowledging a set of possible qualifications when setting country targets.**

Effort sharing mechanisms among the EU-27 can take into account fairness criteria beyond the currently used GDP-based indicators.

A comprehensive understanding of effort sharing can be characterized by, first, the two main approaches and, second, how both can be qualified. The two main effort sharing approaches are Contraction and Convergence (CAC) and Equal Per Capita (EPC). While CAC takes current levels as unquestioned starting points for contraction paths, EPC assumes equal per capita shares of the remaining permissible carbon budget (CB). According to CAC every country starts at its own current emission level and converges on a common future level of per-person emissions by a future point in time in such a way that all countries together stay within the limits of the global or regional greenhouse gas budget (see Figure SPM-2).[3]

[3] GHG emission budgets (i.e. cumulative GHG emissions) in this report are used as a proxy for the accumulated emissions reduction effort since a certain point in time – for example, since the Kyoto Protocol was established and international agreements started to focus on GHGs. With the GHG emissions budgets we do not intend, however, to represent the contribution of different countries to climate change, but rather use cumulative emissions as a proxy for whether or not countries have followed up with GHG commitments in the past (or in the future).

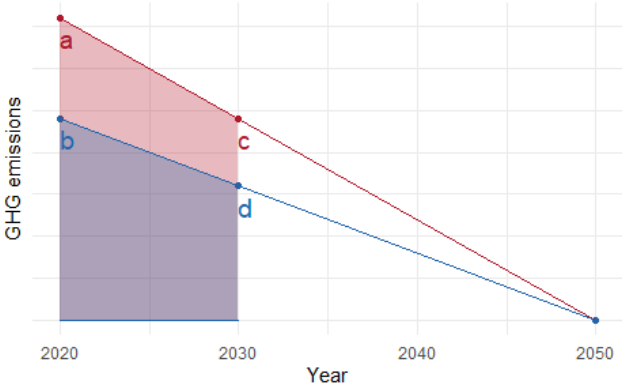



*Figure SPM-2: Conceptual depiction of the contraction and convergence (CAC) effort sharing mechanism. Two countries with different starting emissions converge to a lower common future level of per person emissions. Thus the ratio of emissions between countries remains the same over the time period of convergence up to net zero GHG emissions (a:b equals c:d).*

According to EPC, the greenhouse gas budget is split in such a way that all countries are allocated an equal amount of emissions per person for the time period until climate neutrality is achieved. Both approaches can take into account further major fairness considerations. These reflect countries' unequal

- ability to abate emissions,
- past efforts in improving emissions efficiency by means of decreasing energy intensity or implementing renewables,
- population below minimum welfare levels,
- past emissions,
- inherited benefits (such as available infrastructure, having been created by activities that generated GHG emissions in the past).

**A more comprehensive understanding of effort sharing mechanisms can be made operational.**

This more comprehensive view on effort sharing is implemented in a unified analytical framework that offers an extensive understanding of effort sharing, which aims at transparency via fully reproducible numerical results, consistency by integrating the different allocation procedures, and operationality by an adequate software tool. Accompanying this Policy Brief is therefore the Effort Sharing Tool (ES Tool), a software device that is available for various platforms upon request from the authors. This tool implements the different effort sharing mechanisms, allows for additional experiments with effort sharing suggestions and enables to obtain insights into their impacts on reduction efforts by individual Member States.

As (a qualified understanding of) CAC has informed EU climate policy to date, in our empirical study we use CAC from 2018 to 2050 as our first interpretation of effort-sharing by 2030 (serving as reference allocation) and compare its implications with qualified versions of it. Six qualifications of the main allocation approach CAC are investigated: ability to abate (GDP per person), convergence to equal annual emissions per person already by 2030, share of population below minimum welfare levels, past emissions, inherited benefits and past efforts on renewables implementation. Considering the last one, and given the extremely high levels of economic interdependencies within the EU it seems likely that welfare gains realized in one country will benefit people in other EU countries as well. Accordingly, we have reasons to give higher shares of emission rights to countries which have induced welfare increases by an expansion of their shares of renewable energy resources insofar as these national measures are likely to increase weighted transnational aggregative welfare in the EU. In addition, assuming the budget as determined by the CAC approach for 2019-2030 for EU-27, we apply the EPC allocation mechanism within the EU-27 (granting equal emissions budgets per person), which can thus be considered a seventh qualification. In these

qualifications we further acknowledge a ratchet mechanism that countries cannot fall behind their ES reduction commitments for 2030 according to the currently effective Effort Sharing directive.

These qualifications can be used individually or combined in bundles, and each qualification can be scaled to an individual weighing intensity at which it qualifies the reference allocation. Figure SPM-3 provides one such example implementation for a 55% reduction of total EU GHG emissions, presupposing an emission share of 35% of the EU ETS[4], and acknowledging qualifications for the equal per capita emissions budget, renewables, and share of population below minimum welfare levels.[5] For each country, two comparative values are given in Figure SPM-3: (i) ES reduction commitments according to the currently effective Effort Sharing directive, and (ii) adjusted commitments that account for Brexit and still ensure the 30% reduction target for aggregated EU-27 ES emissions when allocated among Member States according to the principles that the current directive is based on.

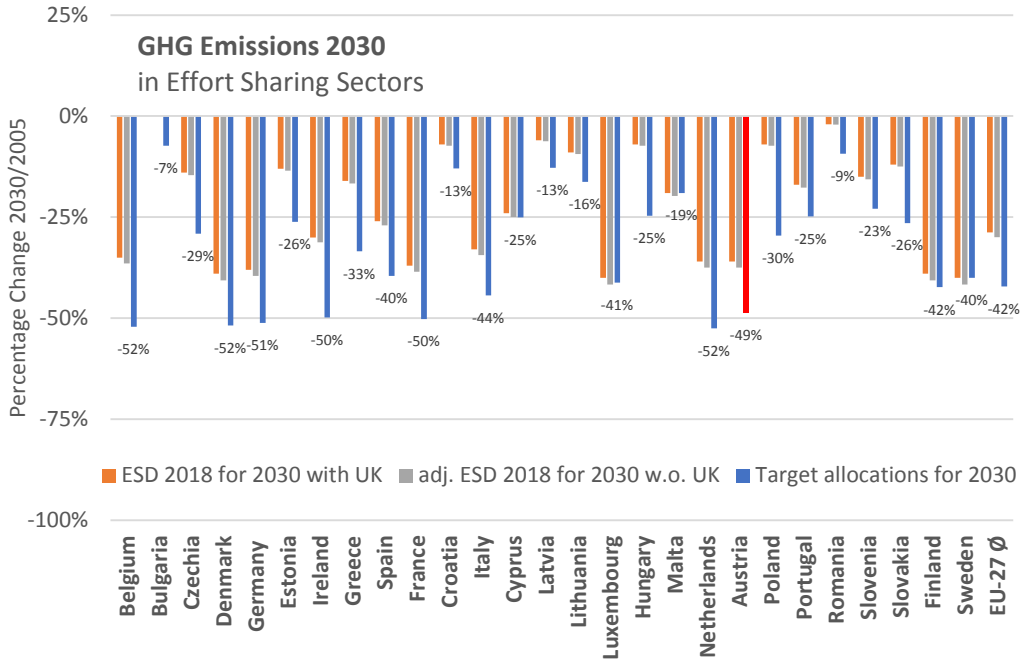



*Figure SPM-3: Example implementation of allocating the 55% GHG emission reductions, taking into account qualifications for the emissions budget, renewables, and minimum welfare criteria.*

This particular ES allocation would require Austria to reduce GHG emissions in the ES sector by 49% compared to 2005 by the year 2030. For the total EU-27 ES sector this reduction would be 42%. For details how this ES allocation was generated see Chapter 4.

**A set of benchmarks illustrate the performance of Austria relative to other countries and the aggregated EU ambition.**

We use benchmarks in order to illustrate the performance of Austria compared to other countries and the EU-27 average. In sum, six different types of benchmarks are developed, illustrating how the resulting national GHG emissions reductions compare to the overall average effort at the aggregated European level. The benchmarks show the equity implications of the 2030 allocation mechanisms in terms of per capita emissions rights, and explore whether the implied national emissions reductions will put different countries on track in order to reach net zero GHG emissions by 2050 (Figure SPM-4).

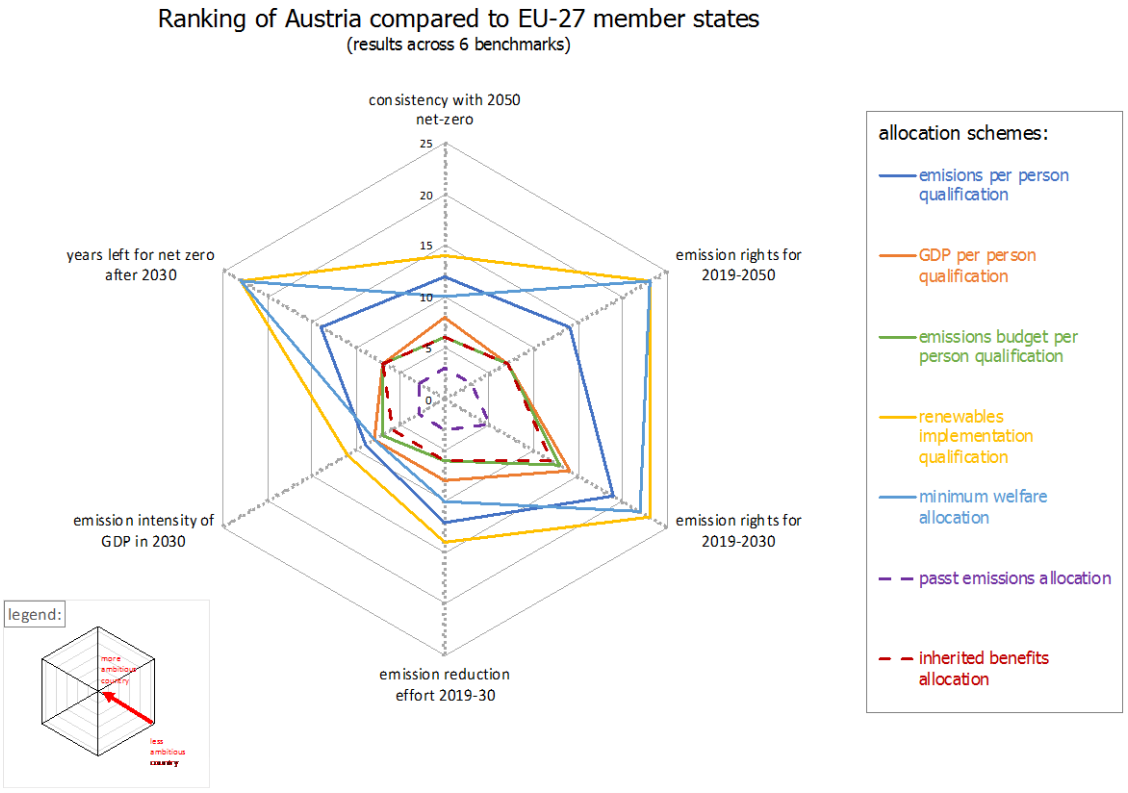
[4] A 35% share of ETS in overall GHG emissions in 2030 reflects the assumptions of the Impact Assessment for Stepping up Europe's 2030 climate ambition of the EU Commission [4].

[5] As taking into account past emissions and inherited benefits might be considered of lower political feasibility to date, the implications of the respective qualifications are made accessible in both the effort sharing tool and individual assessments, but are not integrated in the combined bundle-allocations presented in this Research Brief.

As shown in Figure SPM-4(a), among allocation schemes not considering past emissions most pronounced reductions for Austria are observed via allocations considering GDP per capita and an equal per capita split of the GHG emissions budget 2019-2030. Conversely, the renewables-based allocation would lead to a comparatively low level of emissions reductions for Austria.

With the exception of the renewables-based mechanism all of the allocation schemes depicted in Figure SPM-4(b) would lead for Austria to reductions that are consistent with a net-zero emissions path by the year 2050. Conversely, the renewable-based mechanism would move significant emissions reductions to later (post 2030), and thus is inconsistent with reaching a 2050 net zero GHG emissions target for Austria. In terms of emission intensity, all allocation schemes – including the renewables-based allocation – would lead to intensities by 2030 which are below (and thus, better than) the EU average. Figure SPM-4(b) also shows 100% implementation of allocation mechanisms based on past emissions and past benefits for illustrating that these qualifications require substantial emission reduction if given full weight. In actual implementation they will be weighted at lower intensity and are available to be combined with other qualifications.

Readers interested in the ranking of Austria compared to other EU countries, may have a detailed look at the radar plot of Figure SPM-4(a). For each allocation scheme, we show the best performing countries in the middle of the radar plot and the least performing countries in the rim. The ranking analysis shows that there are distinct differences in the distribution of the allocation effort across countries. Hence, Austria may rank in a similar position in terms of the emissions reduction benchmark, but may rank (for the same allocation scheme) very differently for other benchmarks.



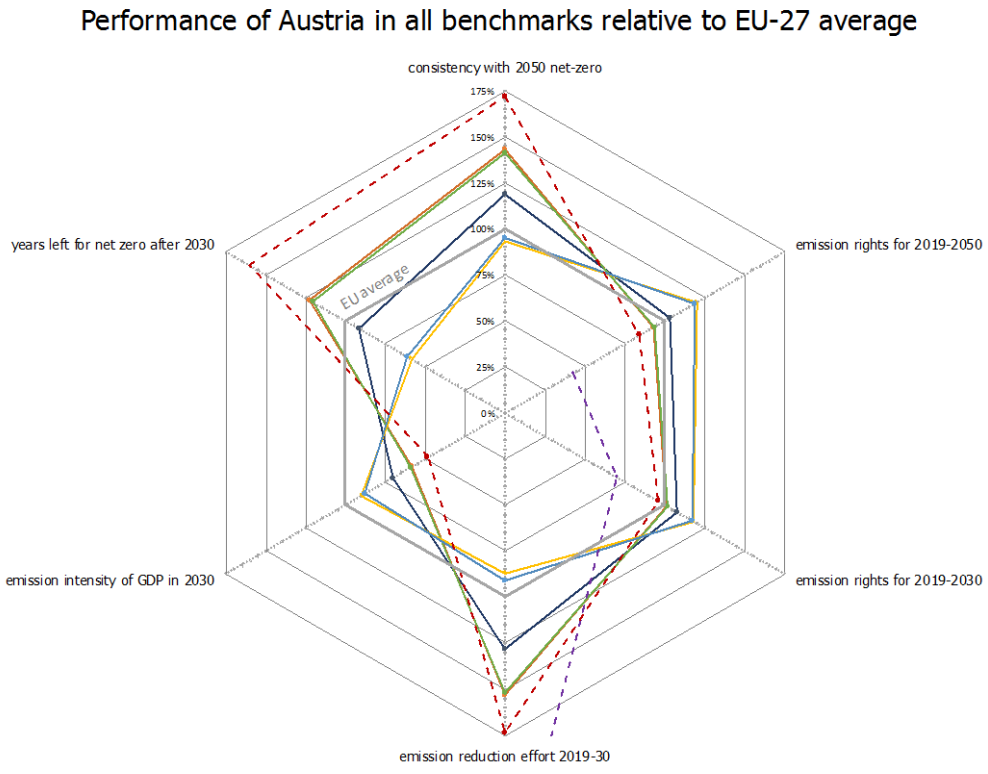




*Figure SPM-4: Benchmark assessment for the seven main allocation schemes of this Brief. Upper panel (a) shows the ranking of Austria compared to the other EU-27 countries. The axes of the radar denote the ranking of countries for different benchmarks. Best performing countries would be in the middle and least performing countries in the rim. The colored lines show the ranking of Austria for different allocation schemes. Lower panel (b) compares the Austrian reductions with the EU average. Levels over 100% indicate allocation schemes where Austria is tasked with higher reductions than average, with the opposite for levels under 100%.*

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Responsible for the content:
Wegener Center for Climate and Global Change, University of Graz
Brandhofgasse 5, 8010 Graz
Contact: karl.steininger@uni-graz.at

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