

FUTUREPROOF



Hitting a moving target:

Ensuring Europe's carbon budgets stay aligned with its greenhouse gas targets

July 2017

About this report

This report was commissioned by the European Climate Foundation (ECF) to assess whether the EU's main carbon budgets still cohere with the greenhouse gas targets they were designed to enforce. The greenhouse gas target is subject to change over time, and the scope and ambition of Europe's carbon budgets are also susceptible to change during their passage into law.

This report explores whether the 2020 target is safely enforced, explores current threats to the 2030 target, and identifies general threats to future targets.

The views expressed in this report are those of Futureproof, not necessarily those of ECF.

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Futureproof is a research, strategy and public affairs consultancy promoting policies to mitigate climate change and other long-term, catastrophic risks to society.

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0. Executive summary

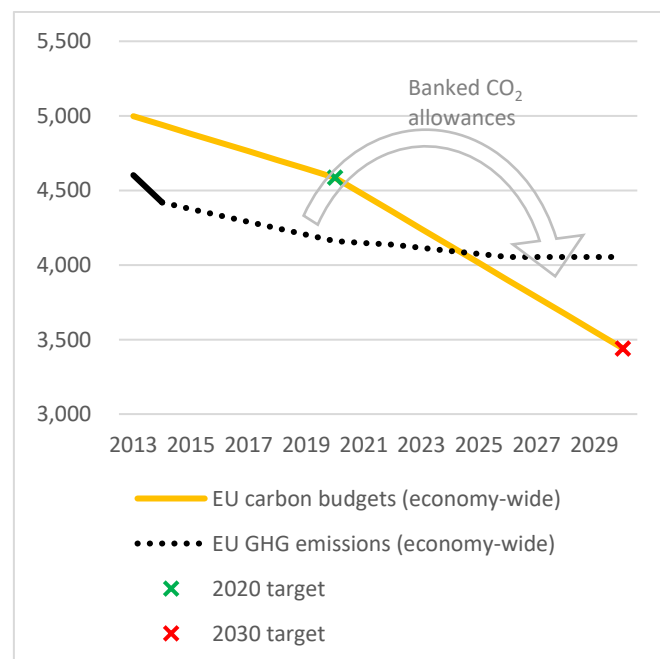
A disjunction between Europe's greenhouse gas targets and its compliance regime

This report seeks to highlight a worrying ambiguity in the way that Europe's domestic greenhouse gas targets are defined and enforced.

While it is widely recognised that Europe has a domestic target to cut greenhouse gases by 20% from 1990 levels in 2020 and at least 40% in 2030, these climate targets do not have any independent existence in law. Instead, these targets are implemented and enforced by packages of legislation, i.e. the various components of the 2020 Package and the 2030 Framework. Above all, Europe's carbon budgets act as an ultimate backstop for Europe's greenhouse gas targets: in particular, the EU Emissions Trading System, which directly limits emissions from power stations, factories, and aircraft, and the EU Effort Sharing budgets which limit Member States' emissions arising from heat, transport, waste and agriculture.

Compliance with the carbon budgets regime, however, is a matter of cumulative emissions staying within the envelope of an eight or ten-year budget rather than emissions falling below a certain target-level in the specific year 2020 or 2030. Emissions reductions earlier in a carbon budget can be used to offset emissions in the target year and, in the case of the EU Emissions Trading Scheme, spare allowances from previous carbon budgets can also be used. This opens up the possibility that the stated greenhouse gas target will be overshoot in the target year even while companies and Member States are fully complying with their obligations under the ETS and the Effort Sharing budgets.

Figure 1: The compliance framework allows surplus carbon allowances to be banked against emissions in 2030



Competing interpretations of the greenhouse gas target.

This disjunction between the budgets-based compliance framework and the single-year greenhouse gas target has created an ambiguity in how the targets themselves should be interpreted.

- On the one hand, we might assume the targets are delivered so long as emissions fall at least 20% below 1990 levels by the **deadline year** 2020, and 40% by the year 2030.
- On the other hand, we might assume that the multi-year carbon **budgets act as a substitute** for the single-year targets, allowing Europe to hedge against delivering a specific level of emissions reductions before a particular year.

Under the first, “single-year-deadline” interpretation of the target, banked allowances pose an acute threat to the greenhouse gas targets. Under this view the carbon budgets are just one of several policy instruments designed to achieve a stated level of emission reductions by a specific milestone. They are a means to an end, and should be reformed where necessary to achieve that end. This interpretation of the target often underpins many familiar calls for stricter supply controls in Europe’s carbon budgets to “protect the integrity” of Europe’s greenhouse gas target, e.g. to restrict the banking of carbon allowances from previous years or periods, to cancel large volumes of allowances, or to set the starting level of Europe’s carbon budgets lower.¹ This interpretation has been put forward by the main environmental NGO’s working on carbon budgets, but it has also been used by prominent environmental thinktanks, and has been supported by a wide community of policymakers. It takes its lead from the European Council Conclusions and also the 2020 and 2030 targets submitted to the UNFCCC (though not the Kyoto Protocol). This interpretation is also reinforced by the annual progress reports from the European Environment Agency and the European Commission, which measure progress against the greenhouse gas target by how far annual emissions have fallen from 1990 levels.

But the mixed success of these stakeholders to land these messages partly stems from its competition with a second, alternative interpretation of the greenhouse gas target. Under the second interpretation, the carbon budgets are viewed as a multi-year hedge against the single-year target, which means the timing of emissions matters far less. This interpretation takes its lead from the legally binding domestic compliance regime. Viewed in this way, Europe is *entitled* to offset high emissions in 2030 with allowances banked from 2021 or from earlier periods. So long as Member States and companies comply with their obligations under the ETS and the Effort Sharing Budgets, the greenhouse gas targets have been delivered. For the stakeholders who advance this view, the carbon budgets *substitute for* the greenhouse gas targets. They are an end-in-themselves.

Again, a wide body of stakeholders, and policymakers support this view, deeming it perfectly legitimate for ETS emissions to overshoot the -43% sub-target in 2030, and ESR emissions to overshoot their -30% sub-target, which, by extension would mean economy-wide emissions can exceed the -40% headline target, all so long as cumulative emissions remain within the envelope of the carbon budgets set. This interpretation is particularly prominent amongst industrial stakeholders concerned about competitiveness threats.

¹ Note, however that independent of concerns about achieving a particular greenhouse gas target. These supply-side reforms are also justified by more general concerns about Europe’s cumulative emissions.

Proponents of this second, compliance-focused view of the greenhouse gas target, tend to assume that this liberates the carbon budgets from any accountability to the -40% greenhouse gas target, but strictly speaking it does not. Carbon budgets still face important environmental tests under this interpretation which are rarely acknowledged or explored.

Environmental tests which the “budgets-substitute-for-target” interpretation of the greenhouse gas target must pass

If, as this compliance-focused view of the target proposes, the trajectory of physical emissions is no longer important, the trajectory of the *carbon budgets* becomes the key measure of whether the greenhouse gas targets are safely delivered.

The legitimacy of this second interpretation depends, therefore, on the carbon budgets converging (in aggregate) at a point at least 20% below 1990 emissions in 2020 and at least 40% below 1990 emissions in 2030. It also depends on the carbon budgets covering emissions at a scope consistent with the intended greenhouse gas target.

When the 2020 Package and the 2030 Framework were each first proposed by the European Commission, the sub-targets and trajectories for each carbon budget neatly converged with the intended greenhouse gas target in 2020 and 2030 respectively. In the years which followed these initial communications, however, changes to the emissions data, and changes to the activities and countries covered by each carbon budget, have unmoored the carbon budgets from these starting assumptions. The carbon budgets contain zombie parameters which leave them misaligned with the 2020 target they were supposed to enforce and pose similar threats to the 2030 target and future targets.

This drift is not just a challenge to the legitimacy of the “budgets-substitute-for-targets” interpretation of the greenhouse gas target, however. Drift in the ambition and scope of the carbon budgets can also compound the risks that emissions won’t fall to intended levels by the actual target year by increasing the supply of carbon allowances available.

Drift between the carbon budgets and the 2020 target

In the 2008 Communication launching the 2020 package, the Commission proposed that the EU’s domestic greenhouse gas commitment to cut emissions by 20% on 1990 levels would be subdivided as follows: stationary ETS sectors would cut their emissions by 21% vs 2005 levels and Non-ETS sectors would cut their emissions by 10% vs 2005 levels. However, we find that during the passage of the carbon budgets into law, the burden of effort has shifted away from Member States and on to private companies in the traded sector. Currently, we estimate that the stationary ETS budget for EU28 countries is 23.5% below 2005 levels in 2020, while the ESD budgets are now 7.2% below 2005 levels in 2020 for Non-ETS sectors. These changes, as well as changes to the greenhouse gas inventory, have led to a very slight reduction in the effort required of stationary sectors by 2020: When the draft legislation

was first produced, the stationary carbon budgets in 2020 were 21.7% below 1990 levels, currently they stand 21.4% below 1990 levels in 2020.²

Meanwhile, during the passage of the ETS aviation budget into law, the 2020 aviation target was strengthened: instead of limiting emissions to 2005 levels, a 5% cut on 2005 emissions was introduced.³ This slight increase in ambition, however, was undermined by a significant reduction in the scope of the ETS aviation budget. After the carbon budgets were finalised, the EU bowed to international pressure and exempted international flights from the ETS apart from those flying between EU countries. While this reduction in scope was supposed to be temporary, new draft legislation from the European Commission proposes to extend the derogation for international flights out to at least 2020.⁴

Despite the movement in both the greenhouse gas inventory and the carbon budgets since the 2020 greenhouse gas target was set, we find that Europe's carbon budgets still (just) manage to converge 20% below 1990 levels. However, that convergence seems entirely fortuitous, with no formal checks in place to ensure the evolving carbon budgets cohere with the 2020 target they are supposed to enforce.

The carbon budgets currently leave some outbound aviation emissions unregulated that were intended to be counted against the climate target, but for now it appears that these unregulated emissions will stay safely within the carbon space that was originally intended for them. If aviation emissions grow faster than current projections indicate, remedial action might be needed to keep the 2013-2020 carbon budgets consistent with reductions of 20% on 1990 levels.

Drift between the carbon budgets and the 2030 target

In a process echoing the 2020 package, in January 2014 the European Commission published a Communication laying out the architecture of the 2030 framework. A greenhouse gas target to cut emissions by at least 40% from 1990 levels was split between the ETS sectors, which would reduce emissions by 43% on 2005 levels (including aviation emissions), and non-ETS sectors, which would reduce emissions by 30% on 2005 levels. The new trajectory for the EU ETS budget from 2021 was also first defined here: a "Linear Reduction Factor" of 2.2%.⁵

As with the 2020 package, however, the calculation used to determine the division of effort beneath the 40% greenhouse gas target has assumed all flights departing from EU airports would be included under the ETS target (i.e. both domestic and international flights). Meanwhile, the draft legislation only includes flights within and between EU or EFTA countries that are in the ETS. This threatens to introduce a policy gap into the 2030 target which it seems unlikely that an international agreement on aviation emissions from ICAO will

² The final burden of effort appears even more strongly weighted towards ETS reductions when measured against average 2008-10 emissions (the starting year for the ESD budgets). Against this more recent baseline, the ETS cap requires just 13.4% reductions for the EU28 sectors in the ETS and a very modest 3.3% for sectors in the Effort Sharing Decision.

³ Technically the targets is set against the mean annual value for 2004-2006 emissions rather than 2005 per se.

⁴ The changes to the 2020 package described here are explored in detail in the Annex to this report (published separately).

⁵ The Linear Reduction Factor defines how rapidly the ETS cap declines, set in reference to the average allowances issued in the 2008-12 ETS budget (adjusted for scope change).

fully bridge – especially given that offset credits used under the ICAO agreement will not be able to count towards the EU's domestic greenhouse gas target.

We find that the outbound aviation emissions that were originally due to be included in the 2030 target but are now left unregulated by the ETS cap are currently expected to climb 222 Mt above the share of the cap intended for them over 2021-2030. If these aviation emissions were regulated by the ETS, any emissions beyond the aviation cap would have represented additional demand for ETS allowances. This reduction in demand is a purely political artefact, which has reduced the stringency of the Phase 4 cap. We therefore recommend that the remaining carbon budgets should ultimately be adjusted down to reflect the missing demand from the aviation sector. This would help maintain the integrity of the carbon budgets in the 2030 framework and maintain their coherence with the 2030 target.

We also see the same issues of targets and budgets being set based on inconsistent greenhouse gas inventories in the 2030 Framework. National greenhouse gas targets under the EU Effort Sharing Regulation that were initially calculated using the 2016 greenhouse gas inventory, will later be applied to new 2005 baselines calculated using later greenhouse gas inventory data when a decision on the final budgets is published. These incompatible inventories may cause the national targets under the ESR to deliver a different level of emission reductions than the 30% cut on 2005 levels intended when the framework was put forward.

Moreover, the UK's participation in the ETS, the ESR and the 2030 greenhouse gas target are all thrown into question by Brexit. If the UK ceased participating in all three, our calculations indicate that the carbon budgets for the remaining EU countries would only reach 39.5% below 1990 levels by 2030. The remaining 0.5% could be compensated for by increasing the ambition of the ETS trajectory or the ESR targets, or by adjusting the 2021-30 carbon budgets down by a comparable volume, which we calculate to be 145 million allowances.

Despite opening a policy gap in the EU target, we find that, owing to a strong domestic climate regime under the UK Climate Change Act, Britain would likely continue to deliver emissions reductions at least equivalent to those currently required of it under the 2030 Framework, even if it left both the ETS and the ESR. This suggests that there might be options for joint delivery of the EU's 40% target even if the UK left both EU carbon budgets. However, it also suggests that even if the EU target was ultimately weakened as a result of the UK's departure, the EU and the UK could, nonetheless, potentially deliver more emissions reductions apart than they would together. Even greater net emissions reductions could be achieved if the EU commits to delivering 40% reductions without the UK.

A triple lock on Europe's greenhouse gas target

At present, we find that no formal checks exist to ensure that Europe's carbon budgets adequately deliver the greenhouse gas target – whether the target is defined by the trajectory of emissions or whether this is defined by the trajectory of the carbon budgets themselves. Accountability for achieving the greenhouse gas targets has, to date, been unhealthily reliant on external political pressure from advocacy

groups rather than internal regulatory checks and balances. Going forward, we therefore propose a triple-lock be introduced to the greenhouse gas target, which reinforces it against threats posed under competing interpretations of that target.

- First, we recommend that an independent definition of the headline greenhouse gas target should be introduced in European law, which clearly states the scope of activities and countries that should be covered, which specifies how any changes in scope should be handled, and which specifies how changes to the greenhouse gas inventory affect the target.
- Second, we recommend that a regulatory commitment be made to routinely reconcile Europe's carbon budgets with its greenhouse gas targets, i.e. that the budgets follow a trajectory that converges at a point at or below the greenhouse gas target in 2020, 2030 etc. with due consideration for the scope of greenhouse gas emissions that the carbon budgets include. Clear triggers should be introduced to legislation to revise the trajectories or adjust the supply of allowances if new developments render them inconsistent with the overall target (e.g. inventory changes, scope changes, etc.).
- Third, we recommend that an additional regulatory commitment be made to ensure that EU emissions fall below the greenhouse gas target by the actual target year. While EU emissions have already fallen below the intended greenhouse gas target for 2020, the 2030 framework currently offers no assurances that emissions will fall at least 40% below 1990 levels by 2030. Clear triggers should be introduced to strengthen current policies or introduce new policies if emissions are not declining at the appropriate pace, making 2030 a hard deadline.

While the process for determining new legislation for the 2021-2030 carbon budgets is already very far progressed, we hope that these recommendations might yet be considered and incorporated. There may still be some opportunity to impose further, temporary supply controls to the EU ETS in target years via the Market Stability Reserve when that mechanism is reviewed. These recommendations also bear upon the new Monitoring Mechanism Regulation and the new Governance of the Energy Union framework.

Together, we feel these three measures would resolve the ambiguity around the EU's greenhouse gas target, and better ensure that these targets are faithfully delivered.

1. Competing interpretations of Europe's Greenhouse gas targets

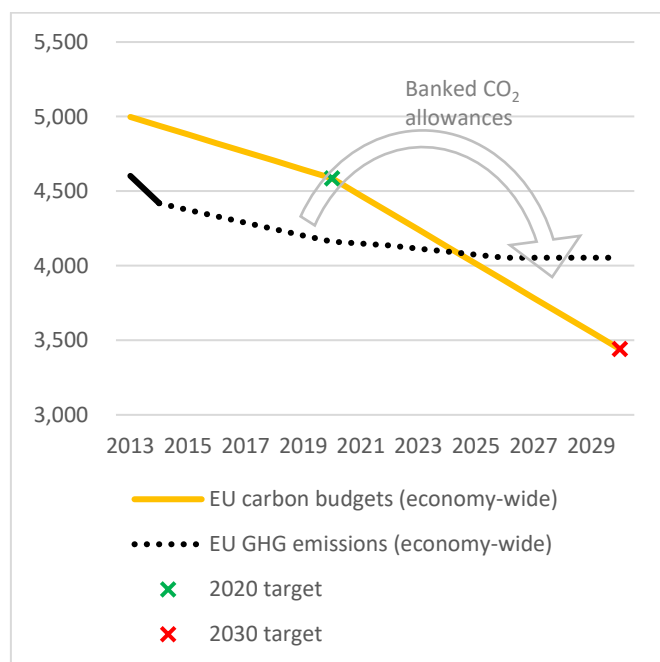
A devil's bargain: using budgets to hedge against targets

Europe's domestic, economy-wide greenhouse gas targets are only loosely defined, and have no existence in law independent of the various pieces of legislation in the 2020 package and the 2030 framework which implement them.

After the initial high-level agreements were reached on both the 2020 and the 2030 greenhouse gas targets, these economy-wide objectives were split into sub-targets for both the ETS and the non-ETS sectors to deliver. These sub-targets were then translated into law as a carbon budgets compliance framework. In the case of the 2030 framework this process is still ongoing.

This conversion has significant consequences. The decision to comply with the greenhouse gas targets via multi-year carbon budgets creates, in effect, an eight-year hedge against the 2020 greenhouse gas target and a ten-year hedge against the 2030 target. The risk of emissions exceeding the greenhouse gas target in 2030 – owing to adverse weather conditions for example – can be offset by reducing emissions earlier in the 2021-2030 budget period and banking the spare allowances. Under this compliance regime, Member States and companies are only accountable for keeping their cumulative emissions within a multi-year budget instead of keeping emissions below a certain level in a single target year.

Figure 2: The compliance framework allows surplus carbon allowances to be banked against emissions in 2030



The same is partly true at the international level. Europe's international commitment to reduce emissions by 20% on 1990 levels by 2020 under the United Nations Framework Convention on Climate Change (UNFCCC) is in line with its domestic greenhouse gas

commitment, but again this commitment is not legally binding. The legally binding, international compliance framework is determined by the second commitment period of the Kyoto Protocol: an eight-year carbon budget.

A budgets-based compliance framework introduces a flexibility on the timing of emissions under the greenhouse gas target which creates an ambiguity about the nature of the greenhouse gas target itself. This ambiguity allows two competing interpretations of the greenhouse gas target to vie with each other:

- On the one hand, we might continue to assume the targets are delivered so long as physical emissions fall at least 20% below 1990 levels by the year 2020, and 40% by the year 2030. The target-year imposes a hard deadline.
- On the other hand, we might instead assume that the carbon budgets substitute for the target, operating as an eight-year hedge against the 2020 greenhouse gas target and a ten-year hedge against the 2030 greenhouse gas target.

The stakeholders who support each interpretation tend to divide along predictable lines, with environmentally ambitious stakeholders tending to invoke the “single-year” interpretation of the target, and stakeholders more concerned about threats to industrial competitiveness being more inclined to the “budgets-as-substitute” interpretation. However, many exceptions exist, and sometimes the same stakeholder groups and even the same individuals will switch between the different interpretations at different times. Below we explore each interpretation, and its implications in turn.

The interpretation of the greenhouse gas target as a single-year deadline

The single-year interpretation of the target derives directly from the headline political agreements which spawned the 2020 and 2030 climate targets. The March 2007 European Council Conclusions state: “the EU makes a firm independent commitment to achieve at least a 20 % reduction of greenhouse gas emissions by 2020 compared to 1990.” The October 2014 Council Conclusions which set the initial terms for the 2030 climate framework, state that “the European Council endorsed a binding EU target of an at least 40% domestic reduction in greenhouse gas emissions by 2030 compared to 1990.”

This language is echoed in Europe’s *international* climate targets as pledged under the UNFCCC (independent of the Kyoto Protocol) which essentially reflect Europe’s domestic greenhouse gas commitments, for example, Europe’s INDC for the Paris Agreement states “The EU and its Member States are committed to a binding target of an at least 40% domestic reduction in greenhouse gas emissions by 2030 compared to 1990”. The type of target is formerly defined as an “absolute reduction from base year emissions” (with a base year of 1990).

The use of the phrase “by 2020” and “by 2030” – language which is echoed in the Commission Communications introducing the 2020 package and 2030 framework – implies that the greenhouse gas target is a fixed deadline, and the emissions goal in each case needs to be achieved at or before the target year, i.e. so long as emissions fall 20%

below 1990 in the year 2020 (or 2019, or 2018, etc.), and so long as emissions fall at least 40% below 1990 levels in the year 2030 (or 2029, 2028, etc.) the targets are achieved.

This reading of the target is also finds support in the Annual Greenhouse Gas Inventory reports and the Trends and Projections reports published by the European Environment Agency, and the annual Progress Reports published by the European Commission.⁶ In each of these documents, Europe's progress against the headline greenhouse gas target is reported in terms of how far annual emissions have fallen below 1990 levels. The Environment Agency press office has been even more open in using this framing, leading its May 2014 press release with the statement that, as of 2012, the EU was "...within reach of its 20 % reduction target, with eight years to go until the 2020 deadline."⁷

If the greenhouse gas targets are defined as a single-year deadline, the 2020 package has been an enormous success. Emissions officially fell 22.9% below 1990 levels in 2014. Under this interpretation, the 2020 target has already been achieved six years early. Indeed, this was how it was reported by the mainstream media when the 2014 emissions were published in 2016.⁸ Moreover, emissions are projected to continue falling, even under the most conservative assumptions. The Member State projections aggregated by the European Environment Agency in its Trends and Projections report show EU28 emissions falling 26.3%-29.1% below 1990 levels by 2020.⁹

But Europe's success in cutting emissions under the 2020 package now poses a threat to the 2030 greenhouse gas target. Spare emissions rights left over from the 2020 package can be carried over into the 2030 framework, as can spare ETS allowances banked from Phase 2 (2008-2012). These banked allowances create additional carbon space in the 2030 framework, potentially allowing emissions in the year 2030 to exceed the intended greenhouse gas target, all while remaining in full compliance with legislation implementing the target. This risk of banked allowances causing the 2030 target to be exceeded is also exacerbated if the ETS and ESR budgets within the 2030 framework start artificially high, as excess allowances from early in the period can also be banked for use in 2030.

For proponents of the single-year interpretation of the target, the carbon budgets are just one part of a broader compliance regime which is a means-to-an-end, with that end being delivery of a specified level of emissions reductions by a specific deadline. For them, the carbon budgets framework currently provides weak reassurances that the EU greenhouse gas emissions will fall at least 40% below 1990 levels by 2030.

For climate NGOs working on carbon budgets, this framing has been repeatedly invoked to ensure that carryover of carbon allowances between phases is strictly limited, to ensure that

⁶ A list of EEA inventory reports and EC progress reports are available here:
https://ec.europa.eu/clima/policies/strategies/progress/monitoring_en#tab-0-1

⁷ <https://www.eea.europa.eu/media/newsreleases/greenhouse-gas-inventory-report-press-release>

⁸ See for example: <http://www.independent.co.uk/news/world/europe/eu-countries-2020-six-years-climate-change-environment-carbon-cutting-emissions-targets-a7097916.html>
<https://www.carbonbrief.org/daily-brief/eu-smashes-2020-emissions-target-six-years-early-norway-ratifies-paris-agreement>

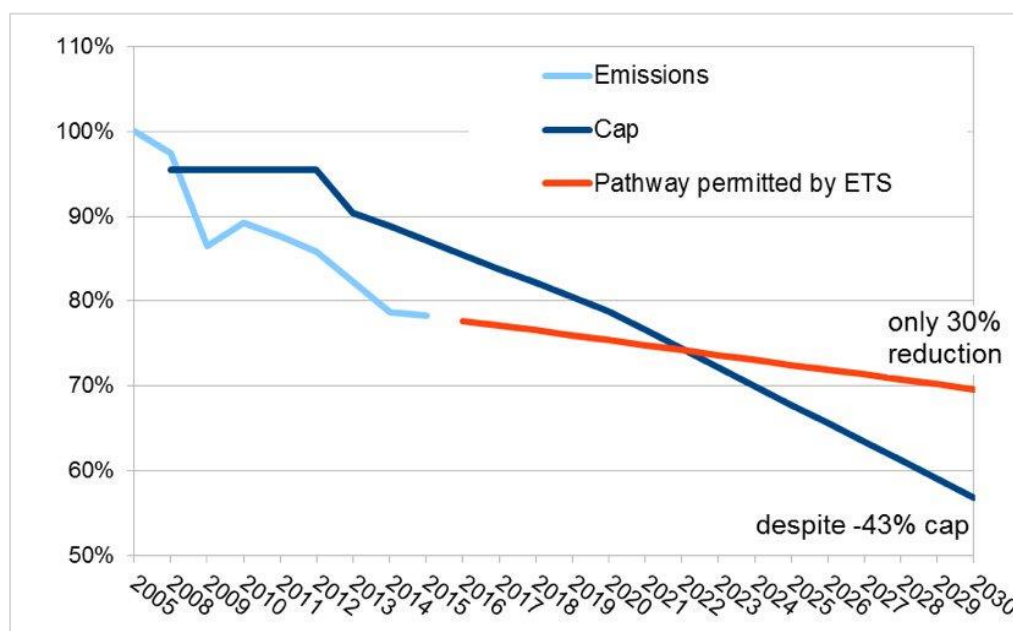
<http://www.climatechangenews.com/2016/06/21/eu-smashes-2020-emissions-target-six-years-early/>
<http://www.businessgreen.com/bg/analysis/2462395/official-eu-delivers-2020-emissions-target-six-years-early>

⁹ 4,229 Mt (WEM) or 4,066 Mt (WAM) vs 5,735 Mt in 1990 https://www.eea.europa.eu/data-and-maps/daviz/greenhouse-gas-ghg-emission-trends-2#tab-chart_1

the starting levels of the ETS and the ESR are as close to projected emissions as possible, and to promote additional supply controls via the Market Stability Reserve.

In the chart below, we see analysis from Sandbag depicting how the 2030 sub-target for ETS sectors could be significantly overshoot under the Parliament's agreed package of reforms. Instead of falling 43% below 2005 levels by 2030, Sandbag's analysis finds ETS emissions might only land 30% below 2005 levels. Overshoot of the ETS sub-target has clear knock on effects which could lead to overshoot of the economy-wide greenhouse gas target in the year 2030.

Figure 3: Sandbag estimate of potential overshoot of 2030 ETS target under Parliament's position¹⁰



Carbon Market Watch and FERN have been even more explicit in drawing attention to the threat that excess, banked carbon allowances pose to the economy-wide greenhouse gas target, again using this single-year interpretation of the target (see Figure 4 overleaf)

This interpretation of the target is not a new one. This author was expressing concerns about the potential for Phase 2 allowances to derail the 2020 target in 2013,¹¹ and Greenpeace was highlighting the threats to the 2030 target around the same time.¹² Neither has this interpretation been exclusive to NGOs. It has been supported by respected environmental consultancies, such as Ecofys, who have performed some of the analysis cited by Greenpeace, Carbon Market Watch and others.¹³ It is shared by key policymakers, and as indicated previously, it is the interpretation of the target which is effectively implied by both the Commission's and the Environment Agency's annual progress reports, and frequently invoked by environmental journalists.

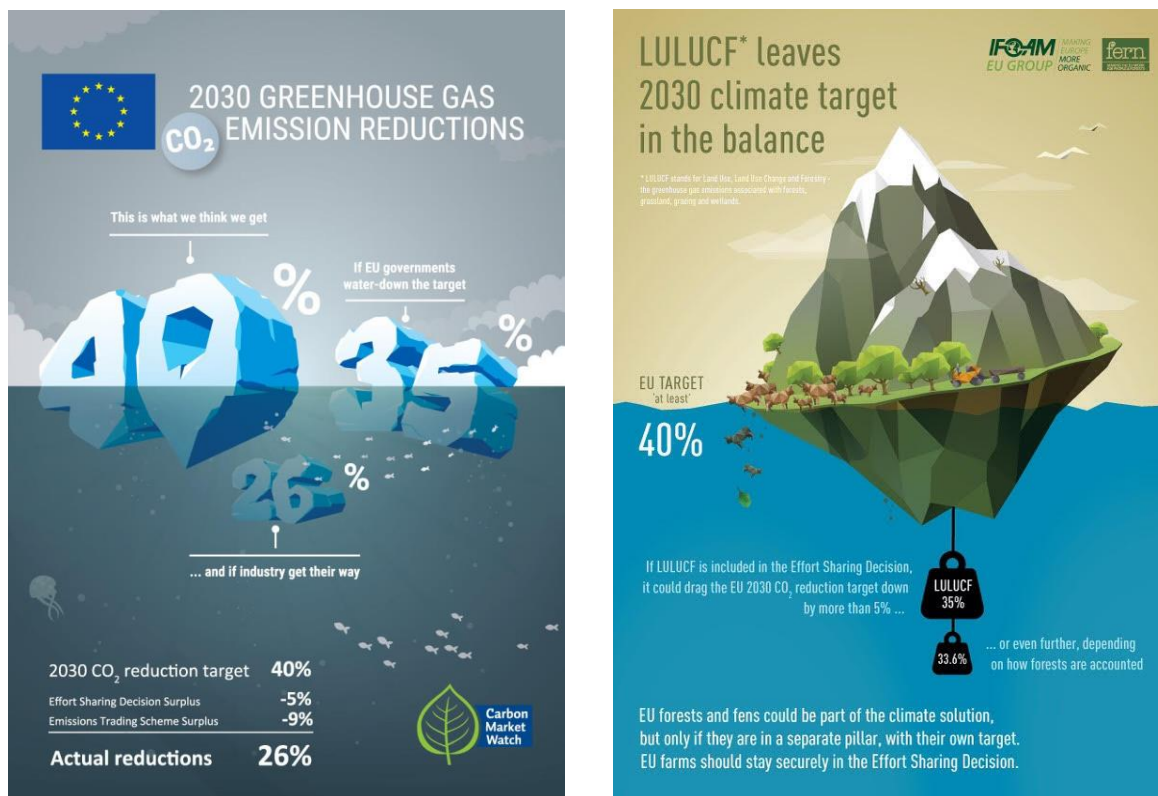
¹⁰ Taken from Sandbag Twitter feed: February 14th, 2017

¹¹ Damien Morris, *Europe's 2020 Confidence Trick* (Sandbag, December 2013) https://sandbag.org.uk/wp-content/uploads/2016/11/Sandbag_2020_Confidence_Trick_09122013.pdf

¹² See <http://www.greenpeace.org.uk/newsdesk/energy/analysis/eu-2030-climate-goals-not-what-they-seem>

¹³ See for example: <http://www.ecofys.com/files/files/greenpeace-ecofys-2013-next-step-in-eu-climate-action.pdf>

Figure 4: Carbon Market Watch and FERN posters highlighting threats to 2030 targets posed by carbon budgets



Nevertheless, these messages have had mixed success in persuading lawmakers to implement aggressive supply-side reforms. We submit that part of the resistance arises from this “single-year deadline” interpretation of the greenhouse gas target running up against a competing interpretation, which we now explore.

The interpretation that carbon budgets substitute for the greenhouse gas targets.

While the single-year interpretation of the greenhouse gas target takes its lead from political agreements like the Council Conclusions and UNFCCC pledges, other stakeholders look to the legislation which implements and enforces these targets, with the carbon budgets framework in particular providing the legislative backstop for the greenhouse gas targets.

For these stakeholders, the compliance framework effectively *substitutes* for the greenhouse gas target, which means that the carbon budgets are viewed as a multi-year hedge against the single-year deadline expressed in the political agreements. Cumulative emissions simply need to stay within the total envelope of those carbon budgets.

Viewed in this way, the timing of emissions matters far less, and it is completely legitimate to offset high emissions in 2030 with allowances banked from 2021 or from earlier periods. Proponents of this view consider it perfectly acceptable for ETS emissions to overshoot their -43% sub-target in 2030, for ESR emissions to overshoot their -30% sub-target as long as cumulative emissions remain within the envelope of the carbon budgets set. By extension, it is acceptable for economy-wide emissions to exceed the -40% headline target in 2030, though the stakeholders supporting this view rarely make that implication explicit.

Consequently, achieving the greenhouse gas target no longer becomes about the trajectory of physical emissions. An unusual implication of this interpretation is that carbon budgets come to substitute not only for the greenhouse gas *targets* but also substitute for the trajectory of *emissions*. Cumulative emissions simply need to stay within the overall budgets set.

This perspective on the target is resistant to arguments about the risks posed by banking allowances, whether these risks arise from setting artificially high starting levels for the carbon budgets or from the carryover of excess carbon allowances from previous budget periods. This has made this interpretation of the targets particularly attractive to stakeholders who are concerned about high carbon prices, or burdensome environmental regulations.

However, under this multi-year interpretation of the target, the carbon budgets still face important environmental tests, which are rarely explored. The legitimacy of the carbon budgets substituting for the 2020 and 2030 targets hinges entirely on carbon budgets converging at a point at least 20% below 1990 emission in 2020 and at least 40% below 1990 emissions in 2030 (because the trajectory of carbon budgets effectively substitutes for the trajectory of carbon emissions). It also requires carbon budgets to police emissions at the appropriate scope.

It is mostly taken for granted that the parameters of the carbon budgets proposed by the Commission ensure that the target is reliably delivered, but a lot can change from when the Commission first proposes these parameters. Indeed, a great deal already has.

2. “Zombie” parameters in Europe’s carbon budgets

When the Commission initially put forward the 2020 package and the 2030 framework, the different sub-targets and budget parameters fit together like a jigsaw to deliver the greenhouse gas targets intended for 2020 and 2030 respectively. The trajectories proposed for the EU Emissions Trading Scheme carbon budgets and the national targets in the Effort Sharing carbon budgets duly converged on the greenhouse gas targets they were supposed to enforce. Unfortunately, the initial assumptions used to determine these trajectories and targets are prone to becoming obsolete, and no formal regulatory checks are in place to compensate for this.

Like a precariously constructed Rube Goldberg machine, the 2020 package and the 2030 framework are both excessively reliant on a long and intricate sequence of conditions going improbably right in order to ensure that the carbon budgets continue to converge on the greenhouse gas target.

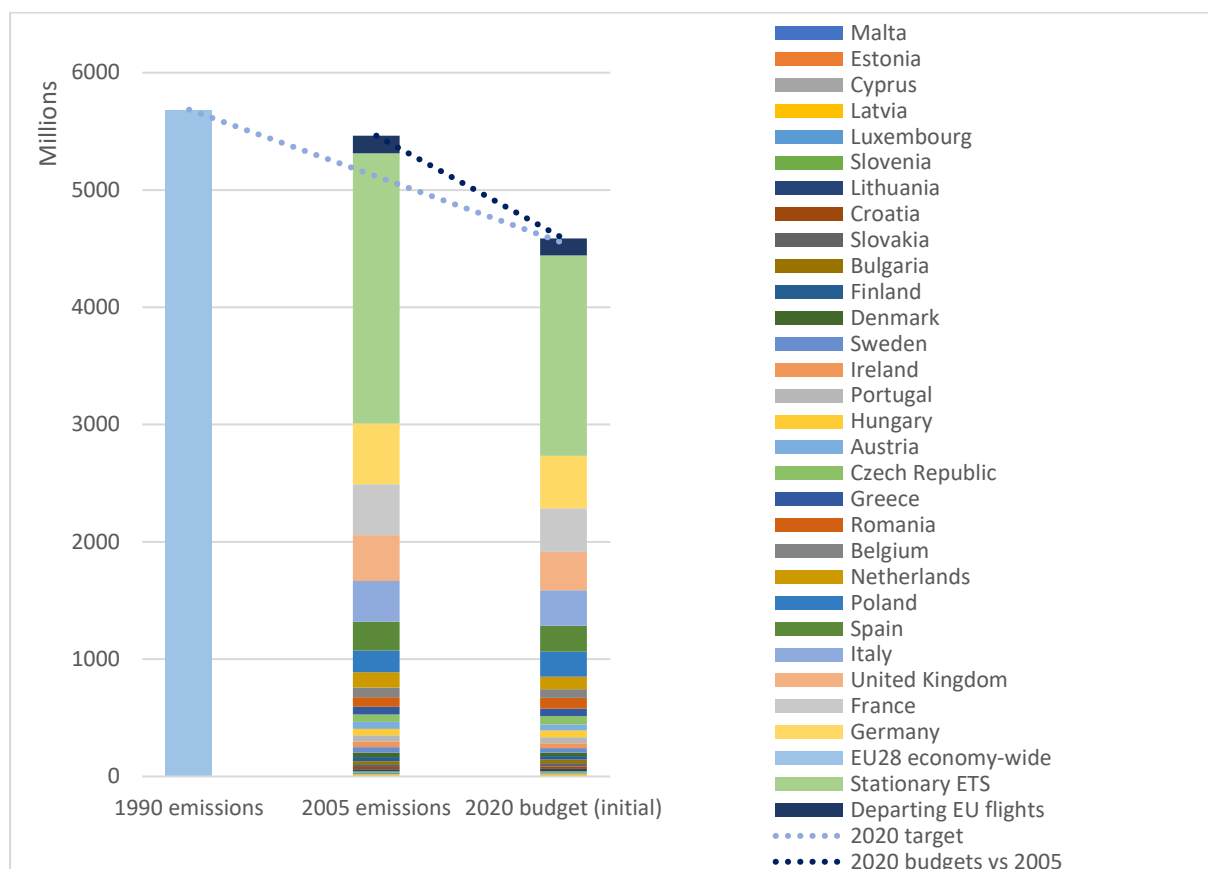
Figure 5: The 2030 framework as a Rube Goldberg machine¹⁴



As depicted in the chart below, 30 separate carbon budgets need to converge at the right level to enforce the headline greenhouse gas target in 2020, i.e. 28 different Member State budgets under the Effort Sharing legislation, a stationary ETS carbon budget and an aviation ETS budget. A similar precarious convergence is required for the 2030 target.

¹⁴ Image from: <https://www.miniphysics.com/rube-goldberg-machine.html>

Figure 6: 30 separate carbon budgets need to converge to achieve the greenhouse gas targets



Moreover, a long chain of assumptions lay behind the specific targets and trajectories for these 30 carbon budgets. In the case of the 2020 package, for example, these include:

- A cost-effectiveness calculation used to calculate the optimal split between the ETS and the non-ETS relative to 2005 emissions (leading to a nominal target of split of -21%/-10%).
- The translation of the -21% ETS target into a declining trajectory (1.74% per annum) set against the Phase 2 cap (adjusted for estimated scope changes)
- The splitting of the -10% ESD target into individual Member State targets based on their GDP per capita.
- The determination of the starting points and trajectories of Member State budgets based on average 2008-10 stationary emissions reported to the UNFCCC minus reported ETS emissions
- The determination of a baseline and an ETS budget for aviation emissions

This process was spread out over the course of several years, during which time a new Member State acceded to the European Union and during which time both the greenhouse gas inventory and the assumed scope of the ETS and ESD budgets were subject to repeated revisions.

The inertia of the political process, however, makes it difficult to revise or dislodge certain targets and parameters once they have been politically agreed. Many of the targets and trajectories that were set for the ETS and the ESD have outlived the assumptions which

generated them. These “zombie” parameters have successively overwritten each other so that hardly any of the original targets remain intact. As we show in our [Annex](#), the ETS no longer delivers a -21% target vs 2005 by 2020, but rather -23.5%, and the ESD no longer delivers -10% vs 2005 by 2020, but rather -7.2%.

These changes, as well as changes to the greenhouse gas inventory, have led to a very slight reduction in the effort required of stationary sectors by 2020: When the draft legislation was first produced, the stationary carbon budgets in 2020 were 21.7% below 1990 levels, currently they stand 21.4% below 1990 levels in 2020.¹⁵

Meanwhile, during the passage of the ETS aviation budget into law, the 2020 aviation target was strengthened: instead of limiting emissions to 2005 levels, a 5% cut on 2005 emissions was introduced.¹⁶ This slight increase in ambition, however, was undermined by a significant reduction in the scope of the ETS aviation budget. After the carbon budgets were finalised, the EU bowed to international pressure and exempted international flights from the ETS apart from those flying between EU countries. While this reduction in scope was supposed to be temporary, new draft legislation from the European Commission proposes to extend the derogation for international flights out to at least 2020.¹⁷

Our [Annex](#) on the evolution of the 2020 package provides a detailed review of the changes in the parameters used at various stages when translating the 2020 greenhouse gas target into the carbon budgets. A general point we seek to highlight in that [Annex](#) is the *movement* of the carbon budgets and the many opportunities for these budgets to fall out of alignment with the 2020 greenhouse gas target. This represents one particular danger to the greenhouse gas target.

In the following section, [section 3](#), we review some of the impacts of inventory changes and scope changes in more detail. Then, in [section 4](#), we will investigate whether the carbon budgets, in aggregate, still reliably converge at a level below the greenhouse gas target they were supposed to enforce: a reduction in economy-wide greenhouse gas emissions of 20% versus 1990 levels by 2020. Following that, in [section 5](#), we review the 2030 framework to see what the experience of the 2020 package can reveal about the threats to the 2030 greenhouse gas target before presenting our final conclusions and recommendations in [section 6](#).

¹⁵ The final burden of effort appears even more strongly weighted towards ETS reductions when measured against average 2008-10 emissions (the starting year for the ESD budgets). Against this more recent baseline, the ETS cap requires just 13.4% reductions for the EU28 sectors in the ETS and a very modest 3.3% for sectors in the Effort Sharing Decision.

¹⁶ Technically the targets is set against the mean annual value for 2004-2006 emissions rather than 2005 *per se*.

¹⁷ The changes to the 2020 package described here are explored in detail in an Annex published separately to the main report

3. Moving targets: changes to the 1990 emissions baseline affecting the 2020 and 2030 targets

Changes to the Greenhouse Gas Inventory over time

Two different ways of measuring Europe's greenhouse gas targets

As mentioned above, each year both the European Environment Agency and the European Commission release a report reviewing Europe's progress against its greenhouse gas targets.

Somewhat confusingly, Europe's progress in these reports tends to be reported using two different methodologies, depending on whether progress is being measured against the domestic and UNFCCC targets (which are effectively the same) or against the Kyoto budgets.

- When measuring progress against its Kyoto targets, progress isn't measured against a 1990 baseline but rather a composite baseline consisting of different base years for different EU countries and different greenhouse gases. Kyoto reporting also includes emissions from Iceland – which has a joint delivery agreement with the EU. Reporting excludes emissions from Land Use, Land Use Change and Forestry (LULUCF) and also excludes emissions from international aviation.
- In contrast, for reporting progress against the UNFCCC target and the domestic climate target, progress is measured against a uniform 1990 baseline, only EU countries are included, LULUCF emissions are again excluded, but the domestic target includes emissions from international aviation.¹⁸

While the differences are subtle, the status of Europe's progress against the target is significantly affected by these different emissions scopes and different baselines. As of 2014, emissions were 24.4% below baseline under Kyoto reporting conventions, but they are 22.9% below baseline when reported against the UNFCCC and domestic greenhouse gas target.¹⁹

Confusion between these two different emissions scopes has sometimes led prominent media outlets and policymakers to unintentionally exaggerate Europe's progress in cutting emissions against its domestic climate target. Progress against the domestic target appears less impressive because it includes aviation emissions, which have grown since 1990 levels. It also appears less impressive against Kyoto reporting because the Kyoto baseline for stationary emissions starts significantly higher than 1990 emissions under domestic reporting.²⁰

Evolving 1990 baselines for the greenhouse gas target

¹⁸ The most recent set of historic emissions reported and climate targets implied against this emissions scope are neatly summarised in a data visualisation accompanying the EEA's 2016 Trends and Projections Report available at this link: http://www.eea.europa.eu/data-and-maps/daviz/greenhouse-gas-ghg-emission-trends-2#tab-chart_1

¹⁹ See p.11 <https://www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2016>

²⁰ The difference in baselines was such that Europe was able to translate its unilateral domestic target to cut emissions 20% from 1990 levels by 2020 into a Kyoto budget which was 20% below baseline levels across all eight years of the second commitment period (2013-2020).

Another key distinction between the baseline for the domestic target and the Kyoto baseline is that the Kyoto baseline and Kyoto “target” is fixed in statute for each commitment period and is unaffected by annual changes to the greenhouse gas inventory. By contrast, the 1990 baseline and the domestic greenhouse gas targets (which are derived as a percentage of that baseline) are liable to evolve with changes to the inventory over time.

The proposal for the 2020 climate package was published in January 2008, and would have been calculated using a 2007 greenhouse gas inventory, but the inventory has been updated several times since then. In the table below we chart the evolution of the emissions inventory concerning the year 1990 and its effects on the 2020 and 2030 greenhouse gas targets. We also show how 2005 emissions have evolved, because these were used as the basis for setting sub-targets for different carbon budgets in both the 2020 package and the 2030 framework. We provide figures for both the EU27 (i.e. without Croatia) and for the EU28 across the decade.

Table 1: Evolution of EU greenhouse gas inventories over the past decade

Mt CO2e	EU 27 (including int aviation)			EU28 (including int aviation)			
GHG inventory	1990	2005	2020 target	1990	2005	2020 target	2030 target
UNFCCC_v08_2007.06	5,687	5,303	4,550	5,719	5,332	4,575	
UNFCCC_v09_2008.09	5,638	5,283	4,511	5,671	5,313	4,537	
UNFCCC_v10_2009.06	5,630	5,240	4,504	5,662	5,271	4,530	
UNFCCC_v11_2010.06	5,633	5,246	4,507	5,665	5,277	4,532	
UNFCCC_v12_2011.06	5,658	5,281	4,526	5,689	5,311	4,552	
UNFCCC_v13_2012.09	5,653	5,281	4,522	5,685	5,312	4,548	
UNFCCC_v14_2013.08	5,644	5,262	4,515	5,676	5,292	4,541	3,406
UNFCCC_v15_2014.06	5,664	5,280	4,531	5,696	5,311	4,557	3,418
UNFCCC_v16_2015.03	5,670	5,290	4,536	5,702	5,321	4,562	3,421
UNFCCC_v17_2015.11	5,723	5,330	4,578	5,758	5,361	4,607	3,455
UNFCCC_v18_2016.06	5,700	5,316	4,560	5,735	5,347	4,588	3,441
UNFCCC_v19_2016.10	5,703	5,319	4,562	5,735	5,348	4,588	3,441
Maximum value	5,723	5,330	4,578	5,758	5,361	4,607	3,455
Minimum value	5,630	5,240	4,504	5,662	5,271	4,530	3,406
Range	93	90	74	96	90	77	49
Source: EEA, UNFCCC, Futureproof calculations							

The value for 1990 emissions baseline for the EU28 has spanned a 96 million tonne range over the decade, leaving the 2020 target spanning a 77 million tonne arc. While the 2030 target was only agreed more recently and has therefore had less opportunity to shift, it has still been subject to some change. The Commission would have had to rely on the 2013 greenhouse gas inventory when proposing the at least 40% domestic reduction target and the various sub-targets in its January 2014 Communiqué. Since then, the 1990 baseline has still spanned a 79 million tonne arc, implying that the 2030 target has shifted by 47 million tonnes. **The EU’s domestic greenhouse gas target is a moving target.**

The carbon budgets in the 2020 package have struggled to keep up with these inventory changes. Important parameters of the carbon budgets, e.g. their targets, their trajectories, their starting points, have been set using inconsistent or anachronistic inventories. For

example, the 2020 targets for each Member State under Annex I of the Effort Sharing Decision were determined using 1990 baselines and 2005 baselines from a 2007 greenhouse gas inventory.²¹ Similarly, the 1.74% Linear Reduction Factor guiding the trajectory of the EU ETS in Phase 3 was devised against 1990 and 2005 baselines calculated from a 2007 inventory as well as a contemporary estimate of how the Phase 2 carbon budget would be adjusted for scope change. These parameters were fixed in the legislation even though the assumptions underlying them were no longer valid when the final carbon budgets were calculated in 2013. By that stage, both the geographical and sectoral scope of emissions covered under each budget was different and the greenhouse gas inventory had also been updated.

Moreover, the greenhouse gas inventory has continued to evolve since 2013, with no formal checks to ensure that the carbon budgets remain consistent with the evolving 2020 target. **Insofar as the 2020 climate target continues to be defined according to a shifting inventory, frozen carbon budgets are required to hit a moving target.**

In regard to the 2030 greenhouse gas target, the -30% sub-target for the non-ETS, the -43% target for the ETS and the 2.2% Linear Reduction Factor would have all been calculated using the 2013 greenhouse gas inventory, as we noted above. An estimate of the scope-adjusted 2005 emissions for ETS and non-ETS sectors would have also needed to be applied, as the verified ETS emissions reported to the EU Transaction Log in 2005 did not span the same activities and countries as they do today.

A new inventory had already been published (UNFCCC_v15) by the time the Commission published its legislative proposal for the ETS Revision on the 15th of July 2015, and a further three revisions to the inventory had been published by the time the Effort Sharing Regulation was published on the 20th of July 2016. These inventory changes might have already invalidated the link between the -43%/-30% target for each carbon budget (vs 2005) and the -40% target for the whole economy (vs 1990),²² however there is no sign that this consideration affected the trajectory of the EU ETS in the draft proposal, or the targets of Member States under the Effort Sharing Regulation.

Once the ETS trajectory and the ESR targets are fixed in law, the greenhouse gas inventories will be updated several more times before the final decision on the Phase 4 ETS cap and the final ESR budgets are published. The 2.2% Linear Reduction Factor that was calculated to achieve a -43% reduction vs 2005 levels for the ETS sectors calculated using a 2013 inventory and the current estimate of the scope-adjusted Phase 2 cap, might be applied against an updated Phase 2 baseline, achieving a very different level of emissions relative to 2005 levels than -43%. Likewise, national ESR targets calculated under a 2013 inventory, will then be applied to a revised set of 2005 baselines derived from the 2020 or

²¹ Europe's unilateral commitment to reduce emissions on 20% from 1990 levels was translated into an economy-wide reduction vs 2005 emissions. A cost-effectiveness calculation divided these reductions between ETS and non-ETS sectors, and then a GDP per capita calculation further divided the non-ETS target between individual Member States. Not only have inventories shifted between these different calculations, but different data sets were sometimes used. Eurostat data was used to calculate the cost-effective split between the ETS and non-ETS, while different data submitted to the UNFCCC was used to calculate the ETS and Member State targets and budgets.

²² This is difficult to ascertain because we have been unable to locate data on scope-adjusted 2005 emissions for the ETS and ESD contemporary with the 2013 greenhouse gas inventory used in the initial communication. The EEA was not publishing scope-corrected historical ETS data on its data viewer at that time.

2021 greenhouse gas inventory.²³ The chances that those carbon budgets will still perfectly align with a 40% reduction on 1990 levels against the latest greenhouse gas inventory are slender. Even if they do still align, the 1990 baseline and the 2030 target will continue to evolve for a decade after those carbon budgets are fixed.

Changes to the sectoral scope of emissions covered by the greenhouse gas target

Another area of ambiguity concerning the target is the *sectoral scope* of emissions covered by the EU's greenhouse gas target, i.e. which sectors are to be included and whether these are allowed to change over time.

When the various components of the 2020 target were first laid out, as we explore in detail in our [Annex](#), it was clear that the scope of aviation emissions to be covered included all domestic EU flights and all international flights outbound from the EU.

The legislation for including aviation emissions under the EU ETS, however, sought to include *inbound* international flights as well, significantly expanding the scope of emissions regulated by the EU. However, after intense pushback from other countries, the EU derogated international flights from the scheme except for flights within and between EU or EFTA countries.

This begs the question: which aviation scope should be used when calculating Europe's 1990 baseline and comparing Europe's progress against that baseline?

- Should it be the original target-scope (i.e. all domestic and all outbound international flights)?
- Should it be original ETS scope (i.e. as above, but also including all inbound international flights as well)?
- Or should it be the derogated ETS scope (i.e. flights within and between EU or EFTA countries)?

This has implications for both interpretations of the greenhouse gas target, i.e. it effects which baseline should be used when assessing whether emissions are falling rapidly enough against the "single-year deadline" and it affects the baseline against which carbon budgets in 2020 or 2030 should be measured under the "budgets substitute for targets" interpretation.

In this report, we have generally assumed – unless stated otherwise – that the geographical scope of the targets fluctuates with the composition of the EU (e.g. increases with the accession of Croatia and decreases with the secession of the UK) but that the *sectoral* scope of the targets remains fixed at the levels originally used when the targets were first proposed and first subdivided into sectoral targets and budgets, i.e. in 2008 for the 2020 package, and in 2014 for the 2030 framework.

We do this for two reasons:

- First, it seems reasonable to expect that the activities policed by the target remain constant at the levels originally proposed, if only to prevent a type of "gerrymandering" of the target scope out of political convenience when certain sectors prove difficult to abate.

²³ This is implied in the draft ESR legislation. See Article 4(3).
[http://www.europarl.europa.eu/RegData/docs_autres_institutions/commission_europeenne/com/2016/0482/COM_COM\(2016\)0482_EN.pdf](http://www.europarl.europa.eu/RegData/docs_autres_institutions/commission_europeenne/com/2016/0482/COM_COM(2016)0482_EN.pdf)

- Second, this methodology seems corroborated by the reporting methodology used by the Commission and the Environment Agency when reporting on the annual progress made towards the 2020 and 2030 greenhouse gas target (i.e. reports consistently include emissions from outbound international flights despite changes in the scope of the ETS but expanded to include emissions from Croatia after it joined the EU).

Those seeking more clarity on Europe's domestic greenhouse gas target by looking towards our international commitments will struggle to find it. The sectoral scope of the target in Europe's 2030 INDC is loosely defined. While the INDC states that "100%" of emissions are covered, the INDC is not clear on what constitutes economy-wide emissions as such. Also, while a list of UNFCCC sectors is given, this does not clarify the critical question of which scope of aviation emissions should be counted towards the target.²⁴

In relation to the EU's 2020 target, the UNFCCC published a compilation "quantified economy-wide emissions reduction targets" in 2013. The following information is provided for the EU's 2020 target:

51. [...] The target covers the IPCC sectors energy, industrial processes and product use, agriculture and waste and includes aviation emissions, but excludes LULUCF, in the 20 per cent reduction target. [Emphasis added].

85. [...] Only the EU identified a different coverage from that of other Parties, by excluding LULUCF in its 20 per cent target (the 30 per cent target includes LULUCF) and, together with Iceland, including emissions from international aviation in both targets.^{25 26}

While the EU took an extraordinary step in including international aviation in the 2020 UNFCCC target, it still remains unclear which of the three international aviation scopes should be used. A short mention in another paragraph of that document states:

53. [...] Concerning mitigation policies in relation to the target, the EU GHG ETS directive and the effort sharing decision combined define the EU GHG targets up to 2020." [Emphasis added].

This passage would seem to imply that the target only concerns whichever scope of emissions those two carbon budgets currently include. Moreover, the latest biennial report submitted by the European Union to the UNFCCC seems to initially corroborate this saying: "Emissions from international aviation to the extent it is included in the EU ETS are included in the target."²⁷ [Emphasis added]. However, in Table 2-2 of that document, which specifically compares the scope of Europe's Kyoto targets, UNFCCC targets and its

²⁴ <http://www4.unfccc.int/ndcregistry/PublishedDocuments/European%20Union%20First/LV-03-06-EU%20INDC.pdf>

²⁵ <http://unfccc.int/resource/docs/2013/tp/07.pdf>

²⁶ It is also interesting to note that the scope of activities included in the target can change with the ambition of the target. While Europe was prepared to take the unusual step of excluding LULUCF emissions from its unilateral commitment to reduce emission by 20% from 1990 levels in 2020, the conditional pledge to increase the target to 30% explicitly came with the caveat that LULUCF emissions would then be included. Notably, this change of sectors within the scope of the target was explicit and pre-arranged, not post-hoc.

²⁷ [https://unfccc.int/files/national_reports/biennial_reports_and_iar/submitted_biennial_reports/application/pdf/eu_second_biennial_report_under_the_unfccc_\(2\).pdf](https://unfccc.int/files/national_reports/biennial_reports_and_iar/submitted_biennial_reports/application/pdf/eu_second_biennial_report_under_the_unfccc_(2).pdf)

domestic carbon budgets legislation, it states: “Aviation in the scope of the EU ETS included. In practice, total aviation emissions considered.” [Emphasis added].

This passage seems to clarify that for all intents and purposes, all EU emissions from international bunker fuels (i.e. all outbound international flights) are included in the target. This approach is confirmed on the first page of that report, which states that EU emissions in 2013 were 19.8% below 1990 levels “when including international aviation for comparability with the EU 2020 target. This percentage, and the supporting data provided in Table 1-1 on that same opening page, is determined using data which includes emissions from all outbound flights. We have confirmed this by comparing the contemporary data set from the European Environment Agency of emissions reported to the UNFCCC from November 2015, which corresponds exactly with the data provided in Table 1-1.²⁸

In effect, while the scope of aviation emissions originally policed under the EU ETS were a larger scope than aviation bunker fuel emissions reported to the UNFCCC, the EU reported emissions at the smaller UNFCCC scope. At the time, that methodological decision was favourable to the European Union, both in relation to obtaining the right data for 1990 aviation emissions, but also because Europe’s aggregate carbon budgets in 2020 would have failed to deliver reduction of 20% below 1990 levels at this larger scope. Subsequent scope changes, this *de facto* reporting scope would prove less favourable to the European Union, though we note that the second biennial report quoted here was published *after* the derogation exempting most international flights was extended to 2016.

While prioritising the interpretation that the sectoral scope of emissions used for assessing the target will be the same as that originally intended (including emissions from all outbound international flights) we will also explore the implications of using a more flexible target-emissions scope defined by the current sectoral scope of the carbon budgets. In [section 4](#) we will explore these implications in the context of the 2020 target, and in [section 5](#) we will explore them in the context of the 2030 target.

28 UNFCCC_v17

4. Do the carbon budgets in the 2020 package converge with the 2020 GHG target?

Section 2 summarises some of the changes to the carbon budget parameters during the implementation of the 2020 package, changes we explore in more detail in the **Annex** to this report. We will now take stock of how these carbon budgets compare against the 2020 target they were designed to enforce. To do this we shall measure the carbon budgets for 2020 against 1990 emissions reported to the UNFCCC, including all domestic and all outbound international flights, using the latest emissions inventory (UNFCCC_v19 from 2016). We note, again, that this was the specific scope of emissions cited in the 20-20-20 Communiqué.

By that yardstick, EU emissions were 5,735 Mt in 1990 providing a 2020 target of 4,588 Mt. To compare against that target, we obtain the following values for the EU's carbon budgets in 2020.

- The stationary ETS budget, controlled for non-EU (EEA-EFTA) Member States, leave a 2020 budget of 1,798 Mt.²⁹
- The aggregated EU28 Member State budgets for the Effort Sharing Decision yield a carbon budget of 2,644 Mt.
- The original scope of aviation in the EU ETS included EEA-EFTA countries and inbound international flights, however if we assume that effort (5% cut vs average 2004-6 emissions) is borne evenly by EU and non-EU countries, and inbound as well as outbound flights, we obtain a notional EU28 outbound aviation cap of 143 Mt.

Together these supply a notional EU28 carbon budget of 4,586 Mt, sufficient to safely deliver the 2020 target (4,588 Mt) and closely conforming with it, despite the various shifts in the greenhouse gas inventory, the sectoral scope and the geographical scope of the budgets that we have chartered. See **Table 2** below.

Table 2: Comparing final carbon budgets at original target-scope against the 2020 GHG target (MtCO₂e)

Formula	Description	1990 emissions	2020 target	2020 vs 1990
A	Target-scope emissions (UNFCCC_v19)	5,735	4,588	-20.0%
B	ETS stationary (EU28 only)		1,798	
C	ESD (4AR GWPs)		2,644	
D	Aviation budget (all flights departing EU28 aerodromes)*		143	
E=B+C+D	Subtotals with all departing flights	5,735	4,586	-20.0%
* Assumes emissions from all departing flights fall 5% from 2004-6 average levels				
Sources: EEA UNFCCC_v19, EEA Trends and Projections Report 2016, Commission Decisions 2013/448/EU and 2013/634/EU, Decision 152/2012 of the EEA Joint Committee, Regulation (EU) No 421/2014, Futureproof Calculations				

Unfortunately, the derogations for international flights leave the majority of outbound EU flights unregulated. The proposed ETS aviation directive suggests freezing allocations at 2016 levels all the way through to at least 2020.

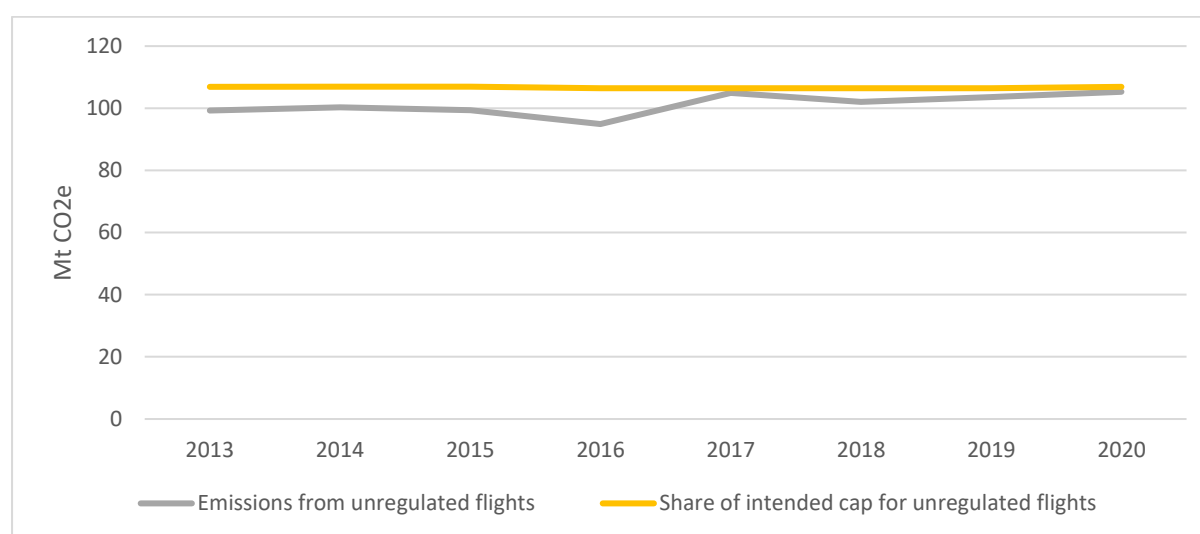
By reducing the scope of aviation emissions covered by the ETS, the derogation for international flights risks increasing emissions which were due to be intended to count towards the 2020 greenhouse gas target. In light of overall emissions trends economy-wide, though, this doesn't represent an immediate cause for alarm, as Europe is scheduled to beat

²⁹ See Technical Annex for details.

its 2020 target by a wide margin. However, this derogation also risks affecting the stringency of the carbon budgets faced by the remaining sectors still covered by the ETS, as outbound international flights potentially represented a net source of demand for allowances from stationary carbon budgets under the intended carbon budgets architecture.

Fortunately, according to aviation emissions projections derived from the European Environment Agency, unregulated outbound international flights look unlikely to exceed their share of the notional, target-consistent aviation budget over 2013-2020.³⁰

Figure 7: Unregulated outbound aviation emissions against their notional share of the original 2013-2020 aviation cap



These projections may prove inaccurate, however, so policymakers are encouraged to keep a watchful eye on how aviation emissions from unregulated outbound international flights evolve through to 2020. If these flights exceed the envelope of the aviation budget that was originally assigned to them, we submit that a volume of allowances corresponding to that overshoot should be cancelled from the remaining EU carbon budgets under the 2020 package in order to maintain the integrity of the carbon budgets and maintain their coherence with the 2020 greenhouse target.

Using alternative 1990 emissions baselines to assess the carbon budgets in 2020

In [section 3](#) of this report, we highlighted some ambiguities about the scope of activities which should be included in the target, specifically in relation to the scope of aviation. If we are choosing to assess the aggregate carbon budgets in 2020 to determine if they are at least 20% below 1990 emissions (under the budget-hedge interpretation of the target), which 1990 emissions should they be measured against? Should we measure the carbon budgets against the original target scope, including all departing flights (as explored above), or should we instead compare the carbon budgets against 1990 emissions using the same scope of emissions that are currently covered by the carbon budgets?

³⁰ Unregulated aviation emissions are calculated by subtracting the verified aviation emissions reported to the EUTL from the combined domestic and international aviation emissions reported to the UNFCCC. Projected emissions for unregulated emissions are calculated by subtracting the EEA's projection for the aviation sector under current ETS scope, from the EEA's projection for international scope combined with 2015 figures on domestic aviation scope (carried forward). This calculation has then been adjusted for non-EU countries.

We interrogate how the carbon budgets in the 2020 package compare against 1990 emission under their own scope below, looking at three different aviation scopes that have been applied.

Measuring three aviation budgets against three different targets

There are significant methodological challenges in assessing whether the current carbon budgets fall 20% below 1990 emissions as defined by the same emissions scope. The main challenge is that it is difficult to identify 1990 aviation emissions baselines to compare against either the original aviation budget or the derogated aviation budget we face today.

It is beyond the scope of this project to fully reconstruct the 1990 emissions baseline for these two aviation budget scopes, but we will provide some illustrative 1990 emissions values using some proxy calculations.

Verified aviation emissions reported to the ETS under derogated scope were approximately 34% of all departing EU28 flights reported to the UNFCCC over 2013 and 2014. 1990 emissions reported to the UNFCCC for all outbound flights were 84 Mt. If we assume the relationship between intra-EEA flight emissions and all outbound flights were constant, this would imply derogated scope emissions of 29 Mt in 1990.³¹

According to the latest inventory (UNFCCC_v19), stationary EU28 emissions were 5,651 Mt in 1990. If we add these values together we obtain a 1990 baseline of 5,679 Mt. We can then determine the relative 2020 target implied by the legislated carbon budgets against this yardstick, by adding the derogated 38Mt EU28 aviation cap to the stationary carbon budgets. **This yields a value of 4,480 Mt or 21.1% below 1990 levels, suggesting that, measured against its current scope, the derogated aviation budget helps to significantly overdeliver against the 2020 target.**³²

Conversely, if we use a similar approach to derive a 1990 emissions baseline for the original aviation cap (controlled for non-EU flights) we find that this larger scope underdelivers against the 2020 target, implying emissions reductions of just 19.5% vs 1990 levels.³³

³¹ N.B. A similar method is used by the EEA when back-casting scope-consistent ESD and ETS emissions prior to 2005. The EEA also obtains a 29 Mt baseline, by back-casting current-scope ETS aviation emissions as a share of all flights departing from EU aerodromes.

³² Strictly speaking it could be argued that the 1990 baseline under this scope-consistent approach should be frozen at the inventory used to construct the budgets when they were set. We face methodological barriers, however, in comparing the 1990 baseline in the 2012 inventory with the 2020 budgets, e.g.: only one version of the ETS budget was given (against which emissions are to be reported using global warming potentials from the IPCC's 4th Assessment Report). In the 2012 inventory, however, an assortment HFC's and PFCs are only reported in aggregate CO₂ equivalent values using global warming potentials from the IPCC's 2nd Assessment Report. We are therefore limited in our capability to translate that inventory into 4th Assessment Report values used. A true like for like comparison is difficult to apply. Moreover, we are obliged to use the 2016 inventory to reconstruct an approximated aviation baseline under both ETS aviation scopes.

³³ Departing flights from EU countries over 2004-2006 are equivalent to 1.6% of departing EU flights over that timeframe. We have therefore assumed the original scope 2020 baseline and cap are 1.6% lower to control for non-EU outbound and inbound flights.

Table 3: Comparing 2030 carbon budgets against same scope 1990 emissions (Mt CO₂e)³⁴

Formula	Description	1990 emissions	2020 target	2020 vs 1990
A	Target-scope emissions (UNFCCC_v19)	5,735	4,588	-20.0%
B	EU28 only ETS	5,651	1,798	-21.4%
C	EU28 ESD (4AR GWPs)		2,644	
D	Aviation (all flights departing EU28 aerodromes)*	84	143	70.5%
E=B+C+D	Subtotals with outbound	5,735	4,586	-20.0%
F	Aviation (derogated scope)	29	38	31.8%
G=B+C+F	Subtotals with derogated scope	5,679	4,480	-21.1%
H	Aviation (original ETS scope controlled for non-EU)	120	205	70.5%
I=B+C+H	Subtotals with original scope	5,771	4,647	-19.5%

* Assumes emissions from all departing flights fall 5% from 2004-6 average levels

Source: Commission Decisions 2013/448/EU and 2013/634/EU, Decision 152/2012 of the EEA Joint Committee, EEA UNFCCC_v19, EEA ETS data viewer, Regulation (EU) No 421/2014, Futureproof calculations

It remains the case that the carbon budgets are best aligned with the greenhouse gas target, when aviation emissions are included at the original scope used to determine the sectoral sub-targets in the original 2020 package – an alignment that seems fairly serendipitous given the changes in ambition, and scope of the various carbon budgets in the 2020 package.

Grounds for dismissing the measurement of the carbon budgets against 1990 emissions under their own, internal scope

This approximation of the 1990 emissions we have used for the two aviation scopes that were actually legislated is purely indicative. The absence of reliable data on 1990 emissions at current budgets scope is a first reason for rejecting this approach.³⁵ Even this indicative 1990 data, though, serves to illustrate some of the general, logical implications of measuring 2020 target-delivery using the emissions scope internal to the carbon budgets.

Aviation is the sector subject to the weakest reduction target compared with 1990 levels (i.e. -5%), much less than both the Effort Sharing Decision sectors and the stationary ETS sectors. It therefore follows that reporting a smaller aviation scope against the target, will leave a larger proportion of EU greenhouse gas emissions subject to stronger targets under the ESD and ETS, leading to stronger looking performance against a 1990 baseline. Conversely a larger aviation scope, will see a smaller proportion of EU emissions subject to stronger targets against the larger baseline.

Our main criticism of this interpretation of the target is that it seems politically convenient to adopt this approach now that the scope of aviation emissions covered by the budgets has narrowed.

This allows Europe to say that its budgets are still concordant with its 2020 and 2030 target despite contractions in the aviation scope used compared to the assumption made when the targets and trajectories for the various carbon budgets were designed. Had this interpretation been adopted from the outset, the original scope of aviation, which also

³⁴ For more information on how we control for non-EU countries in the ETS cap please see our Annex.

³⁵ Emissions for both original aviation scope (outbound and inbound international flights) and emissions for derogated scope (intra EEA flights only) may have followed quite different trajectories between 1990 and today. Moreover, fluctuations in the scope of aviation emissions reported to the ETS makes it difficult to test the stability of the relationship for more than three years.

included incoming flights, would have seen the carbon budgets fall 0.5% short of enforcing the 2020 target, as we see in the table above. This view of the target does not appear to be one that had currency at that time when it would have been less politically convenient.

Redefining the 1990 yardstick against which the carbon budgets are measured every time the carbon budgets change in scope introduces huge volatility into whether they deliver on the greenhouse gas target or not. It also creates perverse incentives which discourage the EU from expanding the scope of their carbon budgets beyond the original target scope to police emissions from difficult-to-abate sectors that are poorly regulated, such as international aviation and maritime emissions.

We conclude, then, that the additional volatility this interpretation brings to the delivery of the greenhouse gas target, the lack of clear data on 1990 emissions at current scope, and finally the cascade of additional ambiguities it introduces to the target, makes this an impractical and unsatisfactory interpretation of the scope of the greenhouse gas target.

5. Potential threats to the 2030 framework

Having reviewed in detail how various changes to the scope and ambition of the carbon budgets threaten the 2020 greenhouse gas target, we now highlight how similar issues threaten the 2030 greenhouse gas target under the 2030 framework.

Inventory changes

We have discussed how changes to the greenhouse gas inventory can affect the greenhouse gas target in [section 3](#). To revisit briefly, the cost-effective split between the ETS and the Non-ETS was calculated against a 2013 greenhouse gas inventory, but the -43%/-10% split between the ETS and the ESR might not continue to deliver the at least -40% economy-wide target against inventory changes and scope changes. Moreover, the 2.2% Linear Reduction Factor, also calculated against 2013 greenhouse gas inventory, might not continue to deliver reductions of 43% in the event of further scope and inventory changes. In the case of the ESR, the 2005 percentage targets that have been calculated to share the 30% target across the 28 Member States will ultimately be fixed into budgets against a later inventory. The mismatching inventories used to determine the budgets could ultimately find them delivering emissions reductions less than 30% below 2005 levels.

Issues with sectoral scope

As with the 2020 package, the 2030 framework seems to be protected against substitutions of emissions scope between the ETS and the ESD, but is not protected against changes in the overall coverage of the budgets.

Aviation emissions

Again, aviation scope in the ETS is a significant threat. The Impact Assessment accompanying the Commission Communication for the 2030 Framework makes clear that the ETS target to cut emissions by 43% vs 2005 and the 2.2% Linear Reduction Factor is meant to include aviation emissions.

“According to the ETS Directive, the ETS cap for stationary sources decreases linearly, with an annual amount equal to 1.74% of the average annual allocation during phase 2 (excluding aviation), referred to as the linear reduction factor. This is equivalent to an annual reduction of around 38 million allowances. The scenario with 40% GHG reductions and moderate EE and RES policies up to 2030 achieves emission reductions in the ETS of 43% by 2030 compared to 2005. Setting a cap at this 2030 emission level would require a change of the linear reduction factor. A revised linear reduction factor applied from 2021 onwards to all sectors included in the ETS would require a linear reduction factor of 2.2% to be coherent with a 2030 cap equal to 43% reductions”.
[Emphasis added]³⁶

³⁶ P.105 <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014SC0015&from=EN>

While the scope of aviation emissions to be covered is not made explicit, this was clarified in a note from the European Commission to the shadow rapporteurs working on the ETS revision in the European Parliament.

"The cost-effective split of this target between ETS and non-ETS sectors based on their emission reduction and abatement potentials shows that the EU ETS emissions should be reduced with 43% by 2030 compared to 2005. This leads to a linear reduction factor of 2.2% per year, including outgoing international aviation."³⁷ [Emphasis added]

We take "outgoing international aviation" to be the same scope of departing EU flights that the European Commission and European Agency use for reporting annual progress against the 2020 target, that is, all flights departing from European aerodromes, irrespective of their final destination. At present, though, there are no indications that this larger aviation scope will be used within the final 2021-2030 carbon budgets. The Commission's legislative proposal for the main ETS revision contained a 2.2% Linear Reduction Factor, but made no specific indication that this would apply to the aviation budget, or that the scope of aviation would be changed. Since then:

- The Parliament's report on the ETS revision called for aviation to continue to be policed at the current, derogated emissions scope, however it called for a 10% drop in allocations in 2021, followed by a 2.2% Linear Reduction Factor.³⁸
- The Commission has issued a new legislative proposal specifically concerning the aviation ETS budget. This proposal also calls for the aviation budget to police emissions at current, derogated scope, and calls for the aviation cap to be brought under the 2.2% LRF from 2021. It does *not* call for a 10% drop in allocation from current levels.³⁹

This implies three different potential aviation budgets for the 2030 framework, contributing three different values to the budget in the specific target year 2030.

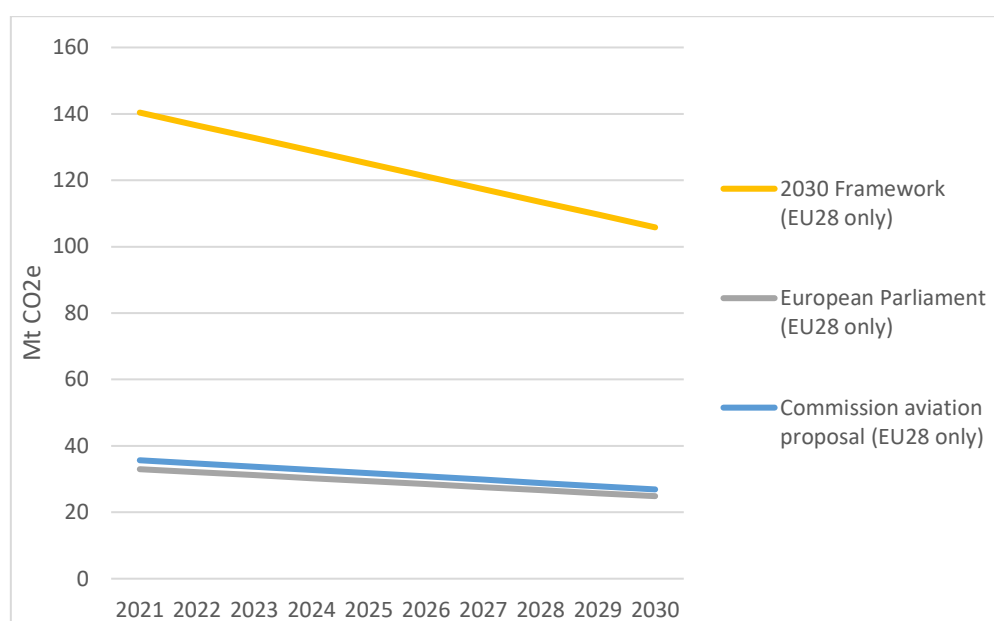
- The aviation budget implied by the Communiqué outlining the 2030 Framework, which implies an aviation budget of 106 million tonnes in 2030.
- The aviation budget under the Commission's new aviation proposal, which implies an aviation budget of 27 million in 2030, and
- The aviation budget under the EU Parliament's report on the ETS revision, which implies an aviation budget of 25 million tonnes in 2030.

³⁷ Provide reference

³⁸ See Amendment 30 <http://www.europarl.europa.eu/sides/getDoc.do?type=TA&language=EN&reference=P8-TA-2017-0035>

³⁹ <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2017:0054:FIN>

Figure 8: Proposed aviation budgets for the 2030 framework



Logically these cannot all deliver the same 2030 target. The small aviation scope proposed for legislation by both the European Parliament and the Commission seems to leave a significant regulatory gap for the 2030 target, which it is unlikely the ICAO agreement will bridge. This danger is particularly acute given that the ICAO agreement is likely to substantially rely on offsets, which cannot be counted towards the EU's greenhouse gas target, which is a purely domestic commitment.

In the table below, we first assess whether the combined carbon budgets in the 2030 framework are at least 40% below 1990 levels if aviation is included at full intended scope including all outbound international aviation. We find that they reach the target. We then assess whether the emissions from flights left unregulated by the reduced ETS scope of the Commission proposal will exceed the budget that was intended for them. We find that they exceed them by a significant margin.

Table 4: Comparing carbon budgets and unregulated aviation emissions against the intended 2030 GHG target (MtCO₂e)⁴⁰

Formula	Description	1990 emissions	2030 target	2030 vs 1990
A	Target-scope emissions (UNFCCC_v19)	5,735	3,441	-40.0%
B	ETS stationary (EU28 only)		1,319	
C	ESR		1,992	
D	EU28 aviation budget (all departing flights)		106	
E=B+C+D	Subtotals with all departing flights	5,735	3,417	-40.4%

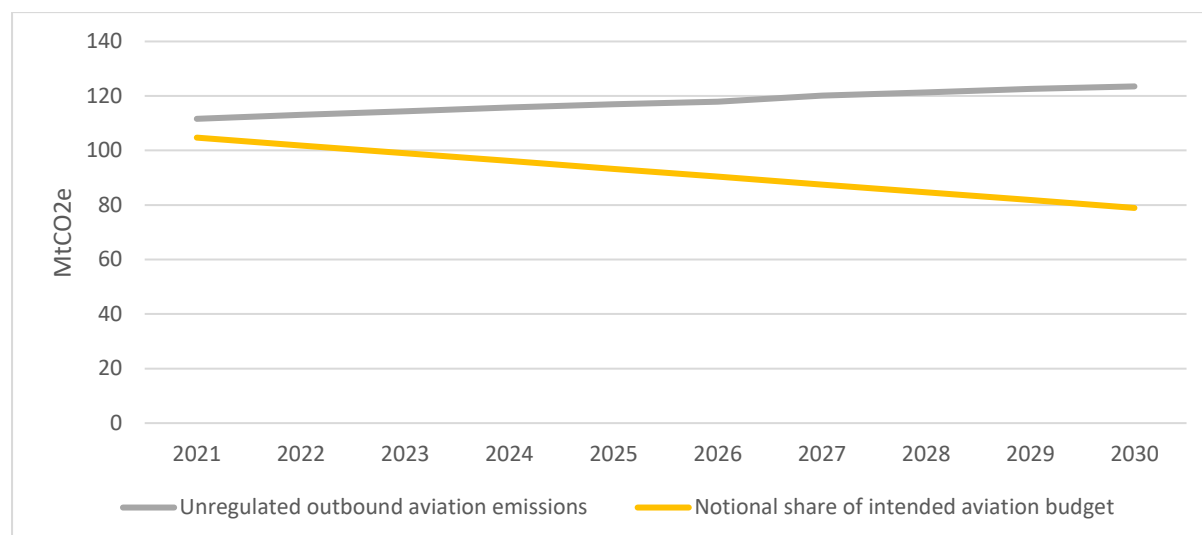
Source: EEA UNFCCC_v19, EEA Trends and Projections Report 2016, EU Transaction Log, Commission Decisions 2013/448/EU, Decision 152/2012 of the EEA Joint Committee, Regulation (EU) No 421/2014, Commission Communication (2016)500, Commission Communication (2015)337, Commission Communication (2017)54, Futureproof Calculations

First, we find that the carbon budgets under original aviation scope (all departing flights), lands 40.4% below 1990 emissions in the latest greenhouse gas inventory, converging comfortably below the 2030 greenhouse gas target.

⁴⁰ For more information on how we control for non-EU countries in the ETS cap please see our Annex.

However, if the aviation budget in 2030 follows the Commission's new proposal at derogated scope, we find that unregulated emissions from outbound international flights will exceed their intended share of the 2021-2030 carbon budgets by 222 Mt.⁴¹

Figure 9: Unregulated outbound aviation emissions are projected to exceed their intended share of the Phase 4 ETS cap



Bridging the gap to the 40% target left by aviation scope change

If these aviation emissions were regulated by the ETS, any emissions beyond the aviation cap would have represented additional demand for ETS allowances. This reduction in demand is a purely political artefact, which has reduced the stringency of the Phase 4 cap. Maintaining the integrity of the carbon budgets in the 2030 framework and maintaining their coherence with the 2030 target would therefore require that the remaining carbon budgets should be adjusted down by 222 Mt on current projections – with the carbon budgets for the stationary ETS sectors as the most appropriate candidate for adjustment.

Ultimately, of course, unregulated international aviation emissions might evolve differently to current projections. European lawmakers will need to keep a watchful eye on this emissions gap, and introduce appropriate measures to bridge it if they are to keep the carbon budgets aligned with delivering domestic emissions reductions of at least 40% compared with 1990 levels.

Assessing the 2030 target using the “shifting” interpretation of the target’s emissions scope

As noted in [section 3](#) of this report, some ambiguity persists in relation to the sectoral scope of Europe’s greenhouse gas targets. We have argued that the strongest and fairest interpretation of the target is to assume it continues to include emissions at the original sectoral scope assumed when the 2020 package and the 2030 framework were first put forward, even when the scope of the carbon budgets has subsequently changed (see [section 3](#) and [section 4](#)). We find precedent for this approach in the EU’s reporting of annual progress against its target to the UNFCCC.

⁴¹ Projected emissions for unregulated outbound aviation are calculated by subtracting the EEA’s projection for the aviation sector under current ETS scope, from the EEA’s projection for international scope combined with 2015 figures on domestic aviation scope (carried forward). This calculation has then been adjusted down for non-EU countries.

However, it has sometimes been argued that the scope of emissions included in the greenhouse gas target should swell and contract with the changing scope of the EU's carbon budgets. Under this interpretation of the target-scope, the reduced scope of aviation emissions under derogated scope would effectively *strengthen* the emissions reductions implied by the 2030 framework by reducing the 1990 emissions baseline they are compared against. Instead of the 40.4% reduction on 1990 emissions implied by the carbon budgets if they cover all domestic and outbound international flights. Under reduced scope the budgets would be 41.2% below 1990 levels.

Figure 10: Comparing 2030 carbon budgets against same scope 1990 emissions (MtCO₂e)⁴²

Formula	Description	1990 emissions	2030 target	2030 vs 1990
A	Target-scope emissions (UNFCCC_v19)	5,735	3,441	-40.0%
B	ETS stationary (EU28 only)		1,319	
C	ESR	5,651	1,992	
D	EU28 aviation budget (all departing flights)	84	106	
E=B+C+D	Subtotals with all departing flights	5,735	3,417	-40.4%
F	EU28 aviation budget (Commission proposal - derogated scope)	29	27	
G=B+C+F	Subtotals with derogated scope	5,679	3,338	-41.2%

Source: EEA UNFCCC_v19, EEA Trends and Projections Report 2016, EU Transaction Log, Commission Decisions 2013/448/EU, Decision 152/2012 of the EEA Joint Committee, Regulation (EU) No 421/2014, Commission Communication (2016)500, Commission Communication (2015)337, Commission Communication (2017)54, Futureproof Calculations

The reason for this, as just noted in section 4, is that aviation is the sector subject to the weakest reduction target compared with 1990 levels, much less than both the Effort Sharing Decision sectors and the stationary ETS sectors. It therefore follows that reporting a smaller aviation scope against the target, will leave a larger proportion of EU greenhouse gas emissions subject to stronger targets under the ESD and ETS, leading to stronger performance against a 1990 baseline.

As noted, both in section 3 and section 4, we're concerned that this interpretation of the target scope is a politically convenient one which provides perverse incentives to avoid including emissions from difficult to abate sectors.

Maritime emissions

The Parliament's report on the ETS revision also proposes to include maritime emissions in the ETS.⁴³ Once more, in our view, the emissions-scope of the greenhouse gas target need not be changed to reflect this, for the reasons just outlined in relation to aviation scope, and described in section 3. However, if a specific decision was made to also expand the definition of the greenhouse gas target to include maritime emissions, this would also effect the balance of effort required across the different budgets to safely deliver the intended 2030 target of at least 40% on 1990 levels. A simple rule of thumb is that, unless new sectors added are also required to cut emissions by at least 40% on 1990 levels, other sectors would need to compensate with deeper cuts to protect the integrity of the climate target.

Issues with geographical scope (Brexit)

⁴² For more information on how we control for non-EU countries in the ETS cap please see our Annex.

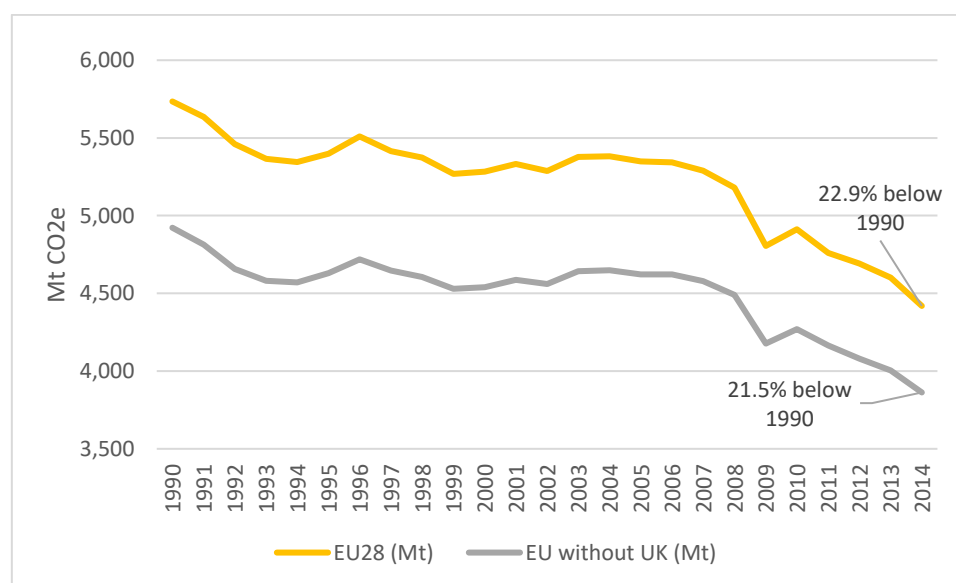
⁴³ See Amendment 36 <http://www.europarl.europa.eu/sides/getDoc.do?type=TA&language=EN&reference=P8-TA-2017-0035>

Brexit could also have very important impacts on Europe's 2030 target. Where Croatia's accession to the EU appears to have strengthened the ambition of the EU's policy framework, the secession of the UK is likely to damage it.

Setbacks for EU ambition without the UK

The UK is one of Europe's largest emitting economies, but also one of the countries making the swiftest progress in cutting its emissions. Without the UK, the remaining 27 EU countries would find their historical progress in cutting emissions set back from 22.9% below 1990 levels to just 21.5% (as of 2014).

Figure 11: EU progress cutting emissions with and without the UK



This setback would make the commitment to cut emissions by 40% in 2030 more difficult to meet if the EU attempted to achieve this without the UK. Moreover, if the UK exited the carbon budgets in the 2030 framework, the carbon budgets might not enforce 40% reductions on 1990 levels, depending on how the exit was handled.

In the table below, we investigate where the carbon budgets for the remaining 27 EU countries would land in 2030 if the UK's current contribution to the Effort Sharing budgets and the ETS budgets were subtracted. We find that ambition under both the stationary budgets is modestly reduced relative to 2005 levels. We also find that the carbon budgets converge 39.5% below 1990 levels, falling just short of the economy-wide greenhouse gas target.

Table 5: Impacts of Brexit on the ambition of EU carbon budgets and the economy-wide GHG target

Category (Mt CO ₂ e)	1990	2005 GHG	2030 target	2030 vs 2005	2030 vs 1990
ESR		2,848	1,992	-30.1%	
ESR without UK		2,434	1,731	-28.9%	
ETS (EU28 only)*		2,349	1,319	-43.8%	
ETS (EU28 only minus UK)**		2,074	1,170	-43.6%	
Stationary emissions (EU28)	5,651	5,197	3,311	-36.3%	
Stationary emissions (EU28 minus UK)	4,855	4,508	2,900	-35.7%	
Aviation (all outbound)*	84	151	106	-30.1%	
Aviation without UK (all outbound)**	67	114	79	-30.1%	
EU28 economy-wide emissions (with aviation)	5,735	5,348	3,417	-36.1%	-40.4%
E28 minus UK economy-wide emissions	4,922	4,621	2,980	-35.5%	-39.5%

Source: EEA UNFCCC_v19 inventory, ESR proposal COM(2016)500, ETS Revision proposal COM(2015)337, Decision 152/2012 of the EEA Joint Committee, Futureproof calculations.

* The LRF baseline has been modified down to remove EEA-EFTA countries

**The LRF baseline has been modified to remove EEA-EFTA countries and also the UK's scope-adjusted Phase 2 NAPs allocation

* We've derived the 2030 target for aviation using a -43% target for stationary and aviation emissions vs 2005

**We've assumed the UK's share of the 2030 aviation target is proportionate to its share of 2005 aviation emissions

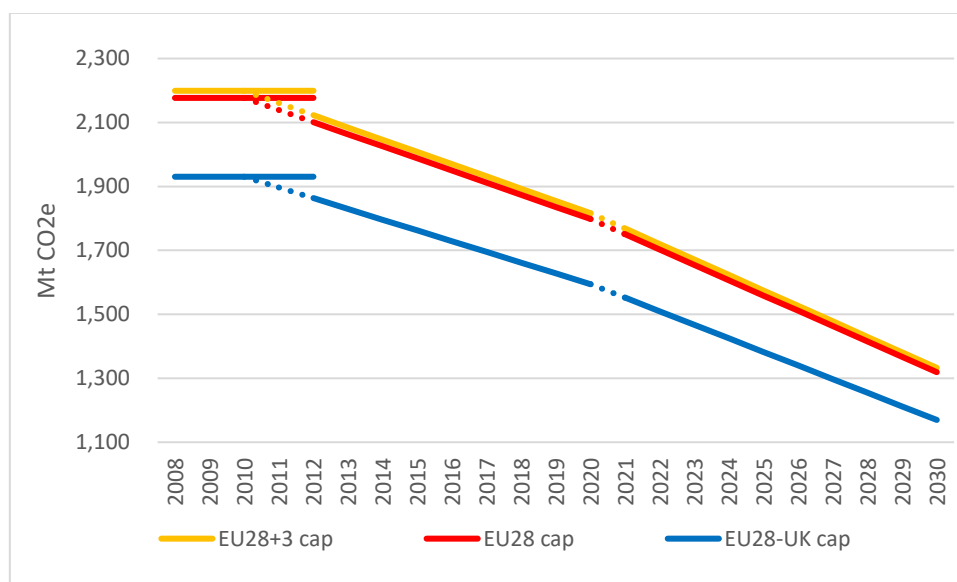
We feel this is the legal default scenario under a UK exit from the EU ETS and the ESR for several reasons.

- First, this simply subtracts the UK's exact contribution to each carbon budget under the current legislation and draft legislation. We remove the UK's target from Annex I to the ESR (while leaving all other national targets unchanged). We also subtract the UK's scope adjusted Phase 2 allowances from the 2010 baseline which determines the trajectory of the Phase 3 and Phase 4 cap (i.e. as described by the Linear Reduction Factor).
- Second, there are several provisions in the ETS directive which would imply that the 2010 baseline determining the cap would be revised to reflect scope change, e.g.:
 - Article 9a of the Directive makes provision for adjusting the 2010 baseline to account for the unilateral inclusion of installations by Member States (see also Article 24.1), the inclusion of new activities in the ETS, and for the unilateral opt-out of small emitting installations by Member States (see also Article 27).
 - Most tellingly, Article 9 of the Directive specifically states that: "*The quantity shall decrease by a linear factor of 1.74 % compared to the average annual total quantity of allowances issued by Member States in accordance with the Commission Decisions on their national allocation plans for the period from 2008 to 2012.*" The proposed Phase 4 cap updates the LRF to 2.2% from 2021. If the UK is no longer a Member State, it seems reasonable to assume its National Allocation Plan should be excluded from consideration in the baseline for the LRF when determining the Phase 4 cap.

We have calculated the adjustment to the stationary ETS cap in the scenario of a UK exit as follows. Based on the final UK Phase 2 National Allocation Plan, and the scope adjustments to the UK's budgets under the EU Effort Sharing Decision, we obtain a scope-adjusted average annual allocation of 246 million for the UK in Phase 2. By extension, this implies

that the UK cap contributed 204 Mt to the ETS cap in 2020.⁴⁴ We then apply the proposed 2.2% Linear Reduction Factor against this lowered baseline in 2010 and lowered starting point in 2020. For the purposes of assessing how the carbon budgets contribute towards the EU's domestic greenhouse gas target, we also control for the contribution of non-EU member states towards the EU ETS budget (see Figure 12 below).⁴⁵

Figure 12: Separating out UK and non-EU contributions to the ETS cap



Bridging the gap to the 40% target left by Brexit

Under this, default scenario, then, the carbon budgets for the remaining EU countries would need to fall by an additional 26 million tonnes in 2030, equivalent to 0.5% of 1990 levels. This leaves aside the issue of aviation, which we treat here as operating at the scope first modelled for the 2030 framework. This emissions gap could be bridged through a modest step up in Member State targets in Annex I of the ESR or a modest trajectory change to the EU ETS, or some combination of the two. If corrected through a volume-based adjustment, this would need to be equivalent to the volumes that would have been removed through a formal trajectory change. In the case of the 2030 carbon budgets, this represents a wedge of allowances declining from 2020. This implies that any emissions gap in the year 2030 would need to be multiplied by a factor of 5.5.⁴⁶

Correcting the EU carbon 2021-2030 budgets to align with 40% emissions reductions in the event of the UK's departure would therefore require 145 million carbon allowances to be removed.

⁴⁴ A 17.4% reduction on 246 Mt

⁴⁵ For more information on how we control for non-EU countries in the ETS cap please see our Annex.

⁴⁶ If the trajectory of the carbon budgets were changed the latest possible pivot point for the trajectory change would be the year 2020, not the year 2021. This implies that the volume of the wedge will be 5.5 times the 2030 gap (i.e. 11/2) rather than 5 (i.e. 10/2). An intuitive way to think about this is that the year 2021 should not be exempted from a volume adjustment when correcting the budgets in the 2030 framework. The total volume adjusted over the ten-year period will be 55 times the adjustment in 2021, i.e. $N(N+1)/2 = 10(11)/2 = 110/2 = 55$, and 5.5 times the adjustment in 2030, the tenth year adjusted.

UK climate ambition unaffected or improved by exiting the EU carbon budgets

Meanwhile, owing to strong domestic climate legislation, it remains possible that the UK could deliver, or even exceed, the emissions required of it under the ETS and the ESR even if it left those two carbon budgets.

- The UK's 5th carbon budget requires emissions to be cut 57% on 1990 levels by 2030.⁴⁷ The independent Climate Change Committee, which advises the UK government on targets, estimates that this is 4% lower than the UK's commitments under Europe's 2030 framework.⁴⁸ All of those additional 4% reductions are in the non-traded sector.⁴⁹
- The way the ETS is reflected in the UK carbon accounting rules, requires that the UK set the traded parts of the carbon budget in keeping with the UK's estimated share of the ETS cap. However, the Committee recommends that UK actual emissions should fall 61% below 1990 levels by 2030. Were the UK to leave the ETS, it is likely that the Committee would change its advice on the appropriate 5th carbon budget level, potentially leading to a new 5th carbon budget which constrains total emissions 4% more aggressively again, this time with the additional constraint taking place in the traded sector.

Together, the current UK budget for the non-traded sector and the potential tightening of the UK budget for the traded sector, could deliver additional national GHG cuts of 8% on 1990 levels against the UK's obligations under the 2030 framework. This roughly equates to an additional 64 million tonnes of emissions reductions in 2030.

Bullish effects on EU carbon prices from a UK exit

Given the UK's strong domestic climate regime, the UK's departure could have a modestly bullish impact on carbon prices under both the ETS and also under the Effort Sharing Regulation against what we argue is the legal default scenario.

- If the UK departed from the ETS, we estimate that this would remove 1.7 billion tonnes from the carbon budget over Phase 4. This compares against UK ETS emissions forecasts of 1.2 billion according to Sandbag,⁵⁰ and compares against the UK government's Reference Scenario which assumes UK emissions will be 1 billion over the ten-year period.⁵¹ Under both of these emissions forecasts, then, a UK departure would remove more supply than demand, modestly increasing the scarcity of carbon allowances in the system. The price effects of this additional scarcity would, however, be muted, because the Market Stability Reserve will be the main driver of the price in Phase 4.⁵²

⁴⁷ Or to be precise, over 2028-2032.

⁴⁸ See Box 2.1 of the CCC's 5th Carbon Budget Report. This estimate is likely conservative. In their central scenario, the CCC estimated that the UK would have an ESD target of -37.5% vs 2005 levels, when the target ultimately proposed was only -37%.

⁴⁹ We know this because the traded parts of the budget are set at the UK's estimated share of the ETS cap.

⁵⁰ Chart 16 page 17 Brexit and the EU ETS (Sandbag, May 2017) <https://sandbag.org.uk/wp-content/uploads/2017/05/Brexit-and-EUETS-Final-Report.pdf>

⁵¹ BEIS Energy and Emissions Projections 2016, Web Figures (Fig 2014_2.1, Column F) <https://www.gov.uk/government/publications/updated-energy-and-emissions-projections-2016> The forecasts for the ETS sector are, however, illustrative only and do not indicate planned policies.

⁵² Point Carbon, ICIS-Tscach and Sandbag have all made similar points about a UK ETS exit potentially driving scarcity in the carbon market – though the effect of the UK exit on supply has been different in each case. See

- Similarly, we expect that the UK's commitments for the non-traded sector under its domestic carbon budgets regime, would require emissions to be lower than the budget implied by the ESR. Indicatively, we estimate the UK's ESR budget to be approximately 2.9 billion tonnes over 2021-2030.⁵³ We obtain this figure by applying the parameters from the Commission's ESR proposal to non-ETS emissions in the UK government's latest Reference Scenario. Against this EU budget, the UK's domestic Non-ETS budgets under the UK climate change act, adjusted for LULUCF emissions, amount to 2.7 billion tonnes over the same ten-year period. These domestic limitations on emissions again suggest that the UK would be removing roughly 200 million more supply than demand from the ESR budgets, driving scarcity in those budgets and increasing the price of carbon for Member States in those sectors.

Environmental implications of Brexit depend on the EU-UK negotiations.

The analysis performed above has several surprising implications for how the UK's secession from the EU is handled in the climate framework. For example:

- It suggests that the UK and the EU could jointly deliver the 40% GHG target in 2030 even if the UK left both the ETS and the ESR.
- It suggests that, if other Member States maintained their current commitments under the ETS and the ESR, the UK and the EU could deliver slightly more emissions cuts if the UK left these budgets than if it remained within them – lowering emissions both in the year 2030 and cumulative emissions across the decade.
- It suggests that, if the remaining 27 EU Member States increased their efforts to fulfil a 40% GHG target without the UK, that still more emissions reductions would take place in total.

It remains to be seen what final arrangement will be made concerning the UK's ongoing participation in the ETS, the ESR or the EU climate target when the UK leaves the European Union, but the decisions made will clearly affect the EU's delivery of its intended 2030 target. Our analysis suggests, however, that a UK departure from some or all parts of the EU climate framework could lead to more environmental ambition overall in the 2030 context, unless the EU or the UK actively weakened their carbon budgets regimes after going separate ways.

<http://www.businessgreen.com/bg/analysis/3007788/brexit-and-the-eu-ets-carving-up-the-emissions-market> and
<https://sandbag.org.uk/project/brexit-eu-ets-greater-sum-parts/>

⁵³ We obtain this figure by applying the parameters from the Commission's ESR proposal to non-ETS emissions in the UK government's latest Reference Scenario (controlled for LULUCF emission, which fall under the UK's Non-traded budget.)

6. Conclusion and recommendations

In this report, we have sought to highlight a deep ambiguity in how the EU's greenhouse gas targets are defined. We highlight two competing interpretations of how successful delivery of the targets is determined.

- On the one hand, we might assume the targets are delivered so long as physical emissions fall at least 20% below 1990 levels by the year 2020, and 40% by the year 2030. We will call this the “single-year deadline” interpretation of the GHG target.
- On the other hand, we might assume that the carbon budgets operate as an eight-year hedge against the 2020 greenhouse gas target and a ten-year hedge against the 2030 greenhouse gas target. We will call this the “budgets-substitute-for-target” interpretation.

Environmental campaigners have raised concerns about surplus allowances in the carbon budgets being banked forward allowing emission to overshoot the 2030 target – thereby invoking the “single-year deadline” interpretation of the target. Industrial stakeholders have routinely deflected these arguments by invoking the second “budgets-substitute-for-target” interpretation.

But this second, interpretation of the greenhouse gas target needs to pass its own environmental tests. If we are asked to ignore the trajectory of actual emissions, scrutiny must shift to the trajectory of the carbon budgets to see if they deliver the required emissions reductions compared to 1990 levels.

Our analysis finds that the carbon budgets in the 2030 framework fail to reliably pass this test, because they are inadequately ambitious, inadequate in coverage (i.e. scope), and inadequately responsive to changes in the greenhouse gas inventory.

We identify a 222 Mt policy gap in the 2021-2030 carbon budgets, owing to the contraction of the scope of aviation emissions covered by the EU ETS. Emissions from unregulated outbound flights are projected to exceed their original share of the Phase 4 ETS cap by this volume. This therefore represents missing demand which needs to be somehow accounted for if the carbon budgets are to remain consistent with the 2030 greenhouse gas target.

Without the UK, we also find that the EU carbon budgets will fall just 39.5% below 1990 levels in 2030 under what we assume to be the legal default scenario if the UK exits the ETS and the ESR. Correcting this would require remedial changes to the ETS trajectory or the ESR targets. Alternatively, the removal of 145 million carbon allowances from the 2021-2030 carbon budgets would have an equivalent environmental effect.

These incompatibilities between the carbon budgets and the 2030 greenhouse gas targets pose a direct threat to the legitimacy of the interpretation of those budgets as a substitute for, and hedge against, the single-year 2030 target. Nevertheless, even under the single-year interpretation of the target, this misalignment between the budgets and the targets accentuates the risks that physical emissions will not fall to the required levels in the year

2030 by adding to the total available supply of allowances and by leaving emissions in some sectors unregulated.

At present, we find that no formal checks exist to ensure that Europe's carbon budgets adequately deliver the greenhouse gas target – whether the target is defined by the trajectory of emissions or whether this is defined by the trajectory of the carbon budgets. Going forward, we therefore propose a triple-lock be introduced to the greenhouse gas target, which reinforces it against the threats posed under both interpretations.

A triple lock on Europe's greenhouse gas target

Lock 1: a greenhouse gas target clearly defined in law.

Our first recommendation is that the EU's domestic greenhouse gas target needs to be clearly and formally defined independently of the various pieces of legislation which implement it. This is necessary to ensure that there is a clear external yardstick by which the implementing legislation can itself be measured.

The definition of the target needs to specify exactly what greenhouse gas emissions are being counted towards the target, the geographical scope of emissions to be included and above all, the precise range of activities to be included for assessment (e.g. which exact scope for aviation should be used). If the coverage of the greenhouse gas targets is allowed to change over time, the conditions for these changes should be clearly laid out.

It should be clarified how changes to the greenhouse gas inventory, including changes in the global warming potentials of different greenhouse gases used within the inventory, affect the EU's greenhouse gas target.

Finally, it should be clarified how delivery of the target is actually determined, i.e. whether delivery of the target can occur flexibly under the auspices of the carbon budgets, or whether emissions need to be below the stated levels in the specific target years.

As an extension of the above process, we call for the Commission to publish an annual update which translates the greenhouse gas target into a current, absolute value in tonnes of CO₂ equivalent, reflecting any updates to the emission inventory or any other factors which can change the absolute value. Against this, we invite the Commission to publish the current value of the carbon budgets in the years corresponding to current greenhouse gas targets, to disaggregate those parts of the carbon budget which are not consistent with the scope of the emissions target (e.g. from non-EU countries), and to highlight any mismatch between the current budgets and the target. This can serve as an annual guide to policymakers as to whether further policy interventions are necessary to adjust the carbon budgets (see Lock 2). Better still, any mismatch could trigger *automatic* adjustments to the supply of carbon budgets.

This reporting requirement could potentially be incorporated into the new Monitoring Mechanism Regulation and the new Governance of the Energy Union framework, with annual updates included in the annual progress reports already prepared by the European Commission and the European Environment Agency.

Lock 2: a commitment to align the trajectory of the carbon budgets with the greenhouse gas targets

Our second recommendation is that a clear regulatory commitment be made to regularly reconcile Europe's carbon budgets with its greenhouse gas targets, i.e. that the budgets follow a trajectory that converges at a point at or below the greenhouse gas target in 2020, 2030 etc. and that they police emissions at an appropriate scope.

In the 2030 framework, a great deal of political attention has focused on the oversupply potentially contributed to the 2030 framework by setting the *starting point* for the carbon budgets at an artificially high level in 2021. An even more inexcusable mistake is to contribute unnecessary oversupply by setting the *end-point* of carbon budgets in 2030 at a level which is incompatible with the 2030 target.

We question the merits of allowing Europe's carbon budgets to act as a ten-year hedge against the 2030 greenhouse gas target, but a minimum condition for allowing the carbon budgets to stand-in for emissions in this way must be that their trajectories converge at or below the target level. Clear triggers should be introduced into legislation to revise the trajectories of the carbon budgets or to permanently adjust their supply of allowances if new developments (e.g. inventory changes, scope changes, etc.) render these inconsistent with the overall target.

Moreover, where some categories of emissions under the intended greenhouse gas target are not covered by the carbon budgets, and are projected to breach their available carbon space, we advise that the carbon budgets should be tightened to compensate for the projected growth in emissions from the unregulated sectors.

Lock 3: a commitment to drive actual emissions below the greenhouse gas target by the target year

Our third recommendation is that the EU should make a clear regulatory commitment to drive EU emissions below the greenhouse gas target in the actual target year, forming a hard ceiling on domestic emissions in 2030, etc. While emissions in 2020 are expected to fall well below the intended greenhouse gas target, this was never strictly ensured by the 2020 package, and the 2030 framework offers no assurances that emissions in 2030 will do the same.

Given the wording of Europe's 2030 target in the October 2014 Council Conclusions and the mirrored wording of EU's INDC, we feel it would be a breach of trust, both with other signatories of the Paris Agreement, and with European civil society for Europe to allow its emissions to exceed the stated 40% reduction in 2030 via a legal technicality.

The multi-year budgets were installed with a view to limiting the cumulative volume of emissions that Europe could emit *en route* to its single-year greenhouse gas targets, but ironically these budgets potentially facilitate Europe exceeding that single-year target. They also arguably have led to more cumulative emissions being released by Europe over time, as unused emissions rights from one budget period are banked forward into the next.

Especially as regards the EU Emissions Trading Scheme, the ceiling the carbon budgets place on emissions also becomes a floor. The cap becomes a trap.⁵⁴

One method by which to better ensure the targets are achieved would be to install stricter bottlenecks on the supply of carbon allowances available in target-delivery years. In principle, the Market Stability Reserve is designed to perform this function for the EU ETS, removing all excess volumes from circulation bar the volumes needed for forward hedging. The Market Stability Reserve shortens the leash for how far ETS emissions can stray above the ETS cap; however, it remains to be seen whether the Market Stability Reserve will get supply down to sufficient levels and whether the MSR thresholds will reflect the hedging volumes needed at that time. The scheduled reviews of the Market Stability Reserve will offer clear opportunities to address these concerns and limit emissions from the traded sector to intended levels in 2030.

In the Effort Sharing Regulation, measures to limit the volume of allowances from previous years that can be banked for use in the year 2030 would have a complimentary effect on limiting how far non-traded emissions can exceed the 2030 budget.

These measures to curb access to banked carbon allowance in target-years would have more success in keeping emission below target levels if applied to carbon budgets which were properly aligned with the greenhouse gas target in the first place, as recommended under Lock 2. And of course, the ability to bank carbon allowances would also be substantially curtailed if the starting level of both the ETS and the ESR carbon budgets falls at a level below or equal to projected emissions in the relevant sectors at the start of the 2021-2030 budget period.

Finally, in addition to limiting the supply of carbon allowances available in target-years, the EU and its Member States also have additional policy levers that can be adjusted to reduce emissions in both the traded and non-traded sectors.

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Once an EU greenhouse gas target has been politically agreed, enforcing that target should be a technical and regulatory challenge, not an ongoing political challenge. Taken together, we feel that the three measures suggested above would resolve the persistent ambiguity around the nature of the EU's greenhouse gas target and better ensure that these targets are faithfully delivered.

⁵⁴ Damien Morris, *Cap or Trap?* (Sandbag, September 2010)

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