

# AEF discussion paper on aviation and climate change

September 2018

Part of a series of three discussion papers on the key environmental policy challenges to be addressed in the Aviation Strategy Green Paper

## Summary and recommendations

Aviation's emissions are on the rise, with passenger numbers growing annually and no near-term prospect of moving away from fossil fuel. Partly because of the challenge this presents, and because the sector is seen as international in nature, aviation has tended to fall through the net when it comes to UK climate change policy and no government plan has ever been developed to limit aviation emissions to a level consistent with the Climate Change Act. The international policy approach has also been patchy, and while a scheme to offset emissions from international aviation from 2020 has now been agreed by the UN, this has not been designed to be compatible with the ambitious Paris Agreement on climate change.

The Government has committed (including in the context of the Airports NPS which approved Heathrow expansion) to set out its policy for tackling aviation emissions in the Aviation Strategy. This paper sets out our views on the key issues that need to be addressed. The strategy should, we argue:

- Show as much ambition on climate change as on safety, technology and customer service
- Make an unambiguous commitment to limit aviation emissions to 37.5 Mt by 2050 as a maximum level
- Map out a policy plan for ensuring that emissions do not exceed this level
- Consider the implications of the Paris Agreement for domestic aviation policy
- Set out a clear UK position in relation to international efforts
- Propose policies to address aviation's non-CO<sub>2</sub> emissions



## 1. INTRODUCTION

Aviation has a significant and growing impact on climate change. It currently represents around 7% of the UK's total emissions<sup>1</sup>, despite the fact that only around half the population takes one or more flights in any given year. By 2050, the proportion of UK emissions coming from aviation is expected to have increased to at least a quarter of the total as a result of increases in aviation demand, and carbon reductions in other sectors.

The policy approach to tackling this has, however, been patchy. This is perhaps partly because it's difficult – few options are available to decarbonise aviation and the sector is set to remain almost entirely dependent on fossil fuels for decades to come – and partly because aviation is seen as international in nature, making it tempting to ignore it in national policy.

## 2. WHAT POLICY ACTION HAS BEEN TAKEN TO LIMIT AVIATION'S CARBON EMISSIONS?

### The international policy framework

A comprehensive global agreement for the aviation sector, fully aligned to wider climate temperature goals, might take the pressure off states in terms of developing their own plan for tackling the industry's growing climate impact. But this is far from being a reality any time soon.

The Kyoto Protocol, the landmark global climate deal agreed in 1997, left out emissions from both international aviation and shipping on the basis of disagreement about how best to allocate them to individual states, and instead requested states to pursue action to tackle them working through the specialist UN agencies for these sectors.

For aviation, the relevant agency was, and still is, the International Civil Aviation Organisation (ICAO). Progress on measures to tackle climate change was painfully slow for many years, however, with the main outcomes being agreements not to implement various options on the table.

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<sup>1</sup> Estimate based on total CO<sub>2</sub> for sectors covered by the Climate Change Act plus aviation at 34 Mt [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/680473/2016\\_Final\\_Emissions\\_statistics.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/680473/2016_Final_Emissions_statistics.pdf);

DfT's 2017 Aviation Forecasts put the figure at 6.5% based on 2015 figures; see Table 6 of [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/674749/uk-aviation-forecasts-2017.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/674749/uk-aviation-forecasts-2017.pdf)

The EU, meanwhile, was taking a number of steps to cut CO<sub>2</sub> emissions in Europe, including the development of an emissions trading system (ETS) covering some of Europe's biggest emitters. The EU's 2020 target has always included its share of emissions from international aviation, and this remains the case for the 2030 target. In 2008, the EU introduced legislation to include in the ETS all CO<sub>2</sub> emissions from flights arriving in or departing from EU airports from 2012, arguing that this would be the most cost-efficient way of tackling emissions from the sector.

The move was met with strong opposition from some of the leading states at ICAO, which argued that the EU should not be imposing measures beyond its own territory. The dispute intensified the need for ICAO to finally step up a gear resulting in the organisation setting a target to limit net emissions from international aviation to 2020 levels. To deliver this goal, in 2016 ICAO agreed key elements of its own climate mitigation scheme - the Carbon Offsetting and Reduction Scheme for International Aviation, set to begin in 2021.

How effective the scheme will be remains to be seen, however, with many important details yet to be decided, including which percentage of international emissions will actually be covered during the voluntary phase between 2021 and 2026, and which offset credits airlines will be able to buy (a critical factor in determining the environmental integrity of the scheme). To enable these negotiations to take place, the EU has agreed to scale back coverage of the EU ETS to include only intra-European flights though it will review the scope again in 2019 when more detail should be available on the likely impact of CORSIA.

In terms of climate policy more generally, while the Kyoto Protocol remains in force, it now sits in parallel to the more recent Paris Agreement, which - in December 2015 - set an ambitious goal to keep global temperature increases to well below 2 degrees and "to pursue efforts to limit the temperature increase to 1.5 °C". The goal of the Paris Agreement covers all states and sectors although international aviation is not currently included in the Nationally Determined Contributions that states are required to draw up.

## Aviation and the UK Climate Change Act

Alongside its involvement in these various international measures, in 2008 the UK introduced what was then world-leading national legislation on climate change. The Climate Change Act was passed with near-unanimous support and was designed to give legal weight to the UK's national and international commitments on climate change. The fundamental premise of the Act is to ensure that the UK plays its part in limiting the risk that global warming exceeds 2 degrees to no more than 50%. An economy-wide emissions reduction of 80% by 2050, based on a 1990 baseline, was regarded as likely to achieve this objective on the assumption that all sectors were covered.

Given methodological uncertainty at the time about how to account for aviation (and shipping) emissions appropriately however, the Climate Change Act specifies that emissions from these sectors should not initially be included in carbon budgets. It requires both that they should be included by 2012 unless there is good reason not to do so, and that they should be taken into account when setting carbon budgets for other sectors. The Committee on Climate Change (CCC) is charged under the legislation with ensuring that the Climate Change Act is delivered, by advising the Government and holding it to account.

In 2009, CCC undertook a review of the likely mitigation potential of biofuels, better air traffic management, and new technology, as well as of the requirements of the Act in relation to aviation. Its conclusion was that aviation emissions should not exceed 37.5 Mt by 2050 and that headroom should be set aside in carbon budgets with a view to the sector's future inclusion at around this level. This framing, the committee advised, would allow for a 60% growth in passenger numbers over the level in 2005, and the Government should not plan for a larger passenger increase. The committee has regularly restated all key elements of this advice, including in every progress report to Parliament on delivery of the Climate Change Act.

All carbon budgets so far legislated allow for the 2050 headroom recommended by CCC. The Government has never, however, set out how it plans to limit aviation emissions to this level and in 2012 postponed (indefinitely) a decision on whether or not to include aviation and shipping in carbon budgets. The CCC's Chair recently wrote to the Government, expressing "surprise" about the lack of any meaningful climate change plans accompanying the Heathrow NPS given the increase in aviation emissions that the policy will generate. The letter highlighted that the 37.5 Mt recommendation is a "relatively generous" allocation for the aviation sector.

The latest CCC progress report identified the Aviation Strategy as an appropriate opportunity for resolving the longstanding policy gap in relation to how aviation emissions will be limited to 37.5 Mt by 2050. The Clean Growth Strategy published by BEIS in October 2017 similarly indicated that lack of clarity about aviation emissions would be resolved by the Aviation Strategy.

### 3. THE NEED TO RECONCILE INTERNATIONAL AND DOMESTIC POLICY ON AVIATION EMISSIONS

With mounting global concern about the impacts of climate change, already being felt around the world, nations meeting at the Conference of the Parties of the UNFCCC in December 2015 in Paris agreed to increase the scale of shared ambition on climate change. The Government has said that following the IPCC's

report on the implications of the temperature targets agreed in Paris, it intends to ask the CCC to review whether the 2050 target in the UK Climate Change Act should be revised.

International agreements set out common goals. The Paris Agreement sets an ambitious target but requires national and/or sectoral commitments to deliver it. There are, we suggest, two possible paths for accounting for aviation in future.

### *1. Replicate internationally the UK's approach of accounting for aviation in national (or regional) targets*

National action, including through Nationally Determined Contributions, is at the heart of the current global approach on climate change. International aviation could be accounted for in NDCs in the same way as under the UK Climate Change Act (domestic aviation emissions are included already), on the basis of all departing flights.

In some cases, national action could be either replaced or supported by regional targets and measures. The EU, for example, has submitted an NDC for the bloc as a whole. Regional approaches can help to avoid concerns about impacts on competitiveness by providing a more level playing field. The inclusion of aviation in the EU's ETS was intended to help address concerns about competitive distortion among European airports and airlines given anticipated impacts on the cost of flying.

CORSIA would, under this approach, be one mechanism through which emissions could be mitigated, but states would not assume that CORSIA alone would sufficiently mitigate aviation emissions to meet national commitments. While the pricing mechanism would, for example, depress demand to some extent, the offsetting component of the scheme would not be seen as removing the need to account for those emissions in national inventories, with additional abatement action potentially required at a national level to address some or all of the aviation emissions attributable to a state.

For the UK, even under the current legal emissions target, CORSIA's price signal will not, in the scheme's current form, reduce emissions sufficiently to deliver the planning assumption (see below). If the stringency of the Act is increased in future in light of the Paris Agreement, the gap between the mitigation provided by CORSIA and the reduction in aviation emissions required could well increase.

### *2. Account for aviation entirely through international approaches*

In theory, CORSIA could be strengthened so as to deliver a pathway for aviation emissions that is compatible with delivering the Paris Agreement. At present, however, CORSIA is not aligned to the Paris Agreement or even to previous

agreements of the UNFCCC; it has no long term target; it addresses emissions only above their level in 2020; it does not have full global support; and it is built on the assumption of a long term supply of relatively low-cost offset credits (which in fact would only materialise if the world failed to achieve the Paris Agreement).

Meanwhile, even if it were possible to achieve a fully-effective, Paris-compatible global deal on aviation emissions, we should not assume that this would take the pressure off in terms of national level commitments. Setting aside a proportion of the global carbon budget for aviation would mean that other sectors, already covered by NDCs, would need to decarbonise even more quickly than most national approaches currently assume, since the CO<sub>2</sub> emissions allowable from other sectors over the coming decades would reduce. The CCC's recommended 'planning assumption' that the UK's total available CO<sub>2</sub> should be reduced by around 25% to allow for aviation could well be a good proxy for international efforts, though the appropriate long-term target for the aviation sector has yet to be discussed at ICAO.

A decision by the UK Government to account for aviation entirely through international measures would, in the absence of a very significant strengthening of CORSIA or the full reinstatement of the EU ETS for aviation, mean emissions overshooting the level of the planning assumption, suggesting that the intention of the Climate Change Act - to cut economy-wide emissions in line with a 2 degree target - would not be met.

## What needs to happen to bring aviation in line with the Paris Agreement?

Developing an approach to aviation that is compatible with the Paris Agreement requires, in the first instance, an assessment of how much CO<sub>2</sub> the sector is currently expected to emit, including the likely mitigation, and what implication that has for total global emissions. CORSIA represents the key global commitment on limiting aviation emissions, but no official assessment has yet been made of what role the implementation of CORSIA will play in delivery of the Paris Agreement, and there is a growing body of evidence suggesting that a reliance on offsetting cannot be sustained in the long-term.

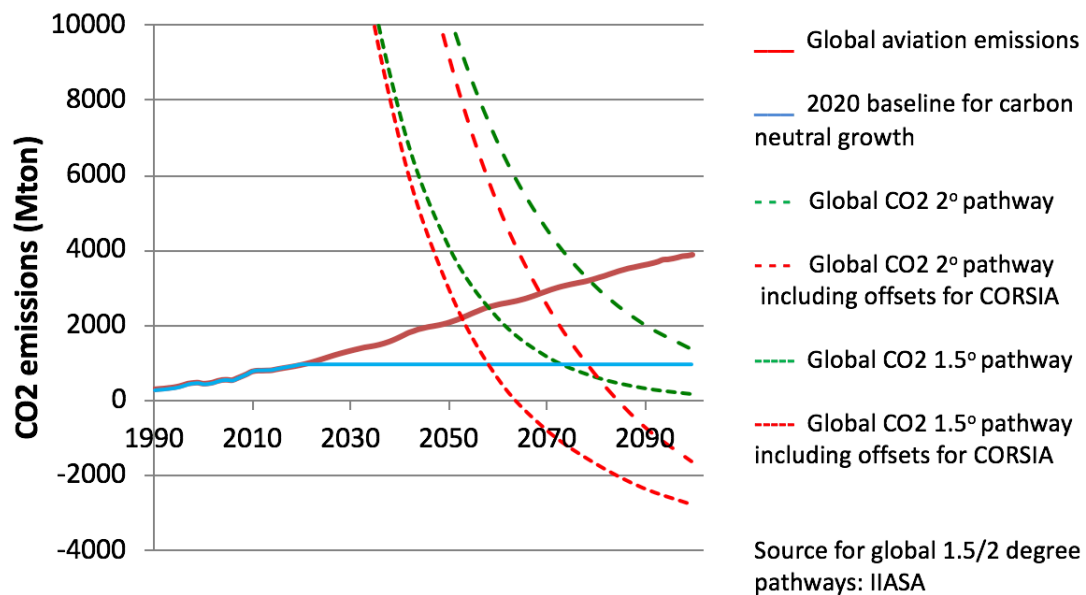
While 2050 has become the target date for many climate policies, CORSIA's implications for achieving the Paris Agreement only become clear in the context of a longer time horizon. Analysis by Professor Paul Peeters<sup>2</sup> projects emissions scenarios out to 2100, using an aviation forecast consistent with ICAO's forecasts for traffic growth and technology improvements, and assuming the sector has

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<sup>2</sup> <https://www.cstt.nl/publications/Tourism%E2%80%99s-impact-on-climate-change-and-its-mitigation-challenges.-How-can-tourism-become-%E2%80%98climatically-sustainable%E2%80%99/2205>

access to 20% of global biofuels. (The World Bank assumes that these are limited globally by a maximum sustainable land production area of 446Mha). Based on the IIASA pathway used by the UNFCCC for informing action to deliver the 1.5 degree temperature goal, aviation uses up the world's entire available carbon budget shortly after 2060.

Negative emissions will be needed after this date, but it's questionable whether these will be available in sufficient quantities to absorb all the CO<sub>2</sub> from further aviation activity, as well as emissions from other sectors, and the historic emissions accumulating in the atmosphere. Significant in-sector emissions reductions from aviation are very likely to be necessary.



Source: Paul Peeters, 2017

## 4. WHAT WILL IT TAKE TO DELIVER ON CLIMATE CHANGE IN UK AVIATION POLICY?

Official forecasts have consistently predicted that aviation emissions at 2050 will be higher than the maximum level compatible with the Climate Change Act. The scale of the likely overshoot, however, is open to some debate.

- In 2013, the DfT predicted that even in the absence of any new runways, CO<sub>2</sub> emissions from aviation would reach 47 Mt by 2050 in a central scenario.

- The Airports Commission's forecasts in 2015 were much lower. In the absence of runway expansion, they predicted, emissions would reach 40 Mt by 2050, or 43 Mt with a third runway at Heathrow<sup>3</sup>.
- The DfT's 2017 forecasts, published in the context of the Government making the case for Heathrow expansion, were 10 Mt lower than those published just 4 years earlier, with emissions by 2050 predicted to be 37 Mt by 2050 without runway expansion. A new runway was, however, forecast to push the level over the maximum recommended by CCC, to 39.9 Mt in the central forecast or 40.8 in a scenario of "making best use" of airport capacity elsewhere in the UK<sup>4</sup>.

We've expressed concern about the robustness of this most recent forecast, not least given the scale of the change since 2013, and the fact that aircraft efficiency assumption seems optimistic<sup>5</sup>. Meanwhile, many airports have made clear that they consider the Government's passenger growth predictions to be too low. Indeed, the Government's case for airspace modernisation is currently being developed on the basis of forecasts of air transport movements from NATS that are over 40% higher in 2030 than those of the Department for Transport<sup>6</sup>. A recent publication on airspace modernisation from the CAA argues that "growth has to be managed to ensure that noise and other environmental impacts are managed in alignment with policy and law" but a shared objective agreed between the Government and the CAA states "we want to ensure that airspace capacity is not a constraint on the growth of commercial aviation, with the constraint to growth instead becoming the number of runways or restrictions imposed on the use of those runways by government or planning authorities as a condition of that growth."

We have previously argued precisely this in the context of Heathrow expansion - that the Government should act to constrain aviation emissions growth by saying no to a new runway. The NPS argued that there is no climate case for runway constraint on the basis that the Airports Commission found "any one of the three shortlisted schemes could be delivered within the UK's climate change obligations, as well as showing that a mix of policy measures and technologies could be employed to meet the Committee of Climate Change's planning assumption". It is important to note, however, that the Commission delegated to the Government the messy business of setting out what mix of policy measures and technologies should be deployed. Paragraph 4.33 of the Airports Commission's Interim Report

<sup>3</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/439687/strategic-fit-updated-forecasts.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/439687/strategic-fit-updated-forecasts.pdf); Assessment of Need Carbon Traded Scenario. Without carbon pricing, emissions would be 48 Mt by 2050 if expansion went ahead, the forecasts indicated.

<sup>4</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/714069/making-best-use-of-existing-runways.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/714069/making-best-use-of-existing-runways.pdf)

<sup>5</sup> <https://www.aef.org.uk/uploads/2017/12/AEF-comments-on-NPS-reconsultation.pdf>

<sup>6</sup> Although the CAA/NATS figures may also include aircraft transiting UK airspace and other commercial users



specified that “It is ultimately for Government, with advice from the CCC, to determine the appropriate framework for controlling aviation emissions.”

With the NPS now voted through, the Government needs to set out what means it plans to deploy. Examples could include:

- A policy that planning authorities should not permit the lifting of any limits on airport growth if this would result in an increase in emissions above the base case, or where no limits exist, the imposition of a threshold above which, on climate grounds, growth would be seen as a material change of use and should be refused
- An increase to aviation taxation

Other policies would be effective only with international cooperation, such as:

- A more stringent CO<sub>2</sub> standard for aircraft
- Measures to make CORSIA more robust
- Snapback to original coverage of the EU ETS, and a wholesale rejection of CORSIA
- Significant investment in synthetic fuel, such as Power to Liquid
- Agreement to give aviation priority access to biomass, reducing that available for use in BECCS (see Annex)

Reliance on international measures would not, in our view, be a reliable path to adopt, bearing in mind the different stages of development of the aviation sector around the world and the reluctance among some countries to put in place any restrictions on their aviation sectors.

## Carbon pricing: the gap between forecasts and reality

The current framing provided by the Climate Change Act and the approach of setting aside a quarter of aviation emissions for aviation by 2050 provide a reasonable starting point, in our view, for a minimum level of appropriate ambition for aviation emissions. But, as noted above, there has been a persistent gap between official forecasts for emissions and the 37.5 Mt level allowed for. Meanwhile these forecasts probably underestimate the scale of the challenge since they assume a level of carbon pricing being built into ticket prices that is currently out of step with reality.

In 2012, the Government created an Airports Commission, to consider “the scale and timing of any requirement for additional capacity to maintain the UK’s position as Europe’s most important aviation hub”. To help model the impacts of potential new runway capacity, the Commission developed a suite of forecasts for aviation. One set, which assumed that aviation would be exposed to a carbon price in line with the price paid by other sectors of the economy, was described as the “carbon traded” forecast. This approach replicated that taken by previous government

aviation forecasts. The second set assumed that policy was introduced in line with the CCC's advice to limit emissions nationally to 37.5 Mt. This was called the "carbon capped" forecast.

Ministers and their representatives have sometimes claimed that the likely future for aviation will lie somewhere between these two scenarios, the implication being that something is bound to be done by someone about aviation's climate change impact and the details of what kind of action is taken, including carbon pricing and other measures, can be worked out in future. This view makes little sense to us. In fact, both the capped and traded scenarios assume some significant action on aviation emissions that is not currently planned or taking place, while neither scenario considers the implications of more ambitious climate change policy than is currently legislated.

### *Carbon traded forecasts*

The DfT's 2017 aviation emissions forecasts followed the same approach as the Airports Commission's carbon traded forecasts. They were built on an assumption that the cost of air travel would, after decades of cost reduction, begin to increase as a result of a carbon price that was expected to increase from £4tCO<sub>2</sub> in 2016 to £77 in 2030 and to £221 in 2050. No explanation was provided for how this pricing mechanism would take effect, though the modelling appears to assume that a global trading system covering every country and sector will be in place by 2030.

In reality, aside from a small market for passengers buying voluntary offsets, the only prospects of carbon pricing in the aviation sector come from (i) the inclusion of intra-EU flights in the EU emissions trading scheme and (ii) international flights complying with ICAO's Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA).

It is not clear if, and on what basis, the EU ETS will continue to apply to intra-EU flights after CORSIA comes into effect in 2021. EU ETS legislation, including its aviation provisions, has been strengthened over time. It will now help to deliver a declining carbon cap, has measures in place to soak up surplus credits, has increased the percentage of allowances that will be auctioned, and has ruled out the use of offset credits from outside the EU. As a result, EUA prices may be beginning to reach a level that will have some bite (notwithstanding the fact that the EU ETS continues to grant the majority of its allowances to airlines free of charge). The 'stop the clock' legislation discussed above, however, means that the scheme now covers only around 40 percent of the aviation emissions originally covered by the scheme, and significant questions remain about whether the scheme will continue to apply at all once CORSIA comes into effect, with legal action possible from airlines if they foresee double counting of emissions.

CORSIA is in many ways less robust than the EU ETS, and the forecast prices are correspondingly much lower than those anticipated under EU ETS and, importantly, those recommended for use in policy analysis by BEIS. While the cost of reducing a tonne of carbon under CORSIA is unknown in the absence of a final decision on which programmes and activities will be eligible, forecasts suggest they could be approximately £11 in 2030. The BEIS 2030 carbon price, assumed in the UK's aviation emissions modelling, is seven times higher at £77/tCO<sub>2</sub>. Additionally, forecasts from both the Airports Commission and the Government assume that a price applies to all CO<sub>2</sub> emissions from UK aviation. Yet CORSIA only requires emissions above 2020 levels to be offset.

The difference between the carbon price assumed in the "traded" forecast and the price anticipated from CORSIA could have a material impact on the CO<sub>2</sub> forecast, since the inclusion of carbon costs significantly dampens demand. The report on carbon abatement commissioned by the Government from Ricardo as part of the NPS assessment indicated that the aviation CO<sub>2</sub> forecast would be 10% (or nearly 4MtCO<sub>2</sub>) higher in the absence of a carbon price.

With the likely costs of EU ETS and CORSIA being only a fraction of the BEIS price used in the modelling (in the absence of significant policy change agreed internationally), overall UK aviation CO<sub>2</sub> projections are likely to be significantly higher in 2050, both in the base case and with Heathrow expansion, than estimated in the DfT's 2017 forecast. Carbon forecasts from both the Airports Commission and the DfT, in other words, overstate the likely reduction in CO<sub>2</sub> from carbon pricing, and therefore understate the scale of the carbon challenge.

### *Carbon capped forecasts*

If even the carbon traded forecast represents a future that will only come about through some kind of concerted action that is not currently planned or underway, the carbon capped forecast is even further from the current reality.

In the Airports Commission's modelling, limiting aviation emissions to 37.5 Mt while expanding Heathrow required a carbon price of over £600 by 2050 – a level no-one seriously considers plausible. The DfT's modelling (in its Updated Appraisal Report Airport Capacity in the South East, October 2017) took a different approach, assuming (i) the same level of carbon pricing built into the carbon traded forecast, (ii) "action to encourage more efficient ground movements" and (iii) a mandate to increase the proportion of renewable fuels.

Yet the report itself makes clear that "This scenario is not intended as a statement of future policy or a definitive conclusion on the most cost-effective measures that are available. There is significant uncertainty around the results of the study and

the conclusions that are drawn.” In reality, delivering any – yet alone all – of these measures is fraught with difficulty.

- (i) **On carbon pricing:** It is worth emphasising that carbon capping is not an alternative approach to carbon trading or offsetting, but instead requires measures *in addition* to a growing carbon cost being included in ticket prices. The likelihood of carbon prices materialising at the level assumed in the “carbon traded” modelling is discussed above.
- (ii) **On cutting emissions from ground movements:** Action would be required from airports and airlines. Since airlines are already strongly motivated to cut fuel costs, it would be important to identify why any emissions reductions related to ground movements are not already taking place. It’s hard to see what kind of measures the Government could mandate to deliver the anticipated carbon saving.
- (iii) **On biofuel:** The Government recently took the decision, after several years of careful analysis and consultation, *not* to introduce a mandate for a certain percentage of aviation fuel to be from alternative sources. This probably reflects both longstanding resistance from the industry to the idea of a mandate, and the strength of evidence that has emerged in recent years about the potential for environmental harm as a result of biofuel production, including the fact that much European biodiesel results in more emissions, once indirect effects are accounted for, than fossil fuels. While the Government has agreed instead to provide a financial incentive for the use of aviation fuels that offer genuine carbon savings, there is a limited supply of low-carbon fuel going forward, and much of it will be required by the road transport sector to meet existing obligations. Looking more widely, most scenarios for meeting the net zero ambition of the Paris Agreement rely heavily on use of BECCS – Bioenergy with Carbon Capture and Storage – potentially making the supply of sustainable biomass for aviation even more limited.

There are, in our view, no easy options for limiting UK aviation emissions, especially in light of Parliament’s decision to support Heathrow expansion. In terms of climate change policy, the Government should be treating the carbon capped model not as some kind of extreme but instead as a minimum level of ambition since the 37.5 Mt cap (i) gives aviation a uniquely generous allowance under the Climate Change Act’s current target (ii) does not take account of the more stringent ambition of the Paris Agreement and (iii) does not account for aviation’s non-CO<sub>2</sub> impacts (as addressed below).

## 5. APPROXIMATELY HALF OF AVIATION'S CLIMATE IMPACT ISN'T BEING TAKEN INTO ACCOUNT

Aviation has impacts on the climate in addition to those of its CO<sub>2</sub> emissions. As early as 1999, the Intergovernmental Panel on Climate Change identified that emissions of NO<sub>x</sub>, water vapour and particulates at altitude, and the formation of contrails, have both warming and sometimes cooling impacts on global temperatures. The overall effect was estimated to be a net warming that, based on historical emissions to date, is a factor of two to four times greater than that from aircraft CO<sub>2</sub> emissions alone. Since publication of this analysis, further research has focused on improving the understanding and certainty of specific impacts but the accepted scientific consensus is that non-CO<sub>2</sub> emissions are major contributors to aviation's total climate impact. IPCC's latest Assessment Reports estimate that, using the radiative forcing metric, the total climatic impact of aviation is 1.9 times greater than the sector's CO<sub>2</sub> impact, excluding the potential impact of additional cirrus cloud formation.

The radiative forcing metric is based on historical emissions and is not regarded as suitable for forecasting future impacts as the relationship between non-CO<sub>2</sub> and CO<sub>2</sub> emissions may vary with time. The scientific community is currently working on alternative temperature-based metrics, including the Global Warming Potential ("GWP") measured over 20 and 100 years. Latest scientific estimates show the likely total GWP for all aviation emissions is in the range of 1.9-2 times that of CO<sub>2</sub>. However, this uncertainty, and the need for further research to find an appropriate metric for future emissions, has been cited as a reason for delaying the introduction of any policy measures.

The CCC's 2009 report, 'Meeting the UK aviation target - options for reducing emissions to 2050', noted:

"Aviation non-CO<sub>2</sub> effects are likely to result in global warming and will therefore need to be accounted for in future international and UK frameworks. This may have implications for the appropriate long-term UK aviation target."

The Airports Commission, in its December 2013 interim report, similarly addressed key uncertainties and sensitivities related to carbon forecasts, in particular noting that:

"national and international policy frameworks do not currently include the most significant non-CO<sub>2</sub> emissions from aviation. As scientific understanding of these emissions develops, policy may need to evolve to address their climate impacts. Should this require additional emissions reductions within the aviation sector beyond what is currently planned, this constitutes a downside risk to the forecasts set out above"

We were pleased that 'Beyond the Horizon' acknowledged the need to "consider areas of greater scientific uncertainty, such as the aviation's contribution to non-

carbon dioxide climate change effects and how policy might make provision for their effects". The potential scale of these non-CO<sub>2</sub> impacts warrants urgent action to complete the research, and to introduce policy measures.

At the time when aviation's inclusion in the EU ETS was being negotiated, the European Commission undertook a study into en-route NO<sub>x</sub> charges. EuroControl and others have meanwhile looked at contrail avoidance, which may be particularly relevant to flights that take place during hours of darkness. The CCC's 2009 report also considered the potential impact of including non-CO<sub>2</sub> emissions in their recommended planning assumption, potentially limiting the allowable level of UK aviation CO<sub>2</sub> emissions in 2050 to 18Mt.

It is also important to take non-CO<sub>2</sub> climate impacts into account when assessing mitigation relating to other environmental issues. For example, unless addressed in the forthcoming report by the Independent Experts to CAEP (the Committee on Aviation Environmental Protection at ICAO), the Government should periodically monitor whether CAEP's conclusion that LTO NO<sub>x</sub> is proportional to cruise NO<sub>x</sub> for current engines still holds true, as this has previously been cited as a reason why a cruise NO<sub>x</sub> standard was not necessary. If not, the UK should urge ICAO to look at developing a cruise NO<sub>x</sub> standard as a priority.

The Government now needs to set out clearly how it plans to progress this issue.

## 6. CAN WE CHOOSE TO LEAVE INTERNATIONAL AVIATION OUT OF DOMESTIC CLIMATE COMMITMENTS?

Action on aviation emissions, then, is likely to be difficult. Unsurprisingly, while UK governments have so far implicitly accepted the CCC's aviation planning assumption, no government has ever set out what suite of policies could or should be implemented to deliver it. The requirements of the Climate Change Act in relation to aviation are that emissions from international aviation must be taken into account in the setting of carbon budgets, and that the CCC must advise the Government at regular intervals on the consequences of including these emissions in carbon budgets. Could the Government choose, under this framework, to effectively ignore aviation emissions? And what would be its motivation if so? We've considered some of the arguments that we've heard on this issue.

*“CORSlA will deal with aviation emissions. We only need to think about emissions within our borders.”*

AEF has welcomed the agreement of CORSlA, on the basis that it represents a global recognition that aviation emissions are a problem, and a first step towards bringing the sector in line with wider climate change ambition. However, as noted above, the scheme has numerous shortcomings that mean it cannot be assumed to deliver an appropriate level of mitigation.

- It is currently not aligned to the Paris Agreement or even to previous agreements of the UNFCCC.
- It has no long-term target, and is envisaged to run only until 2035.
- It addresses emissions only above their level in 2020: emissions below that level are not accounted for.
- It does not have full global support; China has yet to confirm whether or not it will participate, and the voluntary phase between 2021 and 2026 will cover only around three-quarters of eligible emissions.
- It is built on the assumption of a long term supply of cheap offset credits; as set out above, the forecast price of carbon under CORSlA even by 2030 is just £11.

The CCC has argued, meanwhile, that a planning assumption of 37.5 Mt should not be seen as an alternative to global or regional action on aviation emissions but rather as a proxy for effective international action. The Committee is supportive of developing policy for aviation emissions at an international level, and of using pricing measures as a medium-term approach to ensuring cost-effective emissions reductions, with the planning assumption acting as a means of informing infrastructure and planning decisions.

We have set out above how domestic and international carbon policies should, in our view, complement each other, and why any effective action on international aviation emissions will have implications for national carbon budgets – either directly if aviation emissions are included in national inventories, or indirectly if the scale of ambition for other sectors has to be increased to allow for a proportion of the global carbon budget to be set aside for aviation. If CORSlA in its current form looks easier to achieve than the planning assumption, it’s because it’s not adequate in terms of stringency.

*“Taking domestic action on aviation will only result in carbon leakage”*

Every so often, supporters of aviation growth such as the Airports Commission or the Department for Transport will argue that domestic action to limit UK aviation emissions, for example by limiting airport capacity or increasing the cost of air travel, will be futile and perhaps counter-productive as it will increase emissions elsewhere. We’re not convinced.

First, the argument seems to assume that our competitors aren't taking climate action. In fact, all G8 nations have long been committed to the same 80% emissions target as the UK; the EU as a bloc has a commitment to cut emissions in EU territory by at least 40% below 1990 levels by 2030; and all the UK's major hub competitors are signatories to both the Paris Agreement and CORSIA.

More generally, other European states are beginning to grapple with the issues of bringing domestic decision-making and policy on aviation in line with climate ambition. Norway, for example, has committed to 100% electric-powered aircraft for short-haul routes by 2040, and is considering introducing a biofuel mandate for aviation fuel. Expansion at Vienna Airport was blocked by a local court on the basis that it was incompatible with climate legislation. The decision was subsequently overruled by a higher court, although this remains subject to a further appeal. And in France, the decision not to proceed with a new airport at Nantes was influenced by a longstanding campaign supported by climate activists. We should not assume, in any leakage analysis, that aviation growth will go unchallenged elsewhere.

Second, we should resist being drawn into a lowest common denominator argument when it comes to climate change policy. The Climate Change Act itself is characterised by domestic targets and commitments, and covers many sectors, such as manufacturing, that are potentially exposed to carbon leakage. Nevertheless, the CCC reports that there is very little evidence of leakage happening as a consequence of the Act.

*“Limiting UK aviation emissions to 37.5 Mt isn't consistent with the Government's objective to support growth”*

All indications so far are that the new aviation strategy will be strongly pro-growth. In fact the framing of the fifth objective in the aviation strategy suggests that the Government only intends to tackle environmental commitments to the extent that growth is not compromised. While there appear to us to be few constraints imposed by the Government at present, nevertheless the publication of “Making best use of existing runways” implies that the Government is keen to somehow further incentivise air traffic increases.

At the same time, the Government has acknowledged that growth cannot be at any cost and we would hope that the Government will ensure that international and national climate change commitments are upheld even if this means growth can't be unlimited. The CCC's advice allows explicitly for an increase in passenger numbers of 60% over the level in 2005. It is possible that the CCC's estimates in 2008 of factors such as passenger loading and average aircraft size might turn out to have been lower than expected, potentially allowing more than 60% passenger



growth. The latest CCC Progress Report, for example, refers to both of these variables as possible explanations for the fact that aviation emissions increased by only 1% in 2016, while passenger numbers grew 7% and km flown grew 6%<sup>7</sup>. At the same time, however, the Paris Agreement has increased the scale of the challenge and any update to the long-term goal of the Climate Change Act seems likely to reduce the CO<sub>2</sub> available to aviation.

### *“Aviation’s not actually in the Climate Change Act”*

In ‘Beyond the Horizon’ the Government states straightforwardly that emissions from international aviation are not included in the 80% by 2050 target set by the Climate Change Act<sup>8</sup>. We consider this misleading. It is true that Section 30 of the Act specifies that emissions from international aviation and shipping are not covered. However,

- The intention when the Act was passed was for aviation (and shipping) emissions to be included in carbon budgets by 2012, while allowing for the Government to present reasons not to do so.
- While the Government decided against inclusion in 2012, the decision statement at the time made clear that “emissions from international aviation and shipping should be treated the same as emissions from all other sectors, in order to reach our long-term climate goals”<sup>9</sup>.
- The Act specifies that the emissions from international aviation and shipping must be taken into account in the setting of carbon budgets. All carbon budgets so far legislated, and the Clean Growth Strategy, accordingly assume that aviation is part of the long-term target.
- Most fundamentally, the aim underlying the Act for the UK to play its fair part in limiting (to no more than 50%) the risk of temperature increases exceeding 2 degrees was based on the assumption that all sectors, including aviation, were covered. Treating aviation emissions as separate from the long-term target would mean that an 80% emissions cut could no longer be regarded as sufficient in relation to the temperature goal underpinning the Act.

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<sup>7</sup> <https://www.theccc.org.uk/wp-content/uploads/2018/06/CCC-2018-Progress-Report-to-Parliament.pdf> pages 157-159

<sup>8</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/698247/next-steps-towards-an-aviation-strategy.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/698247/next-steps-towards-an-aviation-strategy.pdf) Section 6.12

<sup>9</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/65686/7334-int-aviation-shipping-emissions-carb-budg.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/65686/7334-int-aviation-shipping-emissions-carb-budg.pdf)

## 7. WHAT DO WE WANT TO SEE ON CLIMATE CHANGE IN THE AVIATION STRATEGY?

The Aviation Strategy is strongly pro-consumer and pro-markets. At present there is insufficient incentive, however, for the climate change challenge to be addressed by the aviation industry without appropriate direction and target setting from the Government. We hope, therefore, to see the following six elements in the Aviation Strategy's treatment of climate change.

### i) As much ambition on climate change as on safety, technology and customer service

'Beyond the Horizon' speaks of building on our "world leading expertise" in both safety and security and in emerging technologies. It plans to deliver a "world class service" at the border and boasts of having published the "world's first" GA strategy. But there is no comparable plan to develop a world-leading plan for tackling the sector's climate change impacts. The UK has both a relatively mature aviation sector and world-leading climate change legislation, so we should be well-placed to develop an ambitious, coherent approach on aviation and climate change.

### ii) An unambiguous commitment to limit aviation emissions to 37.5 Mt as a maximum level

In all carbon budgets so far, and in many related official documents, UK aviation emissions have been assumed to be no higher than 37.5 Mt (despite official forecasts anticipating a higher level). The strategy should state explicitly the Government's commitment to limiting aviation emissions to 37.5 Mt by 2050, in actual terms, as a minimum level. This would mean future carbon budgets would continue to be set on the same basis as budgets 1 to 5.

### iii) A policy plan for ensuring that emissions do not exceed this level

The CCC, the Airports Commission and the DfT (and at one time the industry coalition Sustainable Aviation) have all conducted modelling indicating that a limit of 37.5 Mt for aviation CO<sub>2</sub> would be achievable if a suitable package of policy levers and economic measures was put in place (see "What will it take" section above). The strategy needs to set out the Government's preferred package of measures, with reference to the aviation forecasts, which currently anticipate

emissions exceeding 37.5 Mt if a third runway is built at Heathrow, and which could well represent an underestimation of the carbon emissions problem.

#### iv) Consideration of the implications of the Paris Agreement for domestic aviation policy

In 2016 the CCC advised that in addition to setting out a plan to limit UK 2050 aviation emissions to 2005 levels (implying around a 60% increase in passenger demand), “The Government should also consider strategic options and innovation priorities to pursue deeper cuts in aviation emissions, consistent with the objective in the Paris Agreement to move towards overall net zero emissions in the second half of the century.”<sup>10</sup>

The UN IPCC will, this October, be publishing a special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, and the Government has indicated that following publication, it will ask the Committee on Climate Change to consider implications for the UK’s Climate Change Act. While it would be wrong to prejudge the outcome of either of these pieces of work, it is widely anticipated that the IPCC will recommend net zero emissions as soon as 2050, or perhaps before, at least for carbon dioxide, potentially an even more challenging target than anticipated when the CCC expressed the view that the Paris Agreement is likely to necessitate “deeper cuts in aviation emission” than currently planned for.

The aviation strategy should therefore include consideration of what measures could be implemented, and at what cost, to reduce aviation emissions below the 37.5 Mt level currently planned for.

#### v) A clear UK position in relation to international efforts

AEF is part of the NGO umbrella group ICSA, accredited to observe and participate in ICAO meetings. Earlier this year, ICSA submitted its views on aviation decarbonisation to a UNFCCC consultation on delivering the objectives of the Paris Agreement. The submission contained several recommendations for state and international action:

“While many stakeholders have a role to play in the aviation industry’s decarbonization, bold government action will, in the end, define whether the aviation sector is able to contribute its fair share to ensure a 1.5°C future. A methodical next step for governments – at the subnational, national, regional and international level – is to set long-term decarbonization pathways for aviation that are compatible with the Paris Agreement and a

<sup>10</sup> <https://www.theccc.org.uk/2016/10/25/uk-aviation-emissions-must-be-consistent-with-uk-climate-change-commitments-ccc-says/>

roadmap to adhere to these pathways. The elements of a roadmap for aviation's decarbonization include:

- Deploying near-term technology solutions (efficiency and operational measures and alternative fuels with lower lifecycle emissions than fossil jet fuel);
- Addressing non-CO<sub>2</sub> effects through mitigation measures;
- Investing in transformative, breakthrough clean aviation technologies;
- Strengthening the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA);
- Strengthening the ICAO CO<sub>2</sub> standard;
- Revisiting aviation subsidies;
- Developing new mobility solutions to support modal shift;
- Creating new business models for the aviation industry;
- Climate-proofing aviation against the effects of a changing climate; and
- Ensuring compatibility with the Paris Agreement."

In addition, the UK should advocate for ICAO to set a long-term goal in line with the Paris Agreement, and ensure that all future technologies are at least as efficient as aircraft operating today. This is particularly relevant to the potential for a new generation of supersonic aircraft, as initial assessments suggest that the technologies currently being developed are likely to be at least five to six times less efficient than their subsonic equivalents.

The Aviation Strategy should set out future UK efforts to develop targets and set standards together with an explicit course of action and a timetable to underpin the commitments.

## vi) Policies to address aviation's non-CO<sub>2</sub> emissions

As noted, we very much welcome the Government's recognition of aviation's non-CO<sub>2</sub> impacts which have received inconsistent policy treatment in the past, appearing in some government publications but not in others. Defra guidance on company reporting, for example, highlights that non-CO<sub>2</sub> impacts can be taken into account using a multiplier when calculating carbon footprints from air travel.

Aside from consumer action, the Aviation Strategy should:

- Consider a potential role for NO<sub>x</sub> charges
- Commit to continued research into contrail avoidance
- Review CO<sub>2</sub> targets to factor in non-CO<sub>2</sub> emissions
- Review whether CAEP's conclusion that LTO NO<sub>x</sub> is proportional to cruise NO<sub>x</sub> for current engines still holds true; if not, the Government should commit to seeking agreement on the introduction of a cruise NO<sub>x</sub> standard as a matter of urgency.

# ANNEX

**AEF SUBMISSION TO THE ENERGY TRANSITIONS  
COMMISSION CONSULTATION PAPER ON REACHING  
ZERO CARBON EMISSIONS FROM AVIATION,  
AUGUST 2018**



# Energy Transitions Commission consultation paper: Reaching zero carbon emissions from aviation

## Response from the Aviation Environment Federation

31<sup>st</sup> August 2018

### Summary:

- AEF strongly supports the ETC's call for ambitious, in-sector action on aviation emissions.
- The scale of the challenge should not be underestimated, however, given the fact that aviation is currently almost completely dependent on fossil fuels, that demand is growing, and that there is currently no comprehensive plan, whether global or national, on aviation's appropriate contribution to meeting the objectives of the Paris Agreement.
- The availability to the aviation sector of sustainable biofuels may be limited by demand from other sectors already covered by climate policy and by the future need for BECCS in order to achieve net zero emissions.
- The need to address non-CO2 emissions should not be forgotten, given that the associated climate impacts will remain even with biofuels.
- Governments need to clarify how aviation emissions will be included in climate change strategies and targets. In addition to international agreements, governments should, at least in the interim, set out domestic carbon policy for aviation, reinforcing the 'bottom up' approach of the Paris Agreement.

### Introduction

The Aviation Environment Federation (AEF) is the principal UK NGO campaigning exclusively on the environmental impacts of aviation. We represent individuals and community groups affected by the UK's airports and airfields or concerned about aviation and climate change. In recent years we have been called as a witness on the subjects of climate change and air pollution at inquiries into airport expansion by the Airports Commission, the Environmental Audit Committee, and the Transport Committee. At the UN we are a lead representative of the environmental umbrella organisation ICSA, which is actively engaged in the current talks aimed at agreeing global climate measures for aviation.

We very much welcome this initiative from the Energy Transitions Commission. There is, in our view, an urgent need to consider how to bring aviation into line with wider climate ambition, including the need for economy-wide decarbonisation, and there are many aspects of the ETC paper that help to move the debate forward on this issue.



In particular we support:

- The call for ambitious in-sector carbon reduction from aviation, rather than reliance on carbon offsetting
- Acceptance that the measures necessary to achieve this will come with a cost penalty, at least initially
- The call for stronger carbon pricing signals
- Recognition of the need for sustainability criteria for biofuels

There are a number of areas, however, in which we'd suggest different, or supplementary, approaches.

### **The scale of the challenge should not be underestimated**

Aviation will be hard to decarbonise, and many voices in the climate change debate therefore prefer to keep quiet about it. Governments typically leave it out of national policies and targets, few companies have measures to reduce staff air travel, and 'green bonds' providers tend to give aviation a wide berth. In this context, the case for change will surely become compelling only if the scale of the problem is acknowledged.

The opening paragraph of your paper, on page 3, states:

"Emissions from aviation currently amount to circa 1 Gt CO<sub>2</sub> accounting for almost 3% of total global emissions, but, under a business as usual scenario, they would grow to almost 1.7 Gt by 2040 representing above 4% of global emissions and 14% of the transport sector emissions."

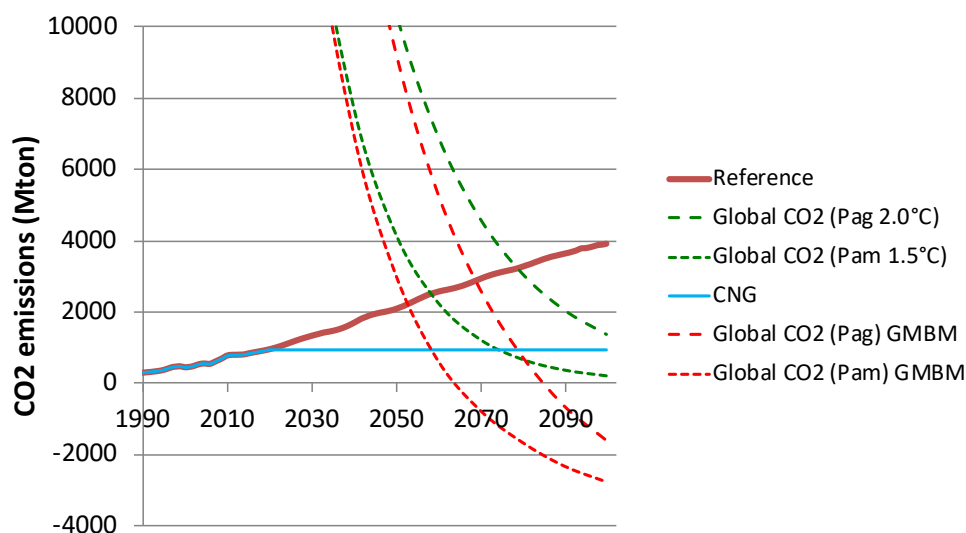
4% sounds small – worth having a go at if possible but hardly a priority. But on page 5, when this statement is repeated, the paper clarifies that the 'business as usual' reference applies not just to the aviation forecast but to the emissions forecast from all sectors, in a 4 degrees scenario.

An alternative, reasonable, basis for considering the significance of aviation emissions would be to assume that sectors directly covered by the Paris Agreement and therefore by NDCs, follow a path consistent with achievement of a 1.5 degree or 2 degree trajectory while aviation emissions follow a different path.

Approximately 40% of global aviation emissions are domestic and covered by NDCs. The remaining emissions are from international aviation and are due to be addressed on a sectoral basis by CORSIA. This is an offsetting mechanism designed to keep these emissions at or below 2020 levels, but without a long-term target linked to a 1.5 degree future.

Work undertaken by Prof Paul Peeters (at NHTV Breda University of Applied Sciences) overlays these projections for aviation with IASA pathways. Under this approach, and looking beyond 2040, a very different picture emerges from that implied in the ETC paper. Emissions from international aviation are found to take up an increasingly large proportion of the available carbon under 2 degree and 1.5 degree trajectories, as shown in the graph

below (taken from Paul Peeters, 2017<sup>1</sup>). In this assessment, international aviation emissions use up all of the available carbon budget under a 1.5 degree trajectory by around 2060, and this reduces to shortly after 2050 when the need to provide offset credits for CORSIA is taken into account.



The UK's Climate Change Act, based on a target of limiting to no more than 50% the risk of exceeding 2 degrees of warming, rather than the more stringent target of the Paris Agreement, assumes that aviation will represent 25% of the total UK emissions by 2050.

#### **The argument that aviation should have priority use of biofuel needs critical evaluation.**

AEF supports the use of biofuels in aviation provided that: they can be produced sustainably; their emissions are appropriately accounted for on a full life-cycle basis; and any government incentives for their use do not decrease average overall fuel costs for airlines, which could incentivise industry growth.

In the decade that has passed, however, since a Virgin Atlantic Boeing 747 flew from London to Amsterdam with one of its engines powered by a mixture of babassu nuts and coconuts, the growth in the aviation biofuel market has been very, very small. We agree with the ETC's view that in terms of decarbonising long haul flights there are few viable alternatives to biofuel, and technical feasibility is no longer a barrier, with the first commercial flight powered 100% on biofuel having taken place earlier this year<sup>2</sup>. However, the slow rate of historic progress on this issue highlights the significant barriers – political, economic and environmental - to increasing the uptake of aviation biofuel. Below, we consider four of the challenges likely, in our view, to remain relevant in the coming decades.

<sup>1</sup> <https://www.cstt.nl/publications/Tourism%E2%80%99s-impact-on-climate-change-and-its-mitigation-challenges.-How-can-tourism-become-%E2%80%98climatically-sustainable%E2%80%99/2205>.

<sup>2</sup> <https://worldairlinenews.com/2018/04/23/the-first-commercial-aircraft-to-fly-using-100-biofuel/>



1. Demand from other sectors will remain high

The UK Department for Transport recently reviewed options for incentivising aviation biofuel. The outcome was that the Government is committed to providing £2million funding support for “advanced biofuels” some of which have an aviation application, and that aviation fuel suppliers will in future be able to claim credits for sustainable aviation biofuels under the Renewable Transport Fuel Obligation.

DfT decided against the introduction of mandate for a specific percentage of aviation fuels to be from sustainable sources, however. The reason given was simply one of cost – a mandate could put UK airlines at competitive disadvantage. But the Government’s view has been influenced by other factors too. The emphasis of the transport fuels policy is now very much on using waste-based sources rather than crops, not least given evidence from the European Commission that much European biodiesel probably results in higher greenhouse gas emissions than fossil sources once ILUC impacts are accounted for.

But significant uncertainty exists about how much of this ‘advanced’ biofuel will be available in future, and sectors with existing climate change obligations under EU and UK law are likely to remain dependent on fossil fuels for their own decarbonisation. Looking just within the transport sector, even if all new car and van sales were to be zero emissions by 2020 – a highly ambitious policy – a significant quantity of low carbon liquid fuels will be required by the road transport sector in order for it to meet existing climate legislation, DfT analysis found.

2. Biomass is more efficiently used in other sectors, preferably combined with CCS

A further relevant consideration, taking into account the assumption that the supply of sustainable biomass will be limited, is where it is most efficiently deployed. There are perhaps two significant drawbacks to using it in aircraft. First, energy is lost simply in the conversion to liquid fuel. A recent press article on a Qantas flight that used a 10% blend of a biofuel derived from mustard seed, for example, noted that “One hectare of the crop can be used to produce 400 litres of aviation fuel or 1,400 litres of renewable diesel.”<sup>3</sup>

Second, using biomass in aircraft precludes the potential additional benefit of combining it with CCS. This is a point the CCC has long argued. It is perhaps now particularly relevant given the current view that achieving the negative emissions needed to meet the Paris goals will necessitate significant use of BECCS (bioenergy with carbon capture and storage). While a number of challenges exist to the successful rollout of this technology<sup>4</sup>, it is included in many pathways developed using integrated assessment models. The implications of various BECCS pathways for the available of

<sup>3</sup> <https://www.theguardian.com/environment/2018/jan/30/qantas-uses-mustard-seeds-in-first-ever-biofuel-flight-between-australia-and-us>

<sup>4</sup> See for example <https://www.carbonbrief.org/guest-post-six-key-policy-challenges-to-achieving-negative-emissions-with-beccs>

biofuel will need careful consideration to ensure that the aviation conversation does not take place in its own silo.

### 3. Biofuel doesn't avoid non-CO2 impacts

We welcome recognition in the ETC's paper that aviation has impacts on the climate beyond those of its CO2 emissions. While there remains debate about the best way to tackle these impacts in policy, it is likely that their impact overall is to increase the Global Warming Potential to around double that of CO2 alone over a 100 year time period.

Biofuel delivers a potential carbon saving over fossil fuel on the assumption that the CO2 released when the fuel is burnt is (partially) balanced out through the capacity of plants to absorb it. But burning biofuel (or indeed synthetic fuels so far tested) still generates non-CO2 impacts, without any evidence that these can be balanced in the process of generating the fuel.

A key recommendation of the ETC report is that increasing, potentially to 100%, the use of biofuel in aviation is the most cost efficient means of delivering carbon reductions in the timeframe required, and in particular that if the cost of biofuel were instead included as a tax on tickets it would fail to achieve the same level of carbon mitigation. This argument would have less relevance, however, if there was a policy to tackle non-CO2 impacts.

### 4. Priority access for aviation could increase decarbonisation costs for other sectors

Finally, there is potentially a social justice argument against giving aviation priority access to scarce sustainable biofuel. In the UK, around 70% of all flights are taken by just 15% of the population<sup>5</sup>, predominantly those on high incomes, and Londoners are twice as likely to be frequent flyers as those in other parts of England<sup>6</sup>. The large majority of the global population, meanwhile, will never set foot on a plane. Questions of fairness would need to be addressed therefore if the use of biofuel in aviation either increases the cost of buying or growing food or increases the cost of decarbonisation for sectors such as home heating, or electricity production.

**The role of policymakers needs to encompass not only specific interventions on carbon price and biofuel but also appropriate target setting and policy plans, both domestically and internationally.**

We welcome the fact that the ETC paper considers possible action from both the industry and the policy community. Our focus as an organisation is largely on what could and should be done by policymakers to tackle the environmental impacts of aviation, and our comments on the ETC recommendations reflect this focus.

<sup>5</sup> <https://fullfact.org/economy/do-15-people-take-70-flights/>

<sup>6</sup> [https://s3-eu-west-](https://s3-eu-west-1.amazonaws.com/media.afreeride.org/documents/RunwayForTheFew_WEB.pdf)

[1.amazonaws.com/media.afreeride.org/documents/RunwayForTheFew\\_WEB.pdf](https://s3-eu-west-1.amazonaws.com/media.afreeride.org/documents/RunwayForTheFew_WEB.pdf)

We engage with the policy discussions both at a UK level (including in relation to the forthcoming Aviation Strategy) and internationally at ICAO, but we are concerned that conversations about appropriate climate mitigation from aviation are currently not well aligned. Our view is that there is a key decision to be taken about how best to account for aviation in the international framework including delivery of the Paris Agreement.

One route would be to include emissions from international aviation in national or regional climate commitments and NDCs. The UK currently accounts for aviation in our Climate Change Act, but has yet to formally include it in carbon budgets. The EU ETS has been strengthened to help deliver EU-wide climate ambition, but its coverage of aviation emissions has been heavily scaled back, and its future alongside CORSIA is uncertain.

Another possible route would be to leave international aviation out of national targets and deal with it separately, for example through ICAO and a strengthened version of the CORSIA. Under this option a portion of the total available global carbon budget would be set aside for aviation, with NDCs and national carbon targets then determined by the remaining carbon budget (and with other sectors potentially working harder than currently anticipated).

The ETC paper appears to characterise CORSIA as an industry initiative, and calls on the aviation industry to “Put in place a mandatory offsetting scheme by 2027.” In fact, CORSIA was initiated and agreed by governments at the UN as the appropriate global response to the need for climate mitigation from aviation and is, indeed, due to become mandatory from 2027, although 76% of international aviation activity will be covered by voluntary pledges to participate from 2020 onwards. The scheme currently has numerous shortcomings however. For it to be an effective vehicle for delivering the Paris Agreement there would need to be greater clarity about appropriate emissions units (ensuring no double counting), a long term emissions target, and a mechanism for accounting for all international aviation emissions, not just those above the level in 2020.

In the absence of a decision on how aviation should fit in the wider climate picture, we are concerned that incentives for aviation to act are likely to be weak, and that decisions on tradeoffs, such as those listed above in relation to biofuel use, will be difficult to resolve.

In UK climate policy, the Committee on Climate Change has recommended that 25% of the economy-wide carbon target for 2050 should be set aside for aviation and that the Government should not plan on the assumption that aviation emissions will be higher than this. The CCC’s preference is for this aviation “planning assumption” to be delivered by way of international measures. The Government should, in our view, be developing both a plan for delivering such international outcome, and a complementary domestic policy plan.

The specific policy interventions recommended by the ETC include a mandate for green aviation fuel, and a carbon tax on aviation fuel.

On biofuel, for the environmental reasons set out above, and in the absence of a wider climate change policy for aviation, we would be reluctant at this stage to support a volume

mandate. The question of the appropriate percentage of sustainable biomass to be used by aviation should, in our view, be assessed in the wider context of the Paris Agreement, and of the need for all sectors to be part of a zero carbon future.

We would support the introduction of an aviation carbon tax and encourage the ETC to explore all possible channels for pursuing it. There are a number of barriers to be overcome, however, including inevitable industry claims of double counting given the modest costs now imposed by way of the EU ETS and CORSIA, and the existence of numerous bilateral legal agreements between pairs of states not to impose taxes on fuel used for international aviation.

**The likely need for limits to growth through capacity constraint should not be ignored.**

We very much agree with the central premise of the report that aviation emissions need to be addressed, and that action needs to come from the sector itself, not just by way of carbon offsetting. This represents a big challenge in our view.

The report argues that supply side measures will be a more efficient means of achieving carbon reductions from the aviation sector than demand side measures, based on a cost comparison that reflects today's biofuel prices. Our view is that supply side measures may in fact be no easier to implement than those focussed on demand. The politics of agreeing sustainability standards for biofuel for example, let alone how to direct biofuel resources to particular sectors, is politically very sensitive. With palm oil increasingly unwelcome in Europe, Indonesia only this week said that its companies should be allowed to build palm oil jet fuel plants in the United States and France as a condition for it buying either Boeing or Airbus planes<sup>7</sup>. There are real questions to be resolved, meanwhile, as we have set out, about the most efficient use for biomass given the energy penalty in converting it to aviation fuel, and in giving up the opportunity to combine it with CCS.

This being the case, governments need to consider the tools available to them in the immediate future for limiting the scale of the aviation emissions challenge. Aviation taxes are one option. Strengthening the mechanisms for imposing carbon pricing on aviation through other means, notably CORSIA or the EU ETS, should also be considered. We also believe that here is a strong case for constraints on airport capacity growth, including limits on the development of new runways and airports.

Barring successful legal challenge, the UK Government has just taken a decision in the opposite direction on Heathrow expansion. It needs to be called to account on how this can be reconciled with the need to bring aviation into line with national and global climate ambition.

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<sup>7</sup> <https://www.reuters.com/article/us-indonesia-biofuels-airplane/indonesia-sets-palm-biofuel-plant-condition-for-jet-purchases-from-us-france-minister-idUSKCN1L60AS>