

Jet Zero Consultation response

Green House Think Tank, 6th September 2021.

Response to government consultation -

<https://www.gov.uk/government/consultations/achieving-net-zero-aviation-by-2050>

Question - Do you agree or disagree that UK domestic aviation should be net zero by 2040? How do you propose this could be implemented?

Strongly Disagree, as this target is not ambitious enough.

Domestic aviation should have an interim aim to decarbonise substantially by 2030. However, this should be part of substantial decarbonisation of all of UK's aviation by this date such that international aviation (which is harder to decarbonise and has higher emissions) has the same 2030 target.

This must result in government policy to accept no expansion of aviation capacity (runways or terminals) in the UK and instead require a year-on-year reduction in total passenger numbers and flights permitted at each airport – starting from current flight numbers, not current airport capacities, and allowing no exceptions (noting that for Gatwick currently no limit on flights is required by government).

Policy should focus on managing down demand for UK aviation and setting limits on (rather than allowing the expansion of) airports across the UK. Flights between UK airports should be progressively reduced. This should be delivered through a combination of both demand and supply-side measures. Mandating carbon footprint information on all flight tickets and banning advertising of flights (and associated marketing of overseas holiday that cannot be taken without long-haul flights, the use of tropical islands to advertise beauty products, and so on) must be matched by the introduction of a frequent flyer levy.

This should be supported by a shift away from net subsidies to the aviation industry – notably through ending the funding of surface transport infrastructure improvements and the current £8 billion a year effective tax break to aviation (as VAT relief on fuel and air tickets far exceeds air passenger duty).¹ In addition, the aviation sector should itself be required to create a fund to support the development of future innovations (such as those set out in the strategy). These elements will all reduce the cost of passenger flights and air freight, thereby further suppressing demand to within the capacity constraints that start with existing aviation capacity and thereafter reduce with time.

With regard to domestic aviation, the government must lead in mandating changes for this to happen. For example, France is not waiting for electric or hydrogen planes to decarbonise domestic aviation – it is displacing it with trains – albeit for city-to-city journeys of more than 2.5 hours rather than the 4 hour recommended by France's Citizens' Convention on

¹ See footnote 38 of a Green New Deal for Gatwick report, https://www.greenhousethinktank.org/uploads/4/8/3/2/48324387/a_green_new_deal_for_gatwick.pdf. £8 billion is an updated calculation based on the Full Fact methodology from 2012 (<https://fullfact.org/news/does-government-subsidise-airlines-10-billion/>).

Climate.² In light of this the UK Government's proposal to decarbonise domestic aviation by 2040 remains hopelessly slow – the majority of these flights are not required.

Question - Do you agree or disagree with the range of illustrative scenarios that we have set out as possible trajectories to net zero in 2050? Are there any alternative evidence-based scenarios we should be considering?

Strongly Disagree.

The scenarios actually fail to *illustrate* much at all, as they focus almost entirely on technological change. There is no discussion of the risk or likelihood of any of the scenarios coming about. No significant government incentives or constraints to manage demand are included in *any* of the scenarios.

Two of the scenarios are not really illustrative – they are entirely speculative, as stated in the UK government's own evidence and analysis paper accompanying the strategy. They also fail to account for non-CO2 carbon emissions and the impact of provision of biofuels (which the strategy appears to wish to rebrand as sustainable aviation fuels (SAFs)).

This leaves three scenarios presented that aren't themselves described as speculative: a baseline, one scenario incorrectly titled 'continuation of current trends' (scenario 1) which assumes a carbon price which is not in place, and appear to have no mechanism within the UK government's control to deliver, and one described as 'high ambition' (scenario 2) which again has a highly misleading title. It is only highly ambitious in terms of the required technological breakthroughs. It proposes virtually nothing for a decade and then only reduces aviation emissions from the optimistic scenario 1 by 14%, without considering the smaller reduction in non-CO2 emissions that its reliance on biofuels (so-called SAFs) would bring about.

- Scenario 1 purports to model a continuation of current trends. However, unless carbon prices are applied to all flights at the same level then emissions are likely to remain above 2018 levels through to 2050.
- The consultation document appears to lean towards adopting Scenario 2, which is described as high ambition. This is really high technology optimism as its variation from the baseline is wholly in terms of what technology improvements may deliver from now until 2050. But it is noted that for scenario 2 to be delivered aviation's needs for biomass must be prioritised over other sectors. The question whether there is sufficient biomass to enable this to happen without jeopardising the UK's overall pathway to net zero is not addressed. Nor is the question of whether airlines can be mandated to modernise somehow to reflect the higher fuel efficiency improvements – something that would appear completely outside the control of the UK government. **So in effect the UK has chosen scenarios that all are dependant on changes that are outside control of the UK government – rather than focus first on what it *can* do, which is to constrain UK aviation demand.**
- Scenario 3 is considered by the UK government as speculative in light of the 75% use of SAF by 2050 (Evidence and Analysis: clause 3.13) so is not treated as a serious alternative. It too is not credible unless supported by clarity as to how biomass feedstock will be prioritised between different sectors (e.g. construction materials,

² See <https://www.bbc.com/news/world-europe-56716708>.

freight/road transport, shipping, aviation). Finally, the shift to SAF will not reduce contrails so the overall reduction of climate impact will not be anywhere near as small as claimed.

- Scenario 4 is also considered speculative by the UK government, to show the impact of over half of air traffic movements becoming electric or hydrogen-battery powered by 2050. It notes significant challenges have to be overcome for it to be feasible.

Whilst talking up the high ambition (for which high-risk might be an appropriate translation) none of the scenarios represent high ambition from a climate perspective. The emission reduction curves of all four modelled scenarios are presented from 2024 to 2050. The scale of residual aviation emissions presented in the Jet Zero consultation dataset shows that compared to continuation of current trends (scenario 1), the high ambition scenario reduces the total carbon emissions by 14.7%. This is hardly a 'high ambition' carbon reduction pathway. The most ambitious scenario is the third, which is based on 70% use of sustainable aviation (bio)fuels and reduces emissions by 25%, to a total of 767 million tonnes CO₂ (or something more than 1462 million tonnes CO₂e if the government's current estimate of non-CO₂ impacts is considered – see below – but noting that the biofuels element of the reduction are not understood to reduce contrails) up until 2050.

In summary the 'high ambition' scenario 2 appears very high-risk technologically, yet relatively low ambition with regard to climate change. Therefore, the scenarios are not illustrative but entirely unrealistic and extremely misleading.

The scenarios should not be based on levels of *technical ambition* but should be aligned to different levels of *climate precaution*. Rather than developing scenarios to illustrate how demand reduction can be avoided, scenarios should illustrate what sufficient climate action is needed to align aviation's carbon reduction pathway with that for the rest of the economy – and examine how these interplay with each other (including overall UK consumption, and net import of embodied carbon through trade from overseas). This is entirely lacking.

In terms of alternatives a better starting point would also be to evaluate evidence of whether any other governments have planned to reduce aviation emissions as well as to utilise the aviation analysis undertaken by the CCC (December 2018) and by academics.

Question - Do you agree or disagree that we should set a CO₂ emissions reduction trajectory to 2050?

Agree, but an earlier date for real (not net) zero is preferred.

Every sector in the UK economy should set a CO₂ emissions reduction trajectory, together with a policy framework that enables it to be met. Analysis for each of these sector CO₂ emission reduction pathways must consider how they impact on the others (which they will). Assuming that every sector can be addressed independently of all the others is inadequate.

In this case there are also significant gaps between the trajectory modelled and the new measures (of which there are little of substance) in the strategy itself. The strategy should be tested to evaluate the extent to which the new policies will deliver the reductions proposed. No such evidence is presented in this case. Such an emission reduction trajectory should not include any offsetting as this is accounted for elsewhere in UK and global carbon accounts.

Question - Should the trajectory be set on an in-sector CO2 emissions basis (without offsets and removals) or a net CO2 emissions basis (including offsets and removals)?

It should be on an in-sector emission basis. That is the only way in which the sum of different sector emission reduction pathways can be managed together to achieve an overall reduction across the whole economy.

Question - Do you agree or disagree with the possible trajectories we set out, which have in-sector CO2 emissions of 39 Mt in 2030, and 31 Mt in 2040 and 21 Mt in 2050, or net CO2 emissions of 23-32 Mt in 2030, 12-19 Mt in 2040 and 0 Mt in 2050?

Strongly Disagree.

These carbon budgets are totally inadequate. They should align to the climate science to stay well within 1.5°C post-industrial global warming, not to technologies and planned aviation growth, as is the case currently.

The carbon budgets must be expressed as cumulative carbon budgets not 'target dates' (in line with the rest of the UK economy), and should be aligned to the five-year budgets for the whole of the UK.

Question - Do you agree or disagree that we should review progress every five years and adapt our strategy in response to progress?

Disagree.

Review should be aligned to the rest of the economy's carbon budgeting process. Aviation should be managed within, not separate from, the current carbon governance framework.

Annual reviews will also be required on a sector-basis to ensure that the policy measures proposed are sufficient to operate well within the carbon budgets set. The actual emission reductions achieved by 2025, 2030 and 2035 are crucial in view of the severity of the climate emergency that this strategy should be required to reflect, which points to significant policy ambition in the short term.

Question - Do you agree or disagree with the overall approach to improve the efficiency of our existing aviation system?

Strongly Disagree.

The overall approach should start by applying to aviation a credible overall strategy for decarbonising transport in general. One such approach that is gaining credence is the **Avoid** (the need to travel), **Shift** (to sustainable transport modes) and then **Improve** what remains **framework**. For road transport this could read as place-based planning alongside walking and cycling investments, before a shift to better public transport (bus and train), and then electrifying what remains. Applying this to aviation would require the starting point to be managing the demand for fast long-distance travel, whilst shifting the much-reduced amount of short-haul flights to rail. The biggest problem with aviation is that unlike cars the electrification of aviation (the third tier of this policy framework: improve) is still a long way off. That means eliminate the flying where there are clear alternatives, and drastically curtail

the rest. This would have to start with halting all aviation expansion plans – to avoid runaway climate change, we *must* have no new runways. The current strategy ignores the *avoid* and *shift* parts of this transport climate action framework, and then proposes delay and is not realistic as to the (technical) ambition of the *improve* tier of policy measures.

In addition there needs to be clear justification and a sensitivity analysis to support any increase from the fuel efficiency improvements of 1.4%/year, which while higher than earlier CCC and DfT estimates is at least based on work jointly commissioned by the DfT and CCC, and is reflected in the balanced emission reduction pathway of the CCC for aviation (December 2020). The choice of a higher efficiency value of 2% for scenarios 2-4 is not justified but does coincide with the stated goal of ICAO. This goal has been critiqued as being unachievable by the International Council on Clean Transportation. Thus, the main technical ‘ambition’ scenario most heavily referenced in the strategy relies on higher efficiency improvements most likely based on a goal of the global aviation industry, rather than any credible modelling. This makes the strategy aspirational, and weakens its credibility.

The strategy *must* not depend on assumptions over which it has no control, such as efficiency improvements by the international aviation sector and how these might affect fuel consumption of all aeroplanes using UK airports. As it is not possible to propose UK policy measures to ensure that this uplift in efficiency saving is deliverable it **must not** be included in the modelling.

Question – In your opinion, to ensure we maximise efficiency within the current aviation system, what more could be done or done differently?

‘Efficiency’ within the current aviation system is the wrong focus for this strategy as set out in the proposed Avoid-Shift-Improve approach outlined in response to the question above. The level of carbon emission reductions which is necessary to address the climate emergency requires a much smaller and very different aviation sector supported by a modal shift to other transport modes. The ‘efficiency’ of delivering these policy measures (considered as ‘Avoid’ and ‘Shift’ in the above framework) should be prioritised and should wholly underpin this strategy.

Also, as noted in the answer to the question above it is vital that all these ‘efficiency’ savings are **ensured**. This means they must be deliverable, which means focusing on measures that are within the government’s control. The extent to which that which is required is within the remit of policy measures proposed should be reflected in the modelling.

Question - Do you agree or disagree with the overall approach for the development and uptake of SAF in the UK?

Strongly Disagree.

The approach taken is poorly defined, especially as there is no consideration of how the UK intends to prioritise scarce ‘green’ hydrogen and sustainable biofuel use across different sectors (including grid balancing, freight transport and aviation), nor is there clarity as to what scale of supply is realistic and sustainable in terms of its wider biodiversity and land-use impacts.

Firstly, it is unclear whether the SAF levels of 30-75% modelled are either deliverable or sustainable. For example, the Airports Commission (2013) highlights the issues of carbon

emissions from production of biofuels and associated land-use changes, as well as conflict with food production and other biofuel uses. Indeed, if climate change itself reduces global agricultural production these conflicts will become acute.

We must not be in a position where a future policy choice is limited to one between increasing global chronic hunger and increasing greenhouse gas emissions.

Wider analysis as to how *all transport* (shipping and land transport as well as aviation) can be powered is needed, and to ensure that 'sustainable transport for all' (see <https://www.sum4all.org>) is prioritised before aviation, which is primarily serving less than 1% of the global population.

Secondly, it is noted that to comply with the RTFO SAF must reduce greenhouse gas (GHG) emissions by at least 60% relative to a set fossil fuel comparator (Evidence and Analysis: 2.6). However, the methodology used for the modelling states (Evidence and Analysis:A.10) that 100% CO₂ emission savings for the aviation fuels for these fuels is assumed. Whilst this is noted as consistent with the approach taken by the CCC and formal GHG accounting rules, it actually appears optimistic rather than realistic.

Thirdly, the Airports Commission (2013) modelled mandatory biofuels (SAF) levels. It is not clear how the scenarios will be delivered unless the SAF level proposed is mandated.

Finally, the SAF technologies are noted as 'at the demonstration stage and yet to be rolled out at commercial scale'. SAF technology refers to use of cooking oil and gasification of municipal solid waste as examples of fuel sources. The scale of the former is insignificant compared to aviation fuel needs. The latter may not even be deliverable (as it is dependent on our society's wastefulness remaining the same so there is still the same amount of rubbish available to burn in the future).

The evidence papers quoting the potential of using cooking oil (which will have very limited scalability) and gasification is even less credible. Gasification of household waste (as proposed in the evidence paper) was recently tried using gasification of Surrey's waste. The plant failed its commissioning, wasting some £40-100m in government subsidies.³ The notion that unrecyclable plastics might constitute a long-term viable supply conflicts with the government's 25 year Environment Plan said that such 'single-use-plastics' would be phased out by 2042.

Question – What, if any, further measures, do you believe, are needed to support the development of a globally competitive UK SAF industry and to increase SAF usage?

As noted in question immediately above the current proposals are completely optimistic and poorly defined so this question cannot be answered. It is not clear that aviation is in any case the best use for biofuels, which will be a scarce resource both in the UK and globally as overall energy use is constrained to within that which can be produced from renewable energy and resources. Clearer proposals are needed before any further measures can be considered.

Question - Do you agree or disagree with the overall approach for the development of zero emission flight in the UK?

³ See <https://www.getsurrey.co.uk/news/surrey-news/shepperton-eco-parks-long-awaited-19347487> and <https://www.getsurrey.co.uk/news/surrey-news/surrey-county-council-starts-legal-20206224>.

Strongly Disagree.

It is most likely that zero emission flight, if practicable, will be mostly for short-haul domestic flights (which are easier to shift to alternative modes). Their promotion as part of a set of 'solutions' without any demand management implies that all longer-term flights will be powered by sustainable aviation fuel or continue to burn kerosene. This is not sustainable. A small degree of zero emission flight might be useful such as to access remote islands, and for emergency services, but does not sit well within a strategy for sustainable aviation based on prioritising action on climate change.

Green hydrogen is also still not being produced at scale. The analysis and evidence document rightly highlights that this fuel source will be scarce. The aviation technology to utilise this is at the proof of concept stage, with a current target to bring to market by 2035.

The sustainable technology research programme UK FIRES, based at Cambridge University in their [Absolute Zero report published in 2019](#),⁴ the year when UK aviation emissions peaked pre-Covid, states that there is no plausible technological way for aviation to decarbonise using technologies that are anything but speculative. They class zero emission aviation – the electric and hydrogen-battery powered flights that this strategy will make up at least 20-50% of flights into and out of UK airports by 2050 – as post carbon technologies. They state that these should be considered as technologies that could, if proved viable, be introduced *after* we have got to zero carbon. The approach therefore proposed instead of that contained in this Strategy is to focus decarbonisation by demand management and modal shift away from aviation and then plan for aviation to be scaled-up again in future should zero carbon technologies and/or sustainable aviation fuels prove to be viable and deliverable – and match aviation's scale to what is then possible. That means these are not counted as part of the way aviation drastically reduces emissions in the short-term, and most probably not before 2050 either.

Instead there should be a focus on urgent capacity constraint and modal shift for short-haul flights.

Question – In your view, what further measures are needed to support the transition towards zero emission aviation?

A completely different approach is needed (as proposed through the Avoid-Shift-Improvement framework, which starts with capacity constraint and demand reduction, as set out above) with strategies to put an end to aviation subsidies and a modal shift for short-haul mandated as part of efforts to manage down demand. In addition policies regarding (i) full costs being borne by the aviation sector; (ii) sufficiently high carbon pricing of all flights to constrain demand; and (iii) management down of demand, are set out below.

(i) Mandating Costs to be borne by Aviation Sector

These various technology measures are far more expensive than current aviation fuel costs. This is highlighted in the strategy's evidence paper which estimates costs as £200-600/tCO₂ for SAF, £30-250/tCO₂e for hydrogen, and £50-470/tCO₂ for greenhouse gas removal. No cost prediction for all-electric aircraft was provided, so its commercial viability appears even less well defined. The current cost of SAF is borne by the government and it is noted in the strategy that this will continue, at least for the foreseeable future. No policy measure for the

⁴ See <https://www.repository.cam.ac.uk/handle/1810/299414>.

additional costs of additional fuels (and policies to avoid this by refuelling elsewhere) is proposed, even in the medium term. Without a price incentive or mandate for a shift to these alternatives it is unclear how this will happen until much later – as was the case for hybrid and electric cars. If sector-specific actions are most costly (as is the case for aviation, as noted above) then these increased costs should ultimately be borne by the sector itself not by the government as is currently the case – or the cost of abatement is in effect being cross-subsidized by the rest of the economy. Instead the costs must be borne by the aviation sector.

(ii) Include policies regarding carbon pricing

All four of the strategy's 'illustrative scenarios' include carbon pricing for all flights (including international flights not covered by the UK Emission Trading Scheme (ETS), EU ETS or voluntary CORSIA scheme). However, such carbon pricing is currently not in place. A sensitivity analysis suggests that without this carbon pricing on flights outside of the EU (as is currently the case) then carbon emissions will be 3MtCO₂e higher in 2050. Therefore, even the business-as-usual scenario (1) does not appear to be reflected in the actual policies set out in the consultation document.

Such carbon pricing is supported but needs to be sufficiently high to manage down demand significantly and needs to be mandated in policy, with the UK taking unilateral action (also known as international leadership, using its chairing of COP26 in November for the purpose) in order to bring this about. The level of carbon pricing must be higher than that in the UK ETS, through an aviation or wider transport and industrial carbon tax. It must apply both to passenger and freight elements of aviation. This needs to be supported by policies to avoid flying with excess fuel if there are differential fuel prices between countries (such as through a carbon border price adjustment mechanism, or similar, to stop any incentive to fly with excess fuel).

This strategy models carbon prices of £231-£346/tCO₂ (2018 prices), noting that the high carbon price has limited effect, particularly with respect to long-haul flights. This is however significantly less ambitious than that modelled by the Airports Commission in 2013, which then considered a central carbon price of £200/tCO₂e by 2050 and a high carbon price of £500/tCO₂e by 2050.⁵ The levels of carbon price required for all UK flights must reflect the increased known climate severity and need for more rapid decarbonisation than was recognised to be the case in 2013, and must apply to all flights, as modelled in all of the strategy's scenarios. Therefore higher, not lower, carbon prices than were proposed in 2013 would be needed.

Without this being properly integrated into policy the strategy risks the actual carbon footprint from the strategy's being far closer to the 'policy off' baseline scenario than either its business-as-usual or high [technological] ambition scenarios (1 and 2) – particularly should the ambitious technological improvements not materialise and the majority of flight emissions (from longer haul journeys) have either minimal or no carbon price. This 57 MtCO₂e in 2050 is a 50% increase on current emission levels. This is the real risk implicit in the current strategy and therefore its high risk of failure.

⁵ Airports Commission (2013) Discussion Paper 03: Aviation and Climate Change. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/186683/aviation-and-climate-change-paper.pdf

However, all of this assumes that aviation expansion can be constrained by a strategy and that a carbon price by itself is a way to damp down consumer demand. However, the UK now has a carbon price agreed for project appraisal that is in line with its national emission reduction targets for project appraisal. This means that as well as carbon pricing of consumer demand, carbon pricing must apply to each and every airport expansion project as well. This alone transforms how this strategy relates to demand management, via a process of constraining capacity (of both airport terminals and runways). This is explored below.

On the 2nd September 2021 BEIS lifted the 2022 carbon prices from £27 (traded) and £72 (non-traded) to £248 per tonne.⁶ BEIS state in this document that "it should be stressed that the carbon values discussed in this paper apply to all types of policy". So this must now be applied to the carbon prices used in the modelling scenarios that underpin the scenarios in this strategy.⁷ This will also be reflected in the decision-making around investing in *all* new infrastructure that will lock in additional carbon emissions.

As Alex Chapman of the New Economics Foundation comments (in response to this announcement on twitter) explained that these new UK Government carbon prices, which are now in line with the UK's national emission reduction targets, will mean that the carbon prices applicable to Leeds, Southampton, Bristol, and Stansted airport expansions triple.⁸ Airports have been incredibly reluctant to present the (monetised) carbon cost of their expansions, despite government guidance explicitly asking for it. This is why. The carbon cost of these projects will completely wipe out even their overstated claims of economic benefit.

So rather than simply considering whether overall carbon emissions of aviation stay below a 2050 target (as the strategy attempts to over-simplify UK climate policy to say), individual infrastructure decisions must be appraised for their full impact on UK carbon emissions budgets – and these new appraisal targets must block individual runway expansion plans. This must apply to all expansion plans regardless of whether they are pipe dreams, current planning applications or appeals, or have received consent. **We must not continue to build infrastructure that the government's own guidance now accepts is not viable.** That means that aviation cannot expand its capacity in a way that is at odds with the rest of the UK economy – there is no exemption for aviation in this BEIS appraisal methodology.

(iii) Measures to first constrain and secondly to manage down demand

The 'range of solutions' (Evidence and Analysis: clause 1.1) outlined in the Jet Zero consultation do not include any serious attempt to manage demand. The UK based FIRES sustainable technology academic research programme⁹ and the IEA's analysis of how to achieve net zero by 2050¹⁰ both conclude that limits to constrain demand growth and quite possibly a reduction in flying are required for aviation. This is reflected in the AEA's initial comments on this consultation response, which are supported here.¹¹

⁶ See <https://www.gov.uk/government/publications/valuing-greenhouse-gas-emissions-in-policy-appraisal/valuation-of-greenhouse-gas-emissions-for-policy-appraisal-and-evaluation?s=03>

⁷ See <https://t.co/WkA7B8MSre> as quoted in <https://twitter.com/chappersmk/status/1433720616591503375?s=03>

⁸ See <https://twitter.com/chappersmk/status/1433407474825154566>.

⁹ This report analyses the time to bring forward new technologies to address climate change and concludes that 'exaggerated claims about new technologies are holding back climate progress'. See <https://ukfires.org/absolute-zero/>.

¹⁰ See https://iea.blob.core.windows.net/assets/beceb956-0dcf-4d73-89fe-1310e3046d68/NetZeroBy2050-ARoadmapfortheGlobalEnergySector_CORR.pdf.

¹¹ See <https://www.aef.org.uk/2021/07/16/net-zero-aviation-plan-government-pins-hopes-on-future-technologies-and-fuels-delivering-clean-growth/>.

Such a need actively to manage down demand is also reflected in the December 2020 aviation discussion paper of the government's independent Climate Change Committee (CCC). This modelled aviation emission reductions with passenger numbers constrained to between a 15% reduction to 25% growth in passenger demand up to 2050.¹² The absence of even a reference to this CCC aviation sector analysis as part of the CCC's response to the government's sixth carbon budget is shocking on its own. Thus, this strategy is not just both inadequate in terms of its climate impact but calls into question the level of authority and respect granted to its own independent Climate Change Committee by the government.

This strategy is incorrect in stating that 'capping demand *may* not be necessary to reduce emissions to levels which can be offset by greenhouse gas removal (i.e. 23 MtCO₂ in CCC's balanced net zero pathway). This is based on techno-optimism, over-statement of international metrics on likely fuel efficiency improvements and also appears to ignore completely both the impacts of freight and the 60% of flights taken by UK citizens, hence a greater responsibility to cut our international aviation footprint than the 50% modelled.

Unlike the CCC no efforts to 'build back better' by managing down demand following the Covid-19 reduction in air travel, or even to monitor the Covid-19 impact on flying, are included in the strategy. This should be an ideal basis on which to build a strategy that both constrains growth in new capacity and manages down the scale of use of existing airport capacity. Unbelievably, this strategy appears to assume *more* passengers than the likely unconstrained demand considering Covid based on sources which it quotes.¹³ Again, this is unacceptable. In the face of a climate emergency the aviation sector should be required to maximise, not minimise, its carbon emission reductions.

Finally, the climate emergency requires carbon emissions to be reduced as quickly as possible. The strategy appears to see 2050 as the only deadline, ignoring the higher ambition intermediate targets and the need for this sector strategy to enable the UK government to deliver carbon reductions greater than required by this legal pathway. It is worth noting that the UK currently has a predicted delivery gap against its medium and long-term emission targets.¹⁴ This includes an estimated gap of around 100 million tonnes CO₂e in the UK government's fifth and sixth carbon budgets (2022-32).¹⁵ **Sector strategies, including this strategy for aviation, must help the UK to bridge the gap and exceed our targets.** Allowing continued expansion now while there is a need for the UK to reduce its emissions further even in order to meet legally binding targets set by the government itself, is both incomprehensible and irresponsible.

Question - Do you agree or disagree with the overall approach for using carbon markets and greenhouse gas removal methods to drive down CO₂ emissions?

Strongly Disagree.

¹² See <https://www.theccc.org.uk/wp-content/uploads/2020/12/Sector-summary-Aviation.pdf>.

¹³ The strategy is based on the government's aviation forecasts (DfT, 2017), which determine central demand, unconstrained by airport capacity, as 494 million passengers per annum by 2050. Assuming the quoted prediction of 16% reduction in global demand by 2050 due to Covid-19 applies to the UK (E&A: para 35 referencing Waypoint 2050 by Air Transport Action Group, 2020 p17) would lead to a passenger demand of 415 mppa in 2050 (a 52% increase on 2018 levels – 89% of the passenger levels in this forecast).

¹⁴ See https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/931323/up-dated-energy-and-emissions-projections-2019.pdf.

¹⁵ See <https://www.carbonbrief.org/in-depth-qa-how-does-the-uks-energy-white-paper-aim-to-tackle-climate-change>.

This is not driving down but an offsetting of aviation emissions. This strategy should focus on reducing aviation's carbon emissions to near zero with a high level of urgency and ambition. Currently, neither of these is present.

The possible future greenhouse gas-related removal measures noted in this strategy are speculative. The UK government should take a precautionary approach and consider these as potential technologies for greenhouse gas *removal* to lower greenhouse gas concentrations in the atmosphere as opposed to gambling on their future availability to offset emissions and assuming therefore that such removal will not be required. Therefore, a prudent strategy that applies the precautionary approach correctly to climate change strategy must not rely on greenhouse gas removals but instead minimise carbon emissions as fast as possible in line with the climate science.

Question - What could be done further or differently to ensure carbon markets and greenhouse gas removal methods are used most effectively?

See comments to question immediately above. In addition, the option of storing carbon (implied by most greenhouse removal methods that do not directly use the carbon captured in some way) is also limited by storage capacity. Therefore, at best, greenhouse gas removal is a temporary not a long-term solution.

Expecting the right solutions to be adopted through market-based price incentives alone is inadequate. Other incentives must be provided in such a way as to deliver an overall strategy for rapid decarbonisation – that is, one directed first towards demand reduction and modal shift away from aviation. This requires the overall £8 billion effective net subsidy compared to other transport forms to be removed first.

Greenhouse gas removal is still not commercially viable. Its support should not be through a 'market' as this risks crowding out the demand management and modal shift required. In no way should it be viewed (as is the case in this current strategy) as an alternative to these or to the need to constrain airport capacity in the UK.

Question - Do you agree or disagree with the overall focus on influencing consumers?

Strongly Disagree.

There is very limited focus on influencing consumer behaviour in this strategy. And the focus should for government to take the lead in providing a policy framework that constrains capacity *and* manages down demand (i.e. both supply and demand side measures – both are needed to work effectively together). This is set out in response to questions above.

Question – In your view, what more can we do to support consumers to make informed, sustainable aviation travel choices?

The most sustainable transport choices should not be viewed as a choice between airlines (as implied in the strategy) but dove-tail into an overall transport strategy to reduce carbon emissions such as Avoid, Shift, Improve transport such that it can reach absolute zero carbon, on the same reduction trajectory as the rest of the UK economy, as set out above.

Thus, the sustainable travel choices must first be to *avoid* travel and reduce the distance, frequency and speed of journeys that are made, which will then enable far more of the remaining journeys to be *shifted* to alternative modes (primarily rail and road) reducing the residual journeys that require decarbonisation – which will bring forward the date by which the far, far smaller aviation sector is able to be completely decarbonised.

The government must influence consumer choice by:

- Removing the £8 billion effective net subsidy to aviation (lack of VAT on aviation fuel and ticket prices, against air passenger duty).
- Banning advertising of air travel and adding carbon warning labels on tickets and at the point of purchase (along the lines of health warnings on tobacco advertising).
- Making sustainable transport (i.e. non-aviation choices) cheaper per mile, which means reversing the aviation subsidy relative to other transport modes such that there is a cost disincentive to fly.
- Introducing carbon pricing on a frequent flyer basis at a sufficient level to influence consumer behaviour dramatically.
- Seeing the responsibility as equally focused on reducing consumer demand for air freighted products as well as demand for passenger flights. This requires demand to be managed for both passengers *and* freight.

Finally, the government must accept that, to quote Rinkinen (2020)¹⁶, ‘demand is made not simply met’. Therefore the role of government must be also to *limit* consumer choice for taking flights by removing that entirely for short-haul and domestic journeys (as has now been brought forward in France), and through stopping all airport terminal and runway capacity increases in the UK. A plan should be instituted to manage down use of existing ‘slots’. This will have the added benefits of immediately eliminating night flights, reducing air pollution, and freeing up surface transport capacity which will help drive more rapid decarbonisation across the rest of the transport sector.

Question - What could be done further or differently to ensure we tackle non-CO2 impacts from aviation?

The strategy does not include the significance of non-CO2 impacts or the need to constrain demand and manage these. It should include non-CO2 greenhouse gas warming effects of aviation in line with government’s current scientific guidelines in pathways, targets and policy framework (i.e. raise ambition)

Whilst the UK Committee on Climate Change (CCC) does not expect passenger numbers to reach pre-Covid levels till 2024, global airfreight levels are expected to be 2.8% higher in 2021 than in 2019.¹⁷ World air cargo has grown an average of 4.3% a year for the last decade and is predicted to increase by around 4% a year for at least the next 20 years.¹⁸ This would correspond to a 177% increase by 2050 – three times the rate of increase of passengers modelled in the strategy, but strangely completely absent – especially for over half of world airfreight that is not transported as extra weight on passenger flights.¹⁹ Yet

¹⁶ Rinkinen, J., Shove, E., & Marsden, G. (2020). *Conceptualising demand: A distinctive approach to consumption and practice*. Routledge.

¹⁷ See <https://www.iata.org/en/iata-repository/publications/economic-reports/air-freight-monthly-analysis---march-2021/>.

¹⁸ See www.boeing.com/resources/boeingdotcom/market/assets/downloads/2020_WACF_PDF_Download.pdf

¹⁹ See <https://core.ac.uk/download/pdf/287585383.pdf> and <https://www.boeing.com/commercial/market/cargo-forecast/>.

even though freight is recovering quicker and predicted to grow faster the CCC's aviation report for the 6th carbon budget (December 2020) says "Freight flights are included within DfT trajectories, so are implicitly assumed to scale with CCC passenger profiles." At least some of this airfreight increase could impact on future aviation demand, which again raises the need for the strategy to include measures to limit demand.

In addition, in 2013 the Airports Commission reported that the government's Committee on Climate Change recommended that options to reduce non-CO₂ emissions will need to be developed over the coming years.²⁰ Surely, a strategy that sets out plans for aviation to 2050 must now address this.

Question - Do you have any other comments you would like to add?

In addition to the comments made above, three significant omissions in the aviation strategy have been identified in this response, all of which point to the need for a higher carbon reduction ambition.

- 1) Firstly, there is very little if anything in this strategy that relates to the level of ambition required as part of the UK's plan to address the climate emergency – it is astonishing that none of the scenarios modelled actually consider the **need to maximise the scale of greenhouse gas emission reductions** which is surely how we should be responding to the climate emergency.
- 2) Secondly, the strategy omits any policies (such as higher carbon reduction ambition) reflecting the **significance of UK passengers** in the passenger carbon footprint.
- 3) Thirdly, it omits any consideration or policies to constrain and manage down demand of the UK's (primarily international – due to imports *and* exports) **freight carbon footprint**.

(1) Reflect the climate emergency in the pathways, targets and policy framework to reflect the climate emergency (i.e. raise ambition)

The strategy notes that in 2019 UK aviation emissions were currently 5.9% of global emissions. This strategy claims international leadership. However, if the proposed 'high ambition' is replicated worldwide (with no change in the share of aviation emissions between countries) then by 2050 global aviation will have emitted 17.2 billion tonnes of CO₂. Considering the uplift recommended to be used by the UK government (BEIS, 2021)²¹ of 1.9 for contrails and NO_x this equates to a total of 32.7 billion tonnes of CO₂e greenhouse gas emissions. This represents around 7.4-14.2% of the post-2020 carbon budget to give between a two-in-three to one-two chance of not exceeding 1.5°C of post-industrial global warming.²² This is painfully inadequate. **There is an opportunity here for the government to match its claimed climate leadership with policies that reflect a commitment in practice.**

(2) Include all UK passengers in pathways, targets and policy framework (i.e. raise ambition)

In 2017 60.2% of international flights from the UK were taken by UK passengers. Applying this to international flights would result in the total UK aviation **consumption** carbon

²⁰ Airports Commission (2013) Discussion Paper 03: Aviation and Climate Change. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/186683/aviation-and-climate-change-paper.pdf, para 4.19.

²¹ See <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2021>.

²² Based on <https://www.carbonbrief.org/guest-post-refining-the-remaining-1-5c-carbon-budget>.

footprint as requiring an uplift of 23.6%.²³ If we are to take responsibility for all of the aviation emissions both from domestic consumption and UK international imports and travellers then the current emissions will be significantly higher and thus the strategy's ambition for carbon reduction will also need to be raised significantly.

(3) Include capacity constraint and managing down demand of freight alongside passengers in pathways, targets and policy framework (i.e. raise ambition)

Admittedly UK Aviation Forecasts (DfT, 2017) detail the passengers/flight but do not quantify or forecast freight volumes. But data on freight movements does exist and it is therefore possible to consider both its carbon footprint today and how this is expected to change in future. UK airfreight was calculated to be responsible for some 11 million tonnes of CO₂ in 2019 (imports and exports) and has growth predictions higher than for passengers. This includes multi-leg journeys except where imports are purchased from a subsidiary (such as some import of flowers from Holland, that are grown in Africa). Even though it may be a relatively small issue (according to the CAA, dedicated cargo accounted for just 3.8% of total ATMs in 2019 – but may not include onward legs reflected in the above calculation based on UK customs declarations) it should not still be reflected in the strategy.

These three areas of omission, taken together, highlight the need for an altogether different type of aviation strategy – one that constrains capacity and manage down demand, a point that is reiterated in detail in answer to the questions above.

Conclusion: Current Strategy Completely Lacks Climate Ambition

This strategy, its almost total reliance on breakthrough technological innovations, and its associated modelling approach, all hang on the assumption that all planned airport capacity expansions are approved as 'precautionary'. However, this is not how the precautionary principle should be applied to climate change. It is important both that a true precautionary approach is applied to the proposed use of these as yet unviable technology 'solutions' and that a precautionary rather than over-ambitious reliance on fuel efficiency improvements is established. The risk associated with the various elements of the four scenarios modelled must be considered so that they are realistic and able to impact policy, rather than being purely illustrative/misleading.

But the need for a precautionary approach must go further than this. A true precautionary approach applied to climate policy must be to maximise not dampen the climate ambition. The consultation states that the pathway (i.e. choice of the scenario) will be flexible, depending on what happens. But the strategy is poorly supported by a set of scenarios that all model a delay in greenhouse gas emission reductions for aviation, with little constraint on demand and no more than 14-25% reduction in cumulative emissions by 2050 (not including non-CO₂ impacts), as against the business-as-usual scenario 1. This means two things:

- Firstly, the proposed Sustainable Aviation strategy does not clearly set out, or seriously attempt to limit, CO₂ emissions between now and 2050. The assumption that which scenario the strategy actually implements will be driven by events further undermines its credibility. However, the level of cumulative emission reductions *is*

²³ Calculated from Table 2.1 of https://www.caa.co.uk/uploadedFiles/CAA/Content/Standard_Content/Data_and_analysis/Datasets/Passenger_survey/2017CAAPaxSurveyReport.pdf, assuming that 96% of the carbon footprint of aviation is from international flights, as stated in the Jet Zero consultation document.

contained in the dataset that underpins the strategy's evidence and analysis. This highlights that scenario 2 (on which the strategy's targets appear based), whilst being described as high ambition only reduces CO2 emissions against the status quo scenario (1) by 14% cumulatively by 2050. This is extremely inadequate and low ambition with respect to climate change. It is climate change, not technology, against which the level of ambition of the scenarios must be set, and delivered.

- Secondly, there is no confidence that *any of the scenarios modelled* reflect actual policies intended to constrain the UK's portion of global aviation emissions over the next 29 years.

Therefore, the strategy as it is currently put, has a very low (almost zero) ambition for active reduction in greenhouse gas emissions, and none in the critical short to medium term. This is totally unacceptable.

This strategy appears based on a decade of government aviation policy that has been shaped by giving the aviation industry too much voice as to how to best make itself sustainable. Instead, in rewriting this strategy the government must first listen to climate scientists, then set a high ambition climate scenario, then use this to develop an aviation carbon reduction pathway that leads not lags the UK's overall target, and then finally put forward a set of policies that will deliver this. This must set out firm policy measures to stop and then subsequently reduce UK airport capacity, which measures must then be actively implemented in order to manage down demand, of both passengers and airfreight. This requires not small tweaks to the current strategy proposed but a complete rethink such that it faces up to the climate emergency and sets climate emissions reduction, not sustaining the current industry, as its priority.

A letter from the Chancellor, Rishi Sunak, to the governor of the Bank of England following the 2021 budget called for climate action across all parts of the UK economy. He wrote:

*"The shift to a world where we are zero-carbon will mean systematic changes across **all** parts of our economy."*²⁴

Such action across all sectors of the economy is particularly needed in the coming decade over which time there is a still a predicted shortfall of around 100 MtCO₂e on government CO₂ reduction targets.²⁵ These targets might yet be strengthened to align fully and fairly with the latest climate science. There should be no special provision for the airport sector to have a licence to pollute at anything near its current scale, either in the short or longer term.

Jonathan Essex

²⁴ See <https://www.carbonbrief.org/budget-2021-key-climate-and-energy-announcements>, emphasis added.

²⁵ See <https://www.carbonbrief.org/in-depth-qa-how-does-the-uks-energy-white-paper-aim-to-tackle-climate-change>.