Evidence to the Airports Commission from the Aviation Environment Federation

Comments on Discussion Paper 03: Aviation and climate change

31.5.13

The Aviation Environment Federation (AEF) is the principal UK NGO concerned exclusively with the environmental impacts of aviation. Supported by individuals and community groups affected by the UK's airports and airfields or concerned about aviation and climate change, we promote a sustainable future for aviation which fully recognises and takes account of all its environmental and amenity affects. As well as supporting our members with local issues, we have regular input into international, EU and UK policy discussions. In 2011 we acted as the sole community and environmental representative on the Government's South East Airports Taskforce. At the UN we are the lead representative of the environmental umbrella organisation ICSA, which is actively engaged in the current talks aimed at agreeing global climate measures for aviation.

The climate challenge

It feels as though the political climate has changed significantly since David Cameron in 2006 fought an election campaign with a "Vote blue, go green" slogan. But in the meantime, the level of threat posed by climate change has in fact intensified.

In December last year the Executive Director of the Paris-based International Energy Agency said "the need to rapidly transition to a more secure, sustainable global energy system is more urgent than ever. IEA analysis shows that achieving the internationally agreed climate goal of limiting warming to 2 degrees C is becoming more difficult and more expensive with every passing year. Without concerted action soon, the world is on track for a much warmer future with possibly dire consequences." [1] Lord Stern, who in 2006 published a groundbreaking study of climate change concluding that the cost of inaction was far greater than the cost of action, said at the World Economic Forum in Davos early this year "Looking back, I underestimated the risks. The planet and the atmosphere seem to be absorbing less carbon than we expected, and emissions are rising pretty strongly. Some of the effects are coming through more quickly than we thought then."[2] Then in May 2013, scientists announced that for the first time in human history, the CO2 concentration in the atmosphere had exceeded 400 ppm.

Aviation and climate change

Aviation is one of the most challenging sectors to tackle in terms of CO2 reduction. It is tempting to assume that there must be some kind of technological solution to the problem of aircraft emissions. But in fact, the issue is one of mathematics: how much aviation can we squeeze in to a carbon-constrained economy? And how then we can make the most of this and develop a system that will best meet the needs of the UK in the coming decades?

[1] http://www.iea.org/newsroomandevents/pressreleases/2012/november/name,33015,en.html
[2] http://www.guardian.co.uk/environment/2013/jan/27/nicholas-stern-climate-change-davos

It is clear that there is a political expectation that the Airports Commission will conclude its work by making recommendations for significant new airport infrastructure. As we have previously noted, the Commission's 2-year schedule of work appears to preclude the possibility of it simply concluding its 'assessment of need' at the end of 2013 with a finding that existing airport infrastructure is sufficient for meeting all demand that could be compatible with our commitments. We suggest, however, that if the Commission considers that building new runways may conflict with achievement of national emissions targets and with the requirements of both the spirit and the letter of the Climate Act, it should spell out the political decision to be taken in relation to any potential sacrifice of environmental commitment for the sake of airport expansion and should present the Government with a range of possible options, which may include no runway building, or restrictions on some airport capacity in order to free up room in the UK carbon budget for increased capacity elsewhere.

Do you consider that the DfT CO_2 forecasts present a credible picture of future UK aviation emissions? If not, why not?

In our response to the Commission's analysis of forecasting, we indicated that we regard the DfT's modelling approach for passenger demand, on which the CO2 forecast figures are based, as structurally sound. We noted, however, that beyond 2030 the figures become much less robust given the lack of oil price forecast from DECC, as a result of which the model assumes that the price flatlines, and we argued that oil price and GDP growth assumptions appear optimistic.

We also consider that DfT may well be underestimating the extent to which passenger numbers per ATM are likely to increase over time. While more realistic, in our view, than the CCC's estimates in their 2009 report, a comparison of historical trends against DfT forecasts suggests that DfT is assuming a lower rate of increase in future than has been the case in the past, as illustrated in analysis by SSE in their submission to the Airports Commission on Aviation Demand Forecasting. While the number of passengers per ATM at Heathrow in 2012 averaged 149, as we noted in our 2011 analysis for WWF (discussed below), the airport would require an average passenger loading of 197.92 per aircraft if it is to grow to 95mppa with only 480,000 permitted ATMs; this was previously considered by BAA to be realistic with, amongst other factors, the introduction of the A380.

Looking more specifically at the CO2 forecast, DfT assumptions on technology seem reasonable to us, though given that aircraft efficiency has not improved as rapidly as forecast in the past[3] and that no improvements are now predicted to take place until after 2020 following a period in which efficiency actually worsens, we would urge caution in an overreliance on assumptions of efficiency improvements. We agree with DfT's finding that improvements can be expected to tail off in the longer term.

The Commission's paper states that "aviation is expected to take relatively longer to decarbonise than other sectors". In fact there is no possibility of aviation decarbonisation in the foreseeable future given the essential physics of aircraft engines. In 2008 Professor David Mackay, now chief scientific adviser to DECC, wrote:

[3] *DfT Aviation Forecasts 2013,* section 6.24

> "[P]lanes are already almost as energy-efficient as they could possibly be. Planes unavoidably have to use energy for two reasons: they have to throw air down in order to stay up, and they need energy to overcome air resistance. No redesign of a plane is going to radically improve its efficiency. A 10% improvement? Yes, possible. A doubling of efficiency? I'd eat my complimentary socks.[4]

The Commission presents figures in Table 4.2 comparing DfT and CCC assumptions on various parameters. In relation to the CCC scenarios it should be noted that:

- The 'no carbon constraint' column would be better labelled 'likely demand' or similar. In a sense both CCC scenarios described include a 'carbon constraint' by way of the EU ETS, since carbon prices are included in the modelling; the key difference between the two CCC columns is that one assumes that demand is restricted to 60% growth, while the other illustrates the growth that is forecast without additional Government intervention. Other factors (such as capacity, APD, and technology improvements) remain equal.
- CCC's 2009 work was based on the policy of the 2003 White Paper, and thus assumed new runways at Heathrow and Stansted. The fact that passenger numbers per flight increase less in the 'carbon constraint' (ie reduced demand) column than in the 'no constraint' column relates, CCC has advised in personal correspondence, primarily to the fact that lower demand would result in less pressure on available capacity, with correspondingly weaker incentives for airlines to a) increase load factors and b) invest in larger aircraft. Within this there is considerable variation by airport, with more constrained airports seeing larger increases in passengers per ATM. In the DfT's modelling, with its assumption of no new runways, gradually increasing (though still modest) numbers of passenger per ATM are predicted.
- The difference helps to illustrate the fact that capacity constraints can help deliver the environmental benefit of lowering emissions per person by incentivising the use of larger planes and the achievement of higher load factors.

Finally, as noted by the Commission, the forecast does not include non-CO2 emissions so very likely underestimates aviation's climate impact. We consider this issue below.

To what extent do you consider that the analysis presented in this paper supports or challenges the argument that additional airport capacity should be provided?

AEF considers that there is already sufficient airport capacity to cater for the maximum passenger growth that could be permissible given climate change obligations, even after taking account of future likely decreases in CO2 per passenger km arising from use of larger aircraft, higher passenger loading, improvements in aircraft and engine design, more efficient air traffic management and the possible introduction of commercial biofuels. We therefore consider that there should be no net increase in airport capacity in the UK. Our reasoning is set out below.

[4] *Sustainability without the hot air,* http://www.withouthotair.com/c5/page_35.shtml

2008: The national aviation emissions target and passing of the Climate Act

When the Labour Government in 2008 announced that it continued to support the building of a third runway at Heathrow subject to various environmental tests being met, it also introduced a new test: in future, aviation in the UK would be subject to a climate target whereby emissions in 2050 would be no higher in gross, untraded terms than in 2005. The Committee on Climate Change was appointed to consider how this target could be achieved, resulting in their 2009 report. Earlier in 2008, the Climate Change Act had entered into force, legally committing the UK to cut its greenhouse gas emissions by at least 80% of 1990 levels by 2050. While emissions from international aviation were not explicitly included, both the Government and the Committee on Climate Change (CCC) were required under the Act to take them into account in the setting of budgets for other sectors, and to formally include them from 2012 unless there was a good reason not to do so.

CCC advised last year that following aviation's inclusion from the beginning of 2012 in the EU Emissions Trading System, there was a clear accounting methodology for the sector and no longer any good reason for its exclusion from carbon budgets. After the EU's decision to 'stop the clock' on EU ETS for all but intra-EU flights (pending formal approval, which was granted in 2013), however, the Government decided to postpone a decision on how to treat aviation under the Climate Act until there was greater clarity on whether EU ETS will resume following its 12-month deferment, or whether a global deal to replace it will be agreed in the interim.

The Government decision in December 2012 stated:

- "The 80% target within the Act is designed to be consistent with the level of effort likely to be needed globally if we are to meet our internationally shared goal to limit temperature increases to below 2°C3. This target applies to the UK economy as a whole"
- "Budgets for other sectors have been constrained so that, to 2027, the UK is on a trajectory that could be consistent with a 2050 target that includes emissions from international aviation and shipping"
- "Whilst we will revisit the issue of whether the net carbon account will be revised to include international aviation and shipping when we come to set the fifth carbon budget, Government reaffirms its overall commitment to the 2050 target and recognises 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."

The Government's Carbon Plan published in December 2011 had already included a number of 2050 scenarios that meet an emissions target of an 80% reduction on 1990 levels, including emissions from international aviation and shipping, and proposed actions to develop those options.

The wording of the Climate Act is such that it could be argued that to comply, the Government need only keep a watching brief on aviation and shipping emissions. CCC has made very clear, however, that excluding aviation and shipping from the 2050 target would result in the Climate Act effectively losing credibility. The 80% emissions target, as stated in the Government paper cited above, was based on the UK's economy-wide contribution to limiting global warming to 2 degrees, giving the UK a 2050 carbon budget of around 160 Mt CO2, according to CCC calculation. If aviation and shipping were not counted as part of this and instead were considered additional, with the result that the economy as a whole made less effort to reduce emissions, total UK emissions would be likely to be

around 200 Mt CO2 in 2050 – a level that would not be compatible, CCC argues, with meeting the UK's fair share of effort to limit (to no greater than 50%) the risk of global warming exceeding 2 degrees.

The relevance of the 2005/2050 target

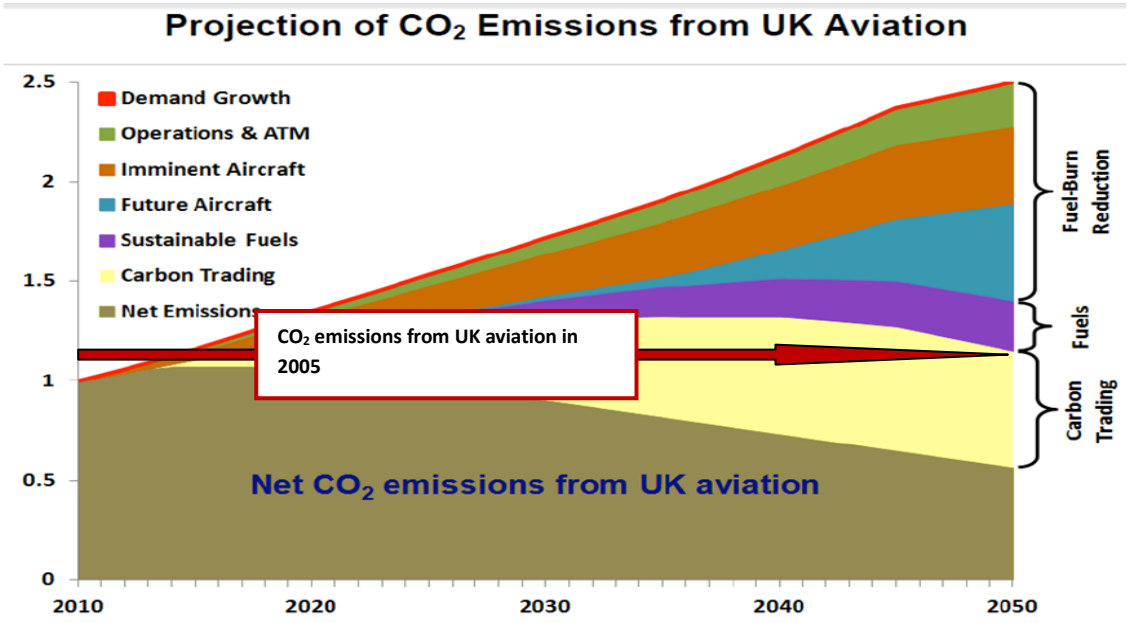
The current Government has neither endorsed nor rejected the national emissions target set in 2008. Nevertheless, we consider, it has ongoing relevance. Although not stated at the time, there are two separate grounds on which the target was probably based.

(i) The Sustainable Aviation Road Map

The industry coalition Sustainable Aviation had, some months earlier, published a CO2 roadmap giving an account of how UK aviation emissions might be brought back down to 2005 levels by 2050 through a combination of technology improvements, more efficient air traffic management and take-up of biofuels, but without recourse to carbon trading. In setting the 2050 aviation target at this level, the Government thus challenged the industry to deliver on its own promise. The Committee on Climate Change, however, having sought detailed and independent advice both on likely aviation demand and on possible means of mitigating the CO2 associated with it, concluded in 2009 that the target effectively proposed by Sustainable Aviation could not in fact be achieved without additional action such as carbon taxes or other measures to constrain demand *in addition to* various carbon efficiency options.

Sustainable Aviation responded in 2012 with an 'updated' version of its roadmap, in which the body expressed the view that "Any unilateral targets and measures that attempt to limit UK aviation's emissions through capacity constraints or price-related demand reduction will lead to carbon leakage, market distortion and the loss of economic benefit to our international competitors". Given its earlier implication, however, that technology and alternative fuels would be sufficient to meet a 2005/2050 target, such a national target should not have had any effect in terms of either carbon leakage or loss of economic benefit.

Rather than stating that it had previously been either dishonest or mistaken in its analysis, the updated SA roadmap included a new target, namely a commitment to a 50% reduction in CO_2 emissions by 2050 (based on 2005 levels), but also introduced a demand for carbon markets. In fact, however, SA's underlying analysis still supports a return to 2005 levels by 2050 without the need for market-based measures. The 2012 roadmap uses 2010 as a reference year, when emissions were nearly 11.5% lower than in 2005 (33.3 $MtCO_2$ in 2010 compared to 37.6 $MtCO_2$ in 2005, as indicated by DECC figures). Extending the reference year for the 2012 roadmap back to 2005 levels is consistent with the reduction expected in 2050 through alternative fuels, and technological and operational improvements alone. Thus SA is still publicly presenting figures suggesting a view that the 2005/2050 target is achievable without recourse to carbon trading while at the same time arguing against exactly this target.



Taken from 'Sustainable Aviation CO2 roadmap 2012'; red line superimposed by AEF

The Commission's climate paper refers to this roadmap as a 'voluntary action' to reduce emissions. We suggest that setting out unrealistic ambition cannot, however, be regarded as action. With respect to the other examples of industry action cited, it is essential that these be considered in context. Measures such as limited biofuel development and more efficient take-off procedures are already accounted for in DfT's and CCC's analyses.

(ii) CCC's assumptions on aviation emissions, as reflected in its wider analysis

In order to comply with the requirement of the Climate Act to take account of aviation emissions when setting carbon budgets, the Committee on Climate Change has adopted a working assumption with respect to the future level of these emissions, which happens to match precisely that of the previous SA target, namely that aviation's contribution to the economy-wide commitment to an 80% emissions reduction on 1990 levels will be a 0% cut on 2005 levels. It is notable that such target:

(a) Represents a 120% *growth* on 1990 emissions levels from aviation, taking into account the increase in emissions between 1990 and 2005
(b) Takes no account of non-CO2 gases (considered below), and
(c) Means that aviation would take up a quarter of all UK emissions by 2050, as against the 6% it represents today.

CCC's reasoning for allowing this degree of leniency towards aviation appears to be entirely economic, though we are not aware of any publicly available document indicating the comparative costs of alternative assumptions. The implication in a number of CCC analyses is that while it may be theoretically possible to achieve the 80% emissions target in different ways, none of these is cost-

optimal. The CCC's 2012 advice on aviation and shipping[5] sets out four possible scenarios in which the economy-wide target could be met despite barriers in (i) industry, (ii) aviation, shipping and non-CO2, (iii) heat for buildings and (iv) surface transport and power. CCC's commentary on each of these illustrates, however, the degree of challenge that would be involved. Under a scenario in which aviation, shipping and non-CO2 emissions were collectively higher than assumed in the basic model, for example, achievement of the target would require a total decarbonisation of buildings as well as power and transport sectors being very largely decarbonised.

Since the CCC's latest progress report, in 2012, on how well the UK is doing in terms of the change necessary to deliver the 80% target concluded that the "pace of measures to reduce emissions needs to increase fourfold"[6], the idea that it will be possible for some sectors to significantly *exceed* the CCC's current decarbonisation expectations seems fanciful. The Commission's paper suggests that "a significant overshoot of 2005 aviation emissions levels in 2050 would suggest more challenging reductions in other sectors." We believe that, realistically, it would require reductions in other sectors that are impossible to achieve.

We consider that a 0% reduction target based not on 1990 emissions levels but on (much higher) 2005 levels is in fact already very generous. Alongside the question of whether a target is economically optimal, no consideration appears to have been given to how emissions reduction responsibility would be allocated among different sectors on the basis of social justice. Justification for aviation's protected status with respect to economic instruments often centres either around its importance to the economy (on which we have commented in other submissions), or around the need to continue a trend of democratisation in air travel.

In fact, the growth in travel has been predominantly among the better off, as described, for example, in CAA (ERG) study published in 2008[7], which found that "passenger growth in recent years is coming at least as much from an increased flying frequency by those that do fly, as from a diminishing pool of non-fliers." Growth in air travel in recent years may thus have facilitated a greater concentration of flying among high earners – the very opposite of democratisation. The fact that the percentage of non-fliers in 2010 was higher than in 2001 – 53% as opposed to 51%[8] - lends weight to this analysis. This being the case, higher earners benefit most, and benefit increasingly, from the lenient terms under which aviation was included in the EU ETS, and from the fact that aviation is not being expected to make cuts in CO2 emissions that match those expected from other sectors under the Climate Act. The inevitable consequence is that additional cost must be borne by sectors such as power, which are far less discretionary than flying, such that people on low incomes will have to pay more to heat their homes.

[5] *International aviation and shipping review*

[6] http://www.theccc.org.uk/pressreleases/pace-of-measures-to-reduce-emissions-needs-to-increase-fourfold-says-committee-on-climate-change/

[7] Civil Aviation Authority, January 2008, *Recent trends in growth of UK air passenger demand*, page 55

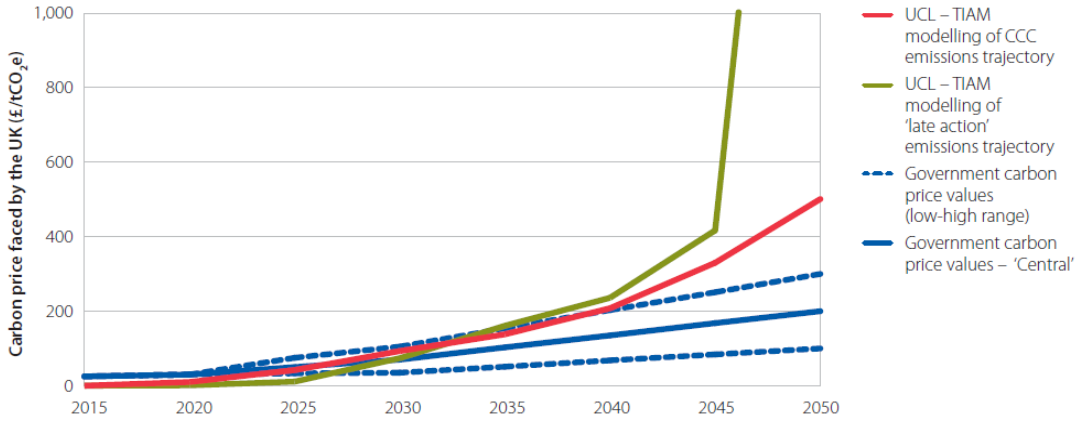
[8] DfT 2010, *Public experiences of and attitudes towards air travel*

If the EU ETS were to be revived or comparable global measures agreed, would this obviate the need for capacity constraint?

CCC's recommendation to the Government in 2012 in relation to aviation and the Climate Change Act was that aviation should be included at a level of 31 Mt – CCC's calculation of the UK's share of the cap imposed on airlines by the EU ETS, namely (from 2013 onwards) 95% of the average level of aviation emissions between 2004 and 2006. Such an approach to the sector's inclusion in the budgets would mirror the treatment of other sectors that are covered by the EU ETS. The figure, based on net emissions, says nothing about what actual aviation emissions will be, or should be. CCC (and others, including DfT) have elsewhere predicted that without additional measures, UK aviation emissions will grow significantly beyond this level between now and 2050. Inclusion of aviation on the basis proposed would not therefore require any additional 'effort' for airlines beyond their participation in the EU ETS.

But it is important to note that as discussed above, CCC also recommends that in the most cost-efficient pathway to meeting the UK's overall 2050 emissions target, aviation emissions are limited to 2005 levels by 2050 in gross terms (35 Mt for international aviation, or 37.5 including domestic aviation). The main reason for this is expected high carbon prices, as illustrated below.

Figure 1.6: Global carbon prices are likely to be high in 2050



Source: UCL Energy Institute (2012) modelling for CCC, DECC (2011) *IAG guidance for policy appraisal.*

Committee on Climate Change (2012) International Aviation and Shipping Review

CCC has always been reluctant to set out how a gross aviation emissions level not exceeding 37.5 Mt CO2 by 2050 could be achieved, though in principle the Committee prefers the concept of action at a global rather than a national level. AEF fully and very actively supports work taking place at the global level to tackle aviation emissions. Yet we consider appropriate action at a national level to be an essential complement to this.

We reject the argument made by CCC and others that because aviation is by its nature international, international policy is the only way to tackle its emissions. It is hard, in fact, to think of any sector in

a modern economy that is not in some sense international, yet nations have long accepted that while climate targets should be agreed globally as far as possible, it is the responsibility of states to decide how to deliver these targets domestically. The Climate Act, which brought the CCC into being and commanded a very high degree of political support, could itself be regarded as a unilateral UK action.

If CCC is correct in its analysis that carbon prices are likely to rise dramatically between now and 2050, and especially after 2030, as more and more countries become bound by climate change commitments such that they are unable to provide cheap 'offset' credits, it would be prudent for the Government to protect UK consumers, workers and industries from such an outcome. This is especially important for a sector such as aviation that is so dependent on oil (DfT predicts that even by 2050, be 97.5% of aviation fuel will be from conventional sources rather than alternative fuels,) as EC analysis[9] indicates that even if global action on climate change proves to be weak such that very high *carbon* prices do not materialise, global *fossil fuel* prices are likely to be high. Limiting dependence on fossil fuels makes sense in either scenario, the paper argues.

Finally, national-level commitments are an important tool for facilitating the success of wider agreements, and the UK has long set out to be a leader in terms of climate change. In 2011, when the Government was divided over whether to approve or reject the CCC's advice in relation to the fourth carbon budget, a leaked letter to the Guardian from foreign secretary William Hague stated, in support of CCC: "In order to retain public support for our climate policy at home we need to be able to point to similar effort abroad. If our domestic resolve is seen to be weakening, we will lose traction elsewhere."[10] The CCC advice was approved. We see no reason why a similar argument should not apply to aviation policy.

Implications of a national aviation emissions target for airport capacity

In July 2011, when Government passenger forecasts were still based on the runway policy of the Air Transport White Paper, AEF produced analysis for WWF-UK considering the existing capacity at UK airports. We assumed full utilisation but within the constraints of existing terminal and runway capacity and with no change to current planning agreements. We found that under these assumptions, UK airports allowed for passenger growth of around 60%, by coincidence precisely the level deemed by the Committee on Climate Change in their 2009 report to be compatible with a target of limiting aviation emissions to 2005 levels by 2050. While recognising that not all capacity was well positioned geographically to match up with demand, we noted that capacity constraints in the South East could be eased through the progressive increase in aircraft size that is evident from both historical trends and industry forecasts but not well-reflected in CCC's analysis.

The last two sets of Government forecasts have assumed, in contrast to earlier versions, that no new runways are built anywhere in the UK, but that there is some incremental growth in terminal capacity and that some additional planning permissions at regional airports are granted to allow increases in aviation activity. The latest forecasts, the lowest ever in terms of passenger numbers, and already incorporating carbon values under EU ETS as predicted by DECC (notwithstanding the

[9] European Commission (2011) *A roadmap for moving to a competitive low carbon economy in 2050* http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0112:FIN:EN:PDF

[10] http://www.guardian.co.uk/environment/2011/may/10/adair-turner-carbon-budgets-row?INTCMP=SRCH

assumed flatline after 2030), nevertheless predict that aviation emissions under the central scenario will reach 47 Mt CO2 by 2050: a level exceeding the 2005 level of 37.5 Mt by more than 25%.

Both our own analysis and DfT's forecasts thus suggest that there is sufficient, or possibly more than sufficient, capacity in the existing airports system to allow for the maximum level of growth that would be compatible with keeping aviation emissions to 2005 levels by 2050. The Liberal Democrats, having accepted this conclusion, have adopted party policy that there should be no net increase in UK runways, such that new capacity should be developed only to the extent that it is restricted elsewhere.

What will happen if UK airport capacity is constrained? (including our answer to: *Are there examples of how other countries have considered carbon issues in relation to airport capacity planning that we should be looking at?*)

The Commission paper presents innovative analysis of the 'carbon leakage' that could arise if UK limits to aviation growth were to result in demand shifting elsewhere in Europe. The analysis suggests that the argument that any UK-imposed capacity constraints would result in all CO2 leaking elsewhere is false. While there appears to be some emissions penalty at 2030, the downward long term trend in terms of the percentage of emissions leaked implies a value in UK action, even assuming that such action would be entirely unilateral and the EU ETS entirely dismantled.

In fact, however, we do not consider either of these assumptions to be justifiable, the reasons for which we set out in some detail below. Were the analysis to be revisited in the way we recommend, it seems very likely that the percentage of emissions leaked would fall significantly.

<u>Presentation of the analysis in relation to EU ETS</u>

First, the analysis is based on DfT figures that assume continuation of aviation's inclusion in the EU ETS. Yet an introductory paragraph states that "assuming the EU ETS (or an equivalent scheme) continues out to 2050, aviation continues to be included and that the scheme functions as intended, this would not result in any change in CO_2 emissions at an EU level. In such a scenario, CO_2 savings or displacement to other European countries by the UK aviation sector would all fall within the overall ETS cap, so there would in theory be no scope for emissions 'leakage' from UK to European airports". We broadly agree with this explanation (though it takes no account of the provision under ETS for the use of 'offset' credits from outside the EU which mean that the 'cap' is already a leaky one).

This being the case, the paper should spell out much more clearly that the leakage analysis has relevance only if the ETS falls through with no international agreement to replace it, a situation the EU says will not arise given its official position that EU ETS legislation will re re-implemented in full after a 12 month suspension for international flights unless ICAO proposes comparable measures. At present, the ETS remains in force for internal EU flights. This does not seem to be in any way reflected in the leakage analysis.

<u>Assumption of no constraints elsewhere</u>

A more fundamental weakness of the analysis is its assumption that no capacity constraints are experienced anywhere else in Europe. We accept that the policy situation in the UK is different in

some respects from that in other countries, including other countries in Europe. There are, we suggest, two possible explanations for this.

First, the aviation market in the UK is more mature than in many other countries, and aviation activity per person is unusually high. There is evidence that 'propensity to fly' in the UK, in terms of number of flights per capita, is higher than in any other developed nation[11]. And analysis published in April this year indicates both that the UK is second only to the USA in terms of total CO2 emissions from international flying, and that given its dominance in the long haul market, London Heathrow is responsible for significantly more CO2 emissions than any other airport globally – nearly 50% more than the next highest emitter, Dubai .[12] It should come as no surprise, therefore, that aviation emissions take a more dominant place in discussions about climate policy in the UK than elsewhere.

Secondly, following strong campaigning from environmental organisations in the UK, we now have world-leading legislation in the form of the Climate Act. Although every other country in Europe, as well as all those in the G8, has made climate commitments at least as demanding as those in the UK, the existence of the Act, and in particular the work of the Committee on Climate Change, has brought a level of focus on the implications of domestic climate change commitments that is perhaps unique. Prior to publication of the CCC's 2009 aviation report, the official policy position in the UK in relation to airport capacity and climate change matched that of most other EU states at present, namely that there was no need for capacity constraint given the existence of the EU ETS.

It is only very recently that policy makers have begun to take seriously the argument made for many years by environmental organisations that climate change commitments should have a bearing on the question of new runways. The court case brought by environmental NGOs and local authorities against the previous Government in relation to its decision on a third Heathrow runway (following which in 2010 Lord Justice Carnwath ruled that the Government should pay 60% of the claimants' costs and told the claimants that they should consider than they had 'won substantially'), has helped to force the UK Government to consider seriously how to ensure that its airports policy is compatible with the Climate Change Act. The fact that other states have yet to join the dots in quite the same way is no reason, we believe, for the UK to turn its back on this thorny question.

Climate commitments by EU hub competitors

At the latest UNFCCC talks in 2011, states reaffirmed their commitment to keeping global temperature rises at or below 2 degrees, and for the first time ever China, India and the USA signed up, under the 'Durban platform', to be part of a legally binding global climate treaty, the details of which will be defined in 2015. G8 nations, who bear more historical responsibility for emissions than others, have been committed since 2009 to cutting their emissions by at least 80% of 1990 levels by 2050. The EU is collectively committed to reductions of 80-95%[13] during this period, and of 20% by 2020, with this latter commitment explicitly including emissions from international aviation[14].

[11] TGI (*2007) Green values: consumers and branding*

[12] Southgate, D (2013) *Aviation carbon footprint: global scheduled international passenger flights 201.* http://southgateaviation.wordpress.com/

[13] European Commission (2011) White Paper: Roadmap to a single European transport area – towards a competitive and resource-efficient transport system

[14] Hill et al (2012) *EU transport GHG: Routes to 2050 II*

Domestic climate legislation exists in all those EU countries with major aviation hubs[15]. In Germany, the Government has committed to a 40% cut in greenhouse gas emissions by 2020: a much more stringent target than that agreed by the EU as a whole, and as a G8 member, the country is also a signatory to the 80% by 2050 commitment. The Netherlands has committed to a 30% emissions cut by 2020. France is committed to a 20% reduction on 1990 emissions levels by 2020, rising to 30% under international agreement, mirroring the EU's position, and domestic 'Grenelle' legislation commits the country to a 75% emissions reduction by 2050 (not greater than 140 Mt CO2e), though as a G8 member, France is also a signatory to the 80% commitment.

While we are not aware of any official advice on how to account for aviation emissions in the context of national commitments in France, Germany or the Netherlands, we suggest that the commitment of France and Germany to a minimum 80% emissions cut, and that of the Netherlands to a 40% cut by 2020, should be understood in the same context as that of both the UK and of the EU as a whole, in other words that it should be assumed to include emissions from international aviation in addition to those domestic emissions currently accounted for under the Kyoto Protocol. While states without the UK's system of carbon budgets may not yet have been forced to acknowledge the detail of what their national commitments should include, it is clear that the scientific basis on which emissions cuts of at least 80% from developed countries were based assumed that these reductions were economy-wide and did not exclude politically difficult sectors such as aviation.

A forthcoming Eurocontrol report[16] will forecast significantly slower growth in European aviation demand than previously expected , mirroring DfT analysis for the UK market and resulting in significantly reduced expectations for runway expansion. Nevertheless, the challenge highlighted by NGOs and others of reconciling anticipated growth in aviation emissions with the overall emissions reductions required across Europe remains. If the ICAO talks end in an agreement that represents any watering down in terms of scope or stringency compared with the EU ETS, it is likely that NGOs would look for states to take complementary action or introduce alternative policy to fill the gap.

Finally, while UK campaigning on aviation focuses on climate change to an extent that is not replicated elsewhere, there are pockets within Europe of very strong opposition to airport expansion. Eighteen months after the opening of Frankfurt's fourth runway, thousands of protesters have met almost weekly calling for its closure on the basis of noise impacts. On 11th May this year in Nantes, France, around 30,000 people including farmers and people from rural communities as well as environmental campaigners, gathered to protest against a proposed new airport at Notre-Dame des Landes. Over the past two years public protest has proved a significant setback to proposals to build a third runway in Munich (with a poll by the City of Munich last year resulting in a no vote from residents) and planned airports in Siena and Viterbo in Italy have been successfully challenged. Attempts to build a 3rd runway at Vienna have similarly seen strong opposition.

[15] GLOBE International (2013), *Climate Legislation Study: A Review of Climate Change Legislation in 33 Countries: Third Edition*. Edited by Townshend T et al

[16] Draft summary available on request

Summary in relation to the Commission's leakage analysis

1) While the UK may currently be ahead of the game in terms of linking aviation policy with climate change commitments, all our hub competitors have similar commitments and with huge pressure for aviation's inclusion in EU ETS to be permanently revised, the challenge of how EU states deal with aviation's predicted emissions growth is likely to remain on political agendas in the coming years. Given the EC's inclusion of international aviation in its 2020 target and the scientific basis on which G8 nations have collectively committed to CO2 cuts matching those of the UK, we can see no justification for aviation emissions to be regarded as additional to national emissions totals, notwithstanding the more limited requirements of the Kyoto Protcol.
2) The combination of economic pressures, falling demand forecasts, and pockets of strong campaigning prompted by aviation's local environmental impacts is such that runway building and expansion of aviation within Western Europe is likely to become increasingly challenging.
3) The leakage analysis presented in the Commission's paper cannot currently, therefore, be regarded as robust, given its assumption that no capacity constraints exist elsewhere in Europe. If it is to be treated as significant in the Commission's wider assessment of airport capacity need, it should be re-run on the assumption that all EU states meet their climate change commitments, and taking into account likely local opposition to individual expansion schemes.

How could the analysis be strengthened, for example to allow for the effects of non-CO_2 emissions?

In its 1999 report *Aviation and the Global Atmosphere*[17] the IPCC listed all known climate impacts of aviation, and gave their effects to date in terms of warming or cooling by ranking them in a Radiative Forcing Index. Subsequent scientific work for the IPCC has led to updates in some of these values. Chapter 5 of the Working Group III section of the Fourth Assessment of 2007 report[18] contains figures indicating a total aviation RFI of around 1.9 (excluding cirrus cloud impacts), indicating that the total historic impact of aviation on atmospheric warming has been around twice that of CO2 alone. However, atmospheric scientists have argued that use of RFI as a forward-looking policy tool is not accurate, as the different atmospheric impacts of aviation have very different durations.

The more recent focus for scientists working in this area has been on developing the use of an alternative metric, Global Warming Potential, for aviation and as noted in the DfT's UK Aviation Forecasts for 2013, "the estimated 100-year Global Warming Potentials from Lee et al (2009) indicate that, once the non-CO2 climate effects of aviation are taken into account, aviation's overall climate effects could be up to double the climate effect of its CO2 emissions."

Whether coincidentally or not, in other words, the value to which scientific research now appears to be pointing is almost precisely the value that has so far had prominence in policy analyses, if not in policy itself, concerning aviation's non-CO2 impacts. When the terms for aviation's inclusion in the EU Emissions Trading System were being debated, for example, the European Parliament proposed that as a proxy for the sector's non-CO2 impacts a multiplier of 2 should be applied to CO2 values – a policy opposed by the Council of Ministers. The compromise reached was that while the ETS would cover only aviation's CO2 emissions, separate legislation would be proposed to tackle nitrogen

[17] http://www.ipcc.ch/ipccreports/sres/aviation/index.htm
[18] Section 5.2.1, http://www.ipcc.ch/publications_and_data/ar4/wg3/en/ch5s5-2.html

oxides (NOx), the most significant of the sector's non-CO2 emissions. In the text entered into the Official Journal of the European Union on 13th January 2009, recital 19 of Directive 2008/101/EC[19] states that "Emissions of nitrogen oxides will be addressed in other legislation to be proposed by the by the Commission in 2008". The EC has failed to fulfil this commitment. No UK measures are currently proposed to fill the gap.

AEF has always argued that the longer policy makers wait for scientific consensus around the ideal way of measuring the non-CO2 impacts of aviation, the harder it will be to bring these impacts within national, EU and global limits, and we have suggested that as a first step, all modelling and forecasts for aviation emissions should include an estimate of non-CO2 impacts based on the latest available science, which currently appears to suggest a doubling of any figures for CO2. The CCC's 2009 aviation report[20] illustrated graphically how significant the effect on UK climate policy could be if aviation's non-CO2 impacts were accounted for in this way. An alternative, though more bureaucratic, approach to the adoption of a 'multiplier' for aviation's non-CO2 effects would be to develop a suite of policies to tackle each impact separately. We accept that some operational and policy responses to climate do require an understanding of how impacts relate to each other. For example, it is clear that some measures – such as flying longer or lower to avoid contrail formation – should be considered only if the associated contrail/cirrus avoidance outweighs the extra carbon/fuel burn. Policy measures that could reduce NOx emissions, however, (such as economic instruments or standards) have fewer trade-off consequences.

Advice from atmospheric scientists is, as we understand it, that there is currently no way to take forward any policy option to tackle aviation's non-CO2 impacts without further work being undertaken, and that funding cuts are such that this work has no scheduled date. Given this stalemate, we suggest that the Airports Commission:

- Avoid any statements that suggest that aviation's non-CO2 emissions have been included if only Kyoto greenhouse gases (which are irrelevant for aviation) are being considered; the climate paper, for example, makes the misleading claim that "globally, aviation accounts for around 1–2% of greenhouse gas (GHG) emissions"
- Request from the relevant climate scientists an estimate of the GWP of aviation's non-CO2 impacts based on the period between now and 2050; GWP is currently based on a period of 100 years, which has limited relevance to the UK policy context
- In the absence of better guidance, seriously consider the use of a 2x multiplier for illustrative purposes.

What conclusions should be drawn from the analysis of effectiveness, and relative cost, of airport capacity and other abatement measures in Chapter 5? Are there alternative analytical approaches that could be used to understand these issues?

The DfT's analysis of the likely cost of various abatement measures should, we consider, be treated with some caution. The document itself contains numerous caveats in relation to its input assumptions, but there are a number of points in particular than concern us:

[19] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32008L0101:en:NOT
[20] Pages 129-132

1. Direct financial incentives, through taxes or charges, were not considered on the basis that taxes are a matter for UK Treasury alone. Previous modelling suggests, however, that increases in Air Passenger Duty could help limit demand for aviation to sustainable levels, and carbon taxes were among the measures listed by CCC in their 2009 report as a way to ensure compliance with the then Government emissions target for aviation. The Commission's paper states that: "the 1944 Convention on International Civil Aviation (the 'Chicago Convention'), which established the ICAO, prohibits signatory states from imposing taxes on fuels purchased for use in international aviation". This could technically be challenged[21], though the convention has been interpreted in this way by numerous legislators, who have subsequently made tax-free aviation fuel a condition of bilateral air services agreements. Nevertheless, the option of ticket taxes remains and we were disappointed that it was given no consideration in the DfT's work.

2. It is essential to note that the analysis assumed no runway increases. Imposing capacity constraints in this situation would therefore involve restricting airports' use of existing infrastructure and planning permissions. Such a step seems likely to us to be both difficult and expensive for any government, and the analysis has little relevance to the Commission's current consideration of potential new airport capacity.

3. As noted in the Commission's summary, in relation to the capacity constraint option in particular, DfT includes an estimate of the 'cost' of anticipated loss of welfare to passengers who become unable to travel. We regard such a figure to be particularly unreliable, however, given the lack of any evidence being cited to indicate whether increased aviation mobility increases wellbeing or whether people in fact adjust their expectations in line with circumstances such that they find other ways, for example, of spending holiday time.

4. While some of the measures proposed appear to be low-cost or even cost-saving, there are numerous practical and political considerations that must be taken into account. This is particularly true of proposals to further increase the efficiency of airspace use.

5. Biofuels feature heavily in the DfT work. But while it was once considered that the use of all such fuels was carbon neutral, the EU has begun to tighten up its rules to reflect the fact that this is not the case[22], and many environmental organisations feel that the EU's carbon accounting in relation to biofuels requires further amendments. The CCC estimated in 2009 that if biofuel were to represent 10% of aviation fuel, it would cut emissions by only 5%. More recently, the body has advised Government that it is economically preferable for biofuels, given their scarcity, to be used either for construction or in power plants with carbon capture and storage, rather than in aviation (for which biomass must be converted into liquid jet fuel). It is thus questionable whether government investment in aviation biofuels, which the DfT MAC analysis suggests would be a relatively cost-efficient measure, would in fact be a wise use of public resource. Such investment could, meanwhile, be regarded as a further subsidy to an industry which already enjoys tax exemptions, given the cost savings that biofuels can provide with respect to EU ETS compliance.

[21] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2001:026E:0065:0066:EN:PDF
[22] https://www.gov.uk/renewable-transport-fuels-obligation