

The Impact on Aviation of a UK Net Zero Greenhouse Gases Target

Prepared by Richmond Heathrow Campaign (RHC)

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Note, this Paper has not been updated but continues to broadly reflect the views of RHC as at September 2020

Background

1. The report by the Committee on Climate Change (CCC) '*Net Zero: The UK's contribution to stopping global warming May 2019*' recommends to Government a new omissions target for the UK which is **net zero greenhouse gases by 2050**. The target fully meets the Paris Agreement, 2015 which has been committed to by the UK. The report says this is necessary and achievable, and in doing so it excludes international credits and includes international aviation. The main component of greenhouse gases (GHG) is long-lived CO₂ but the target also includes short-lived gases such as methane. The prime Minister now seeks to set the UK target in law through a statutory instrument. The new target replaces that set in law in 2008 which targeted a UK reduction of GHG by 80% from 800 MTCO_{2e}¹ in 1990 to 160 MTCO_{2e} in 2050. There have been successes, particularly in power generation, with the UK's total GHG emissions, including aviation and shipping, reduced to 503 by 2017.
2. The CCC says current pledges around the world would lead to warming of around 3°C by the end of the century. This is well short of the Paris Agreement's long-term goal to limit the rise to well below 2°C and to pursue efforts to achieve 1.5°C.
3. A UK net-zero target requires deep reductions in GHG emissions, with any remaining sources offset by removals of CO₂ from the atmosphere (e.g. by afforestation). Net emissions, after accounting for removals, must be reduced by 100%, to zero.
4. The current CCC estimates are in the form of three options - Core, Further Ambition and Speculative. The CCC's Core estimates see GHG emissions reducing to around 210 MTCO₂ in 2050 or 195 MTCO_{2e} net. The Further Ambition scenario sees GHG emissions of around 90 MTCO_{2e} or net 35 MTCO_{2e} by 2050. The CCC believes that with speculative policies and efficiency improvements it should be possible for the UK to reach net-zero by 2050.

Aviation

5. Aviation remains one of the 'hard to reduce' sectors. The target set in 2008 was for aviation emissions to be no higher in 2050 than in 2005, i.e. 37.5 MTCO_{2e}. Aviation GHG emissions have more than doubled since 1990 and stood at 36.5 MTCO_{2e} in 2017. The majority of aviation emissions are from long-haul flights (96%) measured as emissions from departing flights (UK international arrivals are for the account of other territories).
6. Chapter 6 of the CCC's Net Zero Report focuses on Aviation and Shipping and says that there will be a further report in 2019 but it is not clear what might be added.
7. The topic is important in relation to the Government's Green Paper on Aviation Strategy that seeks to establish the relationship between UK aviation growth and environmental sustainability. It is also crucial in defining the planning conditions for any DCO approval

¹ MTCO_{2e} is metric tonnes of carbon dioxide including equivalent tonnage for other greenhouse gases.

of Heathrow's NWR expansion, whereby capacity is only released as environmental constraints are satisfied.

8. The CCC's Core options are aligned to the 2008 planning assumption, i.e. aviation 37.5 MTCO₂e by 2050. The CCC says in Chapter 6 page 173 of its report that these aviation emissions could be achieved through a combination of fuel efficiency improvement of around 0.9% per year, limited use of biofuels (i.e. 5% in 2050), and by limiting growth in UK passenger demand to 60% above the 2005 level of 230 million passengers per annum (mppa), i.e. 368 mppa in 2050.
9. The CCC's Further Ambition options identify additional opportunities to reduce aviation emissions below the Core options, to 30 MtCO₂e in 2050 (29.0 MTCO₂e from international flights). The assumptions are that fuel efficiency improvement rises to 1.4% per annum and biofuel uptake rises to 10% in 2050.
10. The CCC's Speculative options examine two scenarios - scenario one, where UK passenger demand is constrained to 40% above 2005 levels, i.e. 322 mppa in 2050, which saves around 4 MTCO₂e (compared to the 60% option), and scenario two, where UK passenger demand is constrained to 20% above 2005 levels, i.e. 276 mppa, which saves around 8 MTCO₂e (compared to the 60% option). Actual UK passengers were already 267 mppa in 2016. The Speculative options could reduce aviation emissions to 22 MTCO₂e.
11. Clearly aviation itself will be far in excess of net zero emissions by 2050. The use of the UK's negative emissions (e.g. afforestation) to offset aviation's gross emissions may not be the most effective or efficient use of the offsets. For example, choices may have to be made between offsetting long-haul flights for leisure and offsetting agricultural emissions that are also 'hard to reduce'.

Aviation Demand Management

12. Besides fuel efficiencies and use of biofuels, the CCC advises the Government to manage aviation passenger demand. The DfT's 2017 passenger demand forecasts (DfT 17) were used in support of the Airports National Policy Statement (APNS), which parliament approved in June 2018 in support of Heathrow's northwest runway expansion (NWR). The passenger estimates for 2050 were 410 mppa in the Do-Minimum case and 435 mppa in the NWR case. The Government said the planning limit of 37.5 MTCO₂e in 2050 could be met by a variety of abatement measures. But it would appear that achieving the limit also depended on including the price of purchasing global carbon credits. Almost exactly the same passenger numbers were modelled by the Airports Commission in 2015 in its AON carbon traded scenario.
13. The CCC has now advised against the UK relying on global credits and the use of global credits is excluded by the CCC when modelling of UK net zero target emissions. This suggest aviation passenger demand will have to be managed down to the CCC's target of passenger growth of no more than 60% between 2005 and 2050 in order to limit aviation emissions to 37.5 MTCO₂e, i.e. a maximum of 368 passengers in 2050.
14. To examine the consequences of deeper demand management, we refer to the Airports Commission's forecasts 2015 (see Table 2 below). The so called AON CC (carbon capped case) was the central case prepared by the Commission. There are no carbon credits assumed but a carbon price is applied to tickets so as to constrain demand and achieve

aviation emissions of 37.5 MTCO₂e in 2050. In the Do-Minimum case demand is restricted to 386 mppa. This is higher than the CCC 60% growth limit or 368 mppa in 2050, but it achieves the same 37.5 MTCO₂e of emissions.

15. As we have pointed out above, it will be necessary to reduce aviation emissions to much lower levels than 37.5 MTCO₂e and the equivalent 368 mppa passengers in order for the UK to achieve net zero emissions. But the reduction needed will depend on allocation of the negative emissions between aviation and other sectors of the economy. In addition, a contingency requiring further reduction in demand growth is needed to cover the uncertainties in mitigation of emissions, not only from aviation but other sectors of the economy.
16. Under the above circumstances, there is no justification for Heathrow's NWR expansion. If expansion proceeds there is a large risk that demand will have to be restricted to such an extent that the project becomes financially at risk. However, as we see from forecasts by the DfT and Airports Commission, demand management reduces growth at other UK airports and not at Heathrow. This has a seriously negative impact on the north-south economic balance.

The Impact of Aviation Demand Management on the Balance of Regional growth

17. Table 1 shows the allocation of passenger demand between airports in the Base Case (Do-Minimum) in 2050 using the DfT17 forecasts. NWR expansion, due to carbon costs through the purchase of credits or otherwise, results in a reduction in growth at other airports, particularly at the regional airports, as shown in the Table 1.

Table 1	DfT 2017 Passenger Demand Forecasts with and without Heathrow's northwest runway (NWR)			
Million Passengers per annum	Base 2016	Base 2050	NWR 2050	NWR-Base 2050
Heathrow	76	93	136	43
London ex Heathrow	86	112	112	0
Larger Regional airports	81	151	143	-7
Other Regional Airports	23	53	44	-10
Total UK	267	410	435	26
I-I Transfers	24	5	21	16
UK Terminating	243	405	414	10

18. London ex Heathrow comprises Luton, Gatwick, Stansted and London City airports. Larger Regional Airports lose growth of 7 mppa by 2050 and other Regional airports lose 10 mppa. So while the NWR services 43 mppa by 2050 only 26 mppa are added to the UK as a whole.
19. Compared to the case using the DfT 17 forecasts, the Commission's carbon capped forecasts reduce total UK passengers to 369 mppa in 2050 with the NWR expansion. Heathrow's NWR expansion adds 41 mppa but reduces total UK passengers by 17 mppa. London ex Heathrow airports lose growth of 14 mppa, Larger Regional airports lose 28 mppa and Other Regional airports lose 16 mppa (see Table 2).

Table 2	Airports Commission Passenger Demand Forecasts 2015 with and without Heathrow's northwest runway (NWR)			
Million Passengers per annum	Base 2016	Base 2050	NWR 2050	NWR-Base 2050
Heathrow	76	94	135	41
London ex Heathrow	86	107	93	-14
Larger Regional airports	81	133	105	-28
Other Regional Airports	23	52	36	-16
Total UK	267	386	369	-17
I-I Transfers	24	8	30	22
UK Terminating	243	378	339	-39

20. From the above analysis it is clear that NWR expansion causes significant harm to the UK aviation market by scavenging passenger growth from other airports and in particular the regional airports. This leads to negative impact on the regional economic balance with the south east.
21. Still deeper demand reductions required to satisfy the UK net zero carbon emissions are likely to cause still greater scavenging of growth from other airports than indicated by the Commission's AON carbon capped case, illustrated above.
22. The only possible viable conclusion, if the UK is to achieve net zero carbon emissions, is for Heathrow's NWR expansion to be abandoned. Heathrow is the UK's largest single source emitter of greenhouse gases of around 18 MTCO_{2e} per annum and its GHG emissions need to be reduced and not increased with the NWR expansion.

The Impact of Abandoning Heathrow's NWR Expansion on Purpose of Travel

23. The impact of reducing demand is illustrated by comparing the Do-Minimum and NWR expansion cases. Abandoning the NWR expansion and reducing demand actually is neutral or positive on most aviation accounts. We have shown above this to be the case in maintaining the north-south economic balance. Other neutral or positive outcomes relate to the purpose of travel and connectivity. We discuss these below.
24. Table 3 shows the impact of the NWR expansion on the UK aviation market based on the DfT17 forecasts. Abandoning the NWR expansion has the reverse impact to that shown in Table 3. So Heathrow would not add 43 mppa by 2050 but other UK airports would not lose growth of 17 mppa. The UK would lose 26 mppa of additional passengers. But 16 mppa of these are international-to-international transfer passengers, which we argue later provide no value to the UK anyway. The overall result from abandoning the NWR expansion is a loss of UK terminating passengers of just 10 mppa out of 410 mppa in 2050 and restoration of grow at regional airports.
25. Table 3 shows that UK wide business travel is not materially impacted by abandoning the NWR expansion. There is a small loss of 2 mppa leisure foreign resident passengers (e.g. inbound tourists). The loss of 6.4 mppa of leisure UK resident passengers is relatively small and in any event has a positive balance of payments outcome.

Table 3	2016	Do-Minimum 2050			Increment LHR NWR-DM 2050		
		Total UK	Heath row	Rest of UK	Total UK	Heath row	Rest of UK
million passengers per annum							
<i>Business UK resident, international</i>							
Short-haul	15.0	7.1	21.2	28.3	3.3	-2.6	0.7
Long-haul OECD	1.8	2.5	0.8	3.2	0.1	-0.1	0.0
Long-haul NIC	1.8	3.7	1.1	4.7	0.1	-0.1	0.0
Long-haul LDC	0.2	0.4	0.0	0.4	0.0	-0.0	0.0
Total Business UK resident, international	18.7	13.6	23.0	36.6	3.4	-2.7	0.7
<i>Business foreign resident, international</i>							
Short-haul	13.4	7.6	16.5	24.1	3.1	-2.9	0.2
Long-haul OECD	1.7	2.1	0.4	2.5	0.1	-0.1	0.0
Long-haul NIC	1.5	3.3	0.6	3.9	0.0	-0.0	0.0
Long-haul LDC	0.1	0.2	0.0	0.2	0.0	-0.0	0.0
Total Business foreign resident, international	16.7	13.2	17.5	30.7	3.2	-3.0	0.2
Leisure foreign resident, international	51.2	22.1	56.1	78.2	6.9	-4.9	2.0
Leisure UK resident, international	124.8	39.4	170.5	209.9	13.0	-6.6	6.4
Business domestic end-end	15.1	0.7	22.7	23.4	0.4	-0.3	0.1
Leisure domestic end-end	16.2	0.6	25.2	25.8	0.4	0.1	0.5
International-to-international transfers	23.9	3.8	1.1	4.9	15.8	0.0	15.8
Total	266.6	93.4	316.1	409.5	43.0	-17.3	25.8

The Impact of Abandoning Heathrow's NWR Expansion on Connectivity

26. The DfT 2017 forecasts demonstrate that the NWR expansion results in a net loss of just one destination from the UK, based on 394 destinations. There is a loss of 3 short-haul and a gain of 2 long-haul destinations. So abandoning the NWR expansion would have no material impact on the number of destinations from the UK.
27. We conclude that the increase in frequency of flights at Heathrow as a result of the NWR expansion is likely to benefit the already popular routes with diminishing marginal benefit and without much if any increase in the frequency on Thin routes. Furthermore the regional airports seemingly reduce route frequency. So abandoning the NWR expansion would benefit frequencies from regional airports and have no material loss from reduced frequencies at Heathrow.

International-to International (I-I) Transfer passengers demand reduction

28. Most I-I transfers arise at Heathrow, (e.g. in 2016: Heathrow 20.7 mppa, Gatwick 2.1 mppa, other 1.1 mppa). Without NWR expansion the I-I transfers are priced out of Heathrow, given the lower charging competitors such as Schipol. The I-I transfers at Heathrow decrease to 3.8 mppa by 2050. But the NWR expansion results in an increase of 15.8 mppa I-I transfers at

Heathrow by 2050, compared to the Do-Minimum. By far the greatest beneficiaries of NWR expansion are the international-to-international transfers, as shown in Table 3.

29. The Commission and DfT17 give weight to the importance of I-I transfers supporting new long-haul destinations with potentially rich business opportunities. However, we question whether these transfers support thin destinations or business passengers and we question the diminishing returns from adding frequency to already popular routes serving the leisure market and other high frequency routes.
30. In December 2017 RHC examined the DfT’s dis-aggregated data set published as part of the DfT 17 forecasts. Our assessment is that the additional I-I transfers from the NWR expansion option have a substantial negative impact on the aviation market and on the UK economy. The assessment can be seen on the RHC website www.richmondheathrowcampaign.org ‘Revised Draft Airports National Policy Statement’.
31. In our December 2017 response to the Revised draft NPS, we concluded the following in regard to I-I transfers:
 - a. I-I transfers add no economic benefit to the UK and the webTAG valuation in the Revised draft NPS erroneously includes £5.5bn (present value) in “Passenger Benefits” for I-I transfers - resulting in an overstatement of the NWR incremental value by like amount.
 - b. Only 1% of I-I transfers in 2016 were on thin long-haul destinations from Heathrow (a thin route being defined as less than one departure and one arrival a day). Out of 36 such destinations, there were only 8 that had any I-I transfers and our examination suggested that even these would be viable without transfers because there were sufficient terminating passengers to maintain the frequency of service or to provide at least a weekly service. Analysis of a similar data set for 2011 provided very similar results. The figures are annual averages so that in practice with variations in demand over the year, there could be occasions where I-I transfers do contribute to sustaining an otherwise unviable service. But we pointed to further evidence in the DfT17 forecasts, which showed that a forecast reduction in Heathrow’s I-I transfers from 21 million passengers per year (mppa) in 2016 to 4 mppa in 2050 in the Do-Minimum case does not seem to harm the growth in terminating business passengers from 14 mppa to 27 mppa over the same period.
 - c. Table 4 shows the distribution of I-I transfer passengers between long-haul and short-haul destinations and between thin and thick destinations in 2016. There were just 317,000 I-I transfer passengers to thin long-haul destinations out of 24 million I-I transfer passengers (i.e.1%). Conversely, 99% travelled to thick destinations, including short-haul.

Table 4	Heathrow International Destinations in 2016 I-I Transfer passengers (‘000)		
Source CAA	Long-haul	Short-haul	Total
Thin destinations	317	0	317
Thick destinations	13,091	10,560	23,651
Total	13,408	10,560	23,968
Thin destinations: under 2 movements per day (arrival & departure); Long-haul: 3,500km and over			

- d. Most I-I transfer passengers travel to popular destinations that already have high frequency service as demonstrated by Table 4. For example, adding more passengers, say, to the 28 daily departures from Heathrow to New York (JFK and Newark) has little marginal benefit in terms of convenience.
- e. People prefer direct flights and direct flights produce less CO2 and noise emissions. The NWR expansion concentrates noise pollution over an already heavily polluted London, not only from the 17 mppa taken by Heathrow from growth dispersed across other UK airports but also from 16 mppa unnecessary I-I transfers, together representing 77% of the NWR capacity.
- f. RHC's analysis shows that the NWR expansion adds 15.8 mppa I-I transfers by 2050; 1.0 mppa are on journeys in which both legs are short-haul, 13.0 mppa are on journeys where one leg is long-haul and the other is short-haul and 5.6 mppa are on journeys where both legs are long-haul (i.e. 19.6 transfers in total). The point here is that the short-haul leg takes up Heathrow's capacity for no direct benefit. It is claimed that Heathrow's capacity is best used for long-haul. The short-haul does feed the long-haul leg, where there is one, so we need to examine the long-haul segments. NWR expansion adds 9.3 mppa long-haul I-I transfers by 2050.

OECD Destinations. There are 5.0 mppa additional long-haul I-I passengers travelling to/from OECD countries by 2050. But the NWR expansion only adds 1.8 mppa terminating Direct international and Domestic interliner passengers by 2050 to the OECD destinations (i.e. around 73% of additional passengers to the USA, Canada and Australia are I-I transfers)..

NIC Destinations. NWR expansion adds 3.5 mppa long-haul I-I transfers to NIC countries by 2050. But the NWR expansion adds only 1.5 mppa terminating Direct international and Domestic interliner passengers by 2050 to the NIC destinations. (i.e. around 70% of additional passengers to the Far East, India, Latin America, Middle East and South Africa are I-I transfers).

LDC Destinations. NWR expansion adds 0.8 mppa long-haul I-I transfers to LDC countries by 2050. But the NWR expansion adds only 0.1 mppa terminating Direct international and Domestic interliner passengers by 2050 to the LDC destinations. (i.e. around 90% of additional passengers to Africa are I-I transfers).

We submit there is little or no economic value to the UK from the additional I-I travel to OECD, NIC or LDC countries and the outcome is highly inefficient use of Heathrow's additional NWR capacity

- 32. Table 5 below shows that the NWR expansion results in only 0.8 mppa additional terminating long-haul passengers for the whole of the UK by 2050. We should place the matter into context - the forecast number of passengers in 2050, assuming the NWR expansion, is 136 mppa for Heathrow and 435 mppa for the UK as a whole. The table demonstrates how the additional NWR capacity is wasted on I-I long-haul transfers.

Table 5	Incremental (LHR NWR minus Do-Minimum) Passengers, 2050				
mppa	Heathrow	Rest of UK	Total UK	Heathrow I-I	UK Terminating*
Long-haul	12.8	-2.7	10.0	9.3	0.8
Short-haul	29.5	-14.4	15.1	6.5	8.6
Domestic	0.8	-0.2	0.6	na	0.6
Total	43.0	-17.2	25.8	15.8	10.0

Note: There are rounding differences. *excludes de-minimis impact of the NWR expansion on the relatively few I-I transfers at airports other than Heathrow.

33. Regarding short-haul destinations, an additional 8.6 mppa terminating short-haul passengers are serviced by the NWR expansion. But the UK has ample existing and planned short-haul capacity for the foreseeable future. It does not need the highly expensive NWR expansion to service this segment of the market. Moreover there are 6.5 mppa short-haul I-I transfers of no economic value to the UK.
34. Moreover, unlike passengers terminating in the UK, I-I transfers are exempt from Air Passenger Duty. The Terminal Five Public Inquiry was informed that an increase in transfer passengers reflected a new airline strategy. The adoption of this strategy, which diverges from the likely passenger preference for direct flights, may have been influenced by two state interventions in the early 1990s:
- In 1993 the “use it or lose it” rule was introduced for airlines holding slots at Heathrow and other major airports, whereby slots have to be used for not less than 80% of the allocation or surrendered (with no compensation) for re-allocation to competing airlines.
 - In 1994 Air Passenger Duty was introduced with an exemption for transfer passengers for the specific purpose of encouraging transfers at UK airports (primarily Heathrow). Sir John Cope MP (Paymaster General) said *“We are concerned to maintain the international position of the British air transport industry particularly that of Britain’s hub airports, such as Heathrow, and to help the airlines serving them, by preventing the tax from acting as a disincentive to passengers changing planes in Britain.”* (Hansard, 31 Jan 1994, Col. 643).
24. Abandoning the NWR expansion would reduce the I-I transfers but as explained above there would be no loss to the aviation market or the UK economy. RHC proposes that reducing I-I transfers through proper taxation would also be an effective and efficient way to reduce UK demand without negative consequences and in doing so it would reduce UK aviation emissions. It is surely preferable to reduce I-I transfers than UK resident terminating demand in a demand constrained environment.

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