



Carbon

Heathrow Expansion Factsheet 3

What impact would a new runway at Heathrow have on UK Carbon commitments?

In 2009 the government adopted a target to reduce UK aviation emissions back to the 2005 levels of 37.5 million metric tonnes of CO₂ by 2050, which is 25% of the UK's total CO₂.

Carbon capping may provide some scope to meet this but would result in re-distributing growth to Heathrow at the expense of the rest of the UK economy. Carbon trading would challenge the rest of the UK economy for limited carbon credits and only be practical if adopted worldwide.

There is therefore a risk that Heathrow airport's growth will be constrained even more than currently predicted in the Airports Commission's modelling by the impact of carbon emissions, potentially rendering a third runway uneconomic.

What's the issue?

1. The UK is legally bound through its Climate Change Act 2008 to reduce CO₂ levels by 80% from 800 Mt CO₂ in 1990 to 160 Mt CO₂ in 2050 (Mt=million metric tonnes) [\[1\]](#). The reduction is compatible with the aim that the UK should not exceed the world's average per capita CO₂ emissions, estimated by the United Nations Framework Convention on Climate Change, so that the rise in Global temperature should not exceed 2°C above pre-industrial levels. There is the possibility that this will be tightened to 1.5°C.
2. In 2009 the government adopted a target to reduce UK aviation emissions back to 2005 levels (37.5 Mt CO₂) in 2050 (equivalent to 25% of the allowable UK total CO₂ in 2050). The Committee on Climate Change (CCC) says this is the maximum level of emissions for the sector compatible with the Climate Change Act 2008. (The CCC is an independent, statutory body established under the 2008 Act). At present, aviation and shipping CO₂ are not formally included in carbon budgets but 'headroom' for aviation emissions of 37.5 Mt in 2050 has been allowed for in the setting of budgets for other sectors. The CCC assumes that other sectors could cut emissions by 85% but they describe this as "at the limits of what is feasible".
3. The Government will need to decide in 2016 whether to formally include aviation in the 5th carbon budget 2028-2032 (the next carbon budget). At the moment it must "take account of" aviation carbon so in effect it is included.
4. Any decision by the Government on expanding Heathrow will need to identify how and at what cost carbon emissions will be controlled and UK limits met.

What is the impact of the aviation sector on carbon emissions?

5. In 2011 the aviation sector's CO₂ emissions accounted for 6% of total greenhouse gas emissions in the UK or around 35 Mt CO₂. There are a variety of forecasts but the level could rise to as high as 85 Mt CO₂ by 2050 before fuel-burn efficiencies, operational improvements and partial conversion to the use of bio-fuels kick in [\[2\]](#). Net of these efficiencies, improvements and the use of bio-fuels the Airports Commission estimates up to 47.7 Mt CO₂ in 2045 in unconstrained circumstances before decreasing thereafter [\[3\]](#). The issue is whether this peak can be reduced and the limit of 37.5 Mt CO₂ be achieved by 2050.
6. In broad terms aviation CO₂ emissions are a function of passenger numbers, or more accurately passenger-kilometres travelled with long-haul being the most carbon intensive flights. Freight is also taken into account. For illustration only, a near doubling of UK passengers from 218 million in 2011 to say 400 million in 2050 could be expected in broad

terms to double emissions assuming the long-haul/short-haul mix remained unchanged and before offset by emission efficiencies. Efficiency and other improvements would need to halve the gross emissions if the aviation sector were to achieve compliance by 2050. More specifically, the CCC has estimated that in order to avoid the 37.5 Mt CO₂ limit being breached, the number of passengers should not exceed 389 million per year by 2050, which compares to 370 million estimated by the Airports Commission.

What are the forecasts of the Airports Commission for Heathrow?

7. The Airports Commission has set out forecasts across five scenarios, each under carbon capped and carbon traded cases – making ten scenarios in total. Carbon capped forecasts reduce demand to a level consistent with an emissions cap of 37.5 Mt by progressively increasing the assumed price of carbon which is then built into the price of tickets. Carbon traded forecasts assume that aviation is fully included in carbon markets and pays the carbon costs anticipated for other sectors. These are lower, however, than those required to deliver the carbon cap. Carbon traded forecasts are therefore associated with aviation emissions exceeding 37.5 Mt by 2050.
8. The following table shows the UK passenger numbers and passenger-kilometers that in each scenario would be compliant with the 37.5 Mt limit in 2050. The passenger-kilometers are very similar in all carbon capped scenarios with and without expansion. Passenger numbers have a greater variation, largely due to variations in the long-haul/short-haul mix across the forecast scenarios. They range between 342 million and 393 million passengers a year. In the carbon traded scenarios there is greater variation. The range varies between 397 million and 495 million passengers. The figures are based on Heathrow Airport Limited (HAL)'s Heathrow North West Runway (Heathrow NWR) option. Figures for the Heathrow Extended Northern Runway (Heathrow ENR) option are not significantly different in terms of carbon impact.

UK Passenger numbers in 2050 (million)										
	AON CC	GG CC	RDE CC	LCK CC	GF CC	AON CT	GG CT	RDE CT	LCK CT	GF CT
Without expansion	386	361	374	361	393	411	457	418	458	397
NWR expansion	369	342	365	343	366	436	495	435	494	420
UK Passenger-kilometres in 2050 (billion)										
Without expansion	1,140	1,140	1,130	1,140	1,130	1,210	1,390	1,250	1,390	1,140
NWR expansion	1,130	1,120	1,120	1,120	1,120	1,310	1,550	1,310	1,540	1,230

Source: Airports Commission Strategic Fit Forecasts Tables 5.13, 5.14, 5.5, 5.6, 6.15, 6.16, 6.45 & 6.46 [\[4\]](#)
 CC= carbon capped and CT= carbon traded. AON etc. refers to five scenarios defined by the Airports Commission on page 8 of its Strategic Fit Forecasts.

9. *Fact sheet 1 – the UK Economy* comments on the negative impact on the UK aviation market of Heathrow expansion in the carbon capped scenarios and the positive impact in the carbon traded scenarios. This Fact sheet explains further the feasibility of the alternative carbon solutions.
10. To date the Airports Commission has not included the cost of limiting aviation carbon emissions at a national level to 37.5 Mt in their economic assessments. The Commission says that the outcome of other assumptions is difficult to predict: for example, whether a high cost encourages manufacturers to further reduce aviation emissions [\[5\]](#). The claims of economic benefit from expansion consulted on in 2014/15 could therefore be seriously adrift.

What are the solutions to carbon issues?

11. Emissions are expected to reduce with technological and operational improvements and bio fuels but the rate is slowing and additional reductions are needed. Effort will be needed to achieve reductions, and sometimes there will need to be a trade off with reductions in noise. But in all the Commission's forecasts carbon efficiency improvements are not enough to be compliant with the 37.5 Mt CO₂ limit with or without Heathrow expansion without new, unspecified, action to impose a carbon cap. An additional runway makes it that much harder to be compliant. Possible solutions to achieving compliance with the carbon cap are:

- a. *Very substantial increases in the price of carbon.* The current price of a tonne of carbon of around £5 could need to rise to nearly £1,000 in some of the expansion scenarios to suppress demand sufficiently. This is highlighted in *Fact Sheet 1 – UK Economy*, where the expansion of Heathrow under these circumstances results in a re-distribution of demand from other airports, especially airports outside the south-east. Heathrow's expansion would be at the expense of the rest of the UK. Growth of the aviation market outside the south-east is materially curtailed compared to the case without Heathrow expansion.

In addition, carbon trading (e.g. the European Trading Scheme (ETS)), which allows aviation to buy compliance by trading permits has not been notably successful so far. In fact, the ETS for aviation has had to be confined to intra-European flights due to opposition from America, China and others. To be successful, carbon trading schemes need world-wide use and the issue is will there be sufficient supply of carbon credits from other less carbon intensive sectors. In the UK, meeting the 85% reduction in CO₂ by 2050 is challenging and other economically important sectors may need to compete with aviation for a limited supply of credits.

- b. *Not adding capacity with new runways in the UK.* There are those who support this solution for carbon and other reasons. The All Party Parliamentary Group on Heathrow and the wider economy argued in its submission to the Airports Commission that expansion of Heathrow is not likely to provide economic benefits to the UK as a whole. Details are provided in *Fact Sheet 1: The UK Economy*.

What's the risk to deliverability?

12. Carbon trading, even if it can be achieved for aviation, is forecast to be insufficient to keep UK aviation emissions to a level compatible with the Climate Change Act. There are currently no meaningful alternative policy approaches for meeting the carbon cap that are at the UK's disposal, however, aside from halting further runway expansion.

13. The carbon calculations do not at present take into account radiative force. This could double the impact of the emissions. Radiative forcing is where the balance between the earth's absorption of the sun's energy and the earth's emission of radiation is impacted by an agent such as CO₂.

14. If the supply of worldwide permits is abundant and their price low then the carbon traded scenarios forecast by the Airports Commission may materialise. But this is unlikely to solve the world's climate change challenge and at some future date compensatory increases in price will surely be needed. However, by then an additional runway could have been built based on overoptimistic demand forecasts. It is not clear that the Airports Commission is fully factoring in this potentially substantial risk.

References

- [1] Committee on Climate Change: The Climate Change Act and UK regulations
<http://www.theccc.org.uk/tackling-climate-change/the-legal-landscape/global-action-on-climate-change/>
- [2] Sustainable Aviation: Sustainable Aviation CO₂ Roadmap 2012
<http://www.sustainableaviation.co.uk/wp-content/uploads/2015/09/SA-Carbon-Roadmap-full-report.pdf>
- [3] Airports Commission: Strategic Fit: Forecasts (November 2014) page 53, Figure 4.2
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/374660/AC05-forecasts.pdf
- [4] Airports Commission: Strategic Fit Forecasts (November 2014) Tables 5.13, 5.14, 5.5, 5.6, 6.15, 6.16, 6.45 & 6.46
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/374660/AC05-forecasts.pdf
- [5] Airports Commission: Consultation Document (November 2014) section 2.41
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/381912/AC01_tagged_amend_25_11.pdf