Airports Commission Discussion Paper 03: Aviation and Climate Change

Heathrow Airport Limited response

Date: 16 May 2013

This document is Heathrow's response to the Airports Commission's Discussion Paper 03 on Aviation and Climate Change (hereafter called the 'Commission's Paper').

We have structured our response as follows:

- Section 1 summarises our key conclusions;
- Section 2 discusses the issue of climate change and its implications for aviation policy;
- Section 3 answers the Commission's specific questions.

References are summarised in the bibliography, Section 4.

Contents

1. Overview

1.1. We are committed to the sustainable development of Heathrow and have a long-standing sustainability policy which commits us to enhance the benefits of the airport while at the same time limiting our environmental impacts. Our challenge is to demonstrate that Heathrow can decouple growth in air traffic from growth in environmental impacts. We are convinced that we can, and firmly believe that sustainable growth at Heathrow is achievable.

1.2. In terms of carbon and aviation growth we recognise that climate change is a significant issue for our sector and are fully committed to playing our role in addressing it. In the context of the Commission's Paper we draw the following conclusions:

Key Conclusion	Supporting evidence
Heathrow has a comprehensive carbon management strategy that is core to our business success	The airport has set itself a target to reduce CO_2 from its fixed assets by 34% by 2020 relative to 1990. Accreditation at Level 3 Optimisation of ACI's carbon management accreditation scheme since 2010
Technological and operational advances, alongside alternative fuels are making aviation more carbon efficient thereby providing headroom for growth without increasing gross carbon emissions.	Sustainable Aviation's CO_2 Roadmap predicts that passengers can more than double between 2010 and 2050 without a substantial increase in gross emissions.
Emission trading can reduce aviation's net carbon emissions beyond those from improved carbon efficiency.	IATA's target is to reduce aviation's global net emissions by 50% by 2050 relative to 2005.
In policy terms, unilaterally constraining aviation and a hub airport is an economically inefficient and ineffective way of reducing carbon emissions.	Aviation delivers more than twice the economic value per tonne of carbon compared to other sectors. Heathrow's unique long-haul routes generate over twice the economic value per tonne of carbon compared to other UK airports. There will be 0.7 million tonnes more carbon produced globally each year if Heathrow continues to be constrained.
Growing Heathrow's hub capacity is consistent with meeting the UK's long term climate change targets, even if a pessimistic view is taken on the future carbon efficiency of air travel and delivery of a global emission trading framework.	At least 160mppa of growth can be accommodated between 2010 and 2050 without compromising the UK's climate change targets, compared to 105mppa of unconstrained demand growth in hub capacity predicted by the Government.
Heathrow's public transport catchment and embodied carbon in existing infrastructure provides additional carbon efficiencies relative to other hub capacity options.	Four and a half million more people will live within a 60- minute public transport catchment at Heathrow than at proposed hub options at the Thames Estuary or Stansted in the future. £11 billion has been invested in Heathrow's infrastructure in the last 10 years. £20-25 billion has been invested in or committed to Heathrow Airport related rail infrastructure since 1970.

2. Climate change and aviation

2. 'Heathrow has a comprehensive carbon management strategy that is core to our business success'

2.1. We are committed to the sustainable development of Heathrow and have a long-standing sustainability policy which commits us to enhance the benefits of the airport while at the same time limiting our environmental impacts. Our challenge is to demonstrate that Heathrow can decouple growth in air traffic from growth in environmental impacts. We are convinced that we can, and firmly believe that sustainable growth at Heathrow is achievable.

2.2. In terms of carbon management, Heathrow has been measuring its carbon footprint since 2008 and energy since we first started reporting our environmental performance. Our carbon management strategy reflects the degree of control that, we, as airport operator, have over the many sources of emissions[1] associated with the airport. We have therefore defined Heathrow's emissions into three categories - those we can 'control', those we can 'guide' and those we can 'influence'.

2.3. Heathrow 'controls' CO_2 emissions where it has operational and/or financial control – for example, in relation to on-airport energy use - and we have set ourselves a target to cut CO_2 from fixed assets by 34% on 1990 by 2020. To deliver this target, we have put in place an ambitious energy strategy that includes year-on-year reductions through energy efficiency, as well as significant investment in new infrastructure. For example, the new Terminal 2 building is 40% more efficient than minimum building regulations require and will be powered by 20% renewable energy.

2.4. Heathrow 'guides' CO_2 emissions by agreeing with airport companies and staff the policies, standards and operating procedures used to manage emissions within and close to the airport boundary. For example, working with Sustainable Aviation, Heathrow led on the development of the 'Aircraft on the Ground CO_2 Reduction' (AGR) programme[2] that has developed a suite of effective and practical steps to help cut emissions from aircraft ground movements. Other examples of the 'guide' principle include:

- Investing in energy efficient rapid transport systems to take passengers from car parks to the terminal
- Establishing the biggest car share scheme in Europe, and
- Cutting the number of delivery vehicles to Heathrow by opening an efficient consolidation centre that eliminates unnecessary journeys.

2.5. Heathrow 'influences' CO_2 emissions at and beyond the airport by engaging with stakeholders to develop and promote solutions for managing emissions. Key examples include:

- Membership of the Aviation Global Deal Group (Aviation Global Deal Group, 2009), which has developed a policy approach for managing aviation's global emissions, and has directly influenced negotiations at the UNFCCC and ICAO.
- As members of the Prince of Wales's Corporate Leaders Group on Climate Change, this has enabled Heathrow to lobby UK and international policy makers on climate policy and been a strong supporter of mandatory carbon reporting.
- Significant investment in rail infrastructure (£750 million for building and operating Heathrow Express) to drive a shift from car to lower carbon rail journeys to the airport.

[1] All references to emissions refer to CO_2

[2] See http://www.sustainableaviation.co.uk/wp-content/uploads/aircraft-on-the-ground-best-practice-guidance-june-2010.pdf

2.6. Heathrow's carbon management performance has been recognised by ACI and been rewarded at the Level 3 Optimisation level of ACI's Airport Carbon Accreditation Scheme[3] since 2010

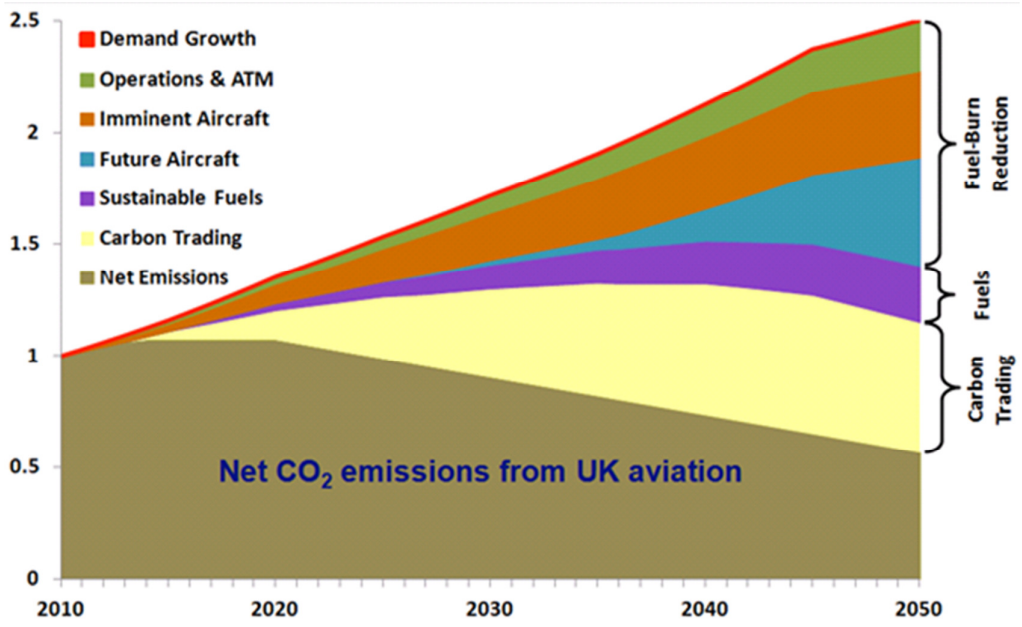
'Technological and operational advances, alongside alternative fuels are making aviation more carbon efficient thereby providing headroom for growth without increasing gross carbon emissions'

2.7. Sustainable Aviation (SA), the coalition of airlines, manufacturers, airports and NATS which develops practical and policy solutions for cleaner, quieter, smarter flying, published a detailed 2050 CO_2 Roadmap in 2012 (Sustainable Aviation, 2012).

2.8. The SA CO_2 Roadmap projects that the UK can accommodate significant growth in aviation by 2050 - a doubling of air traffic - without a substantial increase in gross emissions.

2.9. This can be achieved through a combination of new aircraft and engine technology, operational efficiencies and sustainable biofuels as Figure 1 shows.

Figure 1: Net CO_2 Forecast from UK aviation



Source: Sustainable Aviation

'Emission trading can reduce aviation's net carbon emissions beyond those from improved carbon efficiency'

2.10. Heathrow has a long-standing policy position going back to 2002 on the need to include aviation in the European Union Emissions' Trading Scheme (EU ETS).

2.11. Emission trading provides the industry with the most economically-efficient and environmentally-effective way to abate its carbon emissions. By providing aviation with access to carbon abatement from other sectors, not only does aviation benefit from lower abatement costs, the carbon market is stimulated to drive further abatement.

[3] Airport Carbon Accreditation is an independent programme administered by ACI. Airports must have carbon footprints independently verified in accordance with ISO14064 (Greenhouse Gas Accounting). Evidence of this must be provided to the administrator together with all claims regarding carbon management processes which must also be independently verified.

2.12. Our research shows that passengers value international connectivity and will be prepared to pay their carbon costs to allow them to travel. Through trading schemes, a growing aviation industry can play its part by investing in emissions cuts in other sectors where they can be delivered much more cheaply. Ultimately, and assuming policy makers take steps to internalise carbon costs across the economy, consumers will decide how to allocate their spending to maximise their utility from each tonne of carbon 'purchased'.

2.13. Furthermore, because an emission cap has been set the environmental outcome is certain. This compares favourably with taxation, which offers no certainty in environmental outcome, is not cost-effective and deprives the carbon market of the stimulus it needs to drive forward broader climate policy.

2.14. While we acknowledge that there is current uncertainty about the scope of the European Union Emissions' Trading Scheme for aviation, our position remains the same - to support aviation's inclusion into the EU ETS as a stepping stone to a global cap and trade scheme.

2.15. Similarly, IATA has a long-standing position supporting global market-based measures to tackle aviation emissions. Its targets include;

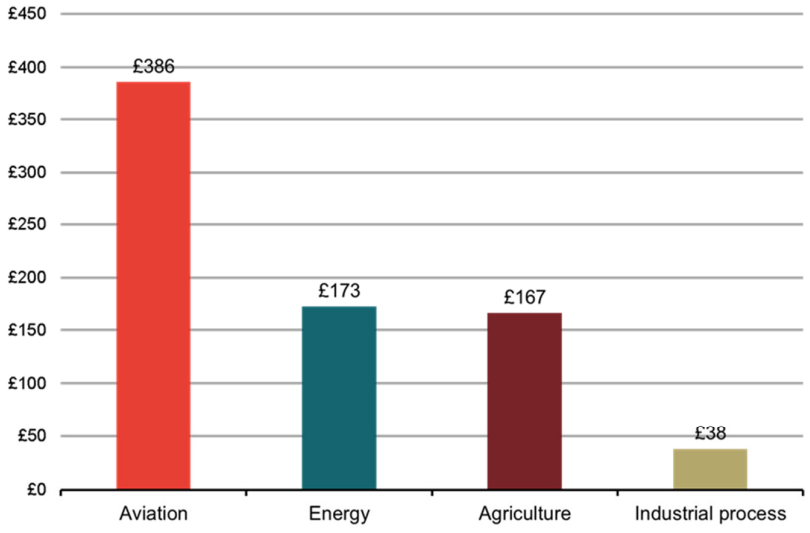
- Improving fuel efficiency by a 1.5% annual average to 2020
- Delivering carbon-neutral growth through a cap on 'net' emissions (taking account of emissions trading) from 2020 onwards and
- Cutting net emissions in half by 2050, compared with 2005 levels (IATA, 2010).

2.16. IATA continues to actively input to the ICAO's High Level Group that is required to make recommendations for the treatment of global aviation at the ICAO General Assembly in September 2013.

'In policy terms unilaterally constraining aviation and a hub airport is an economically inefficient and ineffective way of reducing carbon emissions'

2.17. We commissioned Frontier Economics to explore whether it would be more economically efficient for the UK to reduce carbon emissions in aviation or in other sectors of the economy. Recognising that all sectors will need to play a role in reducing emissions, the study (Frontier Economics, 2011) concluded that policy can maximise benefits to the economy by reducing carbon emissions in sectors other than transport and more specifically, aviation which has significantly higher abatement costs than other sectors. See Figure 2.

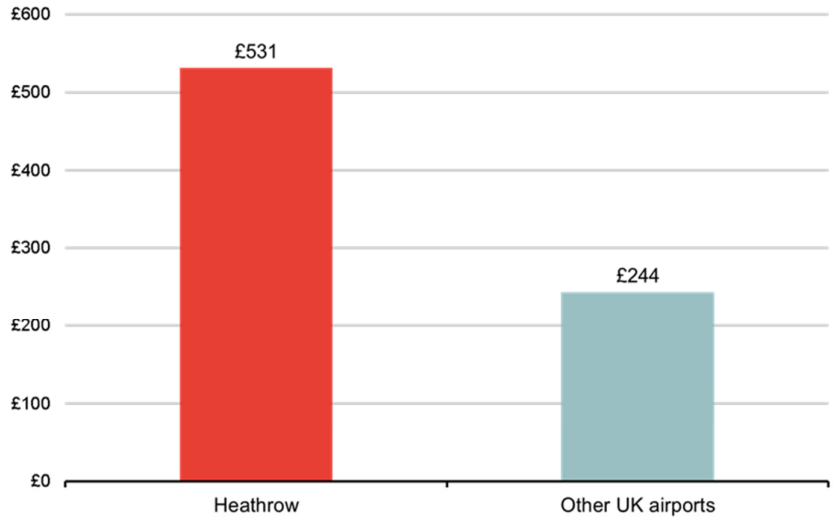
Figure 2: GDP contribution per tonne of carbon emitted in the UK from aviation versus other sectors of the economy in 2009 (£/TCO$_2$)



Source: Frontier Economics, 2011

2.18. Moreover, the analysis concluded that the wider economic benefits from trade and tourism through Heathrow's unique long-haul routes were greater than those from long-haul routes via other UK airports. See Figure 3.

Figure 3: Impact on GDP of overseas customer spending from unique routes flown from Heathrow and from other UK airports per tonne of carbon emitted (£/TCO_2)



Source: Frontier Economics, 2011

2.19. The Frontier Economics report also found that there was relatively limited scope for further carbon abatement from UK aviation at a net economic benefit to the economy. It recognises that the industry is already committed to cutting its gross and net emissions to levels commensurate with meeting global and UK climate change targets.

2.20. We have also commissioned research from a leading global consultancy (Heathrow Airport, 2011a) to quantify the level of carbon leakage resulting from constraining UK airport capacity. This shows that, due to aviation's global nature, capacity constraint is costly and environmentally ineffective.

2.21. It is costly because the economic value from the foregone traffic is lost to the UK economy. It is ineffective because passengers will continue to travel, but in less carbon-efficient ways. The analysis concluded that providing additional capacity at Heathrow would reduce annual global emissions by 0.7 million tonnes compared to a scenario where this capacity is not provided[4].

2.22. In particular, international passengers will detour round the UK, while UK long-haul passengers will transfer through EU hubs. Flying direct from the UK is shorter and avoids an additional landing and take-off – the most carbon-intensive part of the journey. A third runway would allow 1.5 million more passengers per annum to fly direct and save 0.2 million tonnes compared to the equivalent indirect journey (Heathrow Airport, 2011a).

2.23. This analysis compares well with the Commission's own analysis, which shows for example, that for a period around 2030, the carbon emissions from increased transfer trips through overseas hubs exceed the domestic carbon saving from point to point trips.

[4] This analysis was carried out at the time of the previous governments support for third runway at Heathrow taking capacity to 605,000 ATMs, or an additional 20 million passengers. It includes opportunities to reduce staking, and benefit from higher load factors and direct routings.

'Growing Heathrow's hub capacity is consistent with meeting the UK's long term climate change targets, even if a pessimistic view is taken on the future carbon efficiency of air travel and delivery of a global emission trading framework.

2.24. Through the 2008 Climate Change Act, the UK has set a long-term climate change target to reduce carbon emissions by 80% by 2050 compared to a 1990 baseline. It will deliver this through a series of five year carbon budgets making the UK the only country globally to set legal targets in this form.

2.25. While aviation's international emissions are currently excluded from the UK's carbon budgets, these budgets have nevertheless been agreed based on an implicit assumption that such international emissions form part of the 80% reduction target for 2050 and that they will be no greater than the level of the EU ETS cap in 2020 (roughly equal to emissions in 2005).

2.26. It follows, therefore, that in a scenario that saw the UK's international aviation emissions continuing to be regulated through the EU ETS, or an agreed long-term global emission trading framework to 2050 at a cap equal to 2005 emissions or below, then any decision on hub capacity can be decoupled from consideration of climate change emissions.

2.27. Policy makers could then be certain that aviation's emissions would be capped at a level commensurate with meeting the UK's long-term climate change target. In terms of climate change, therefore, the decision on capacity would need only to consider the impact of carbon price on future demand. We note that the Department for Transport's latest demand forecasts (Department for Transport, 2013a) assume a carbon price of £5.26 in 2012 rising to nearly £70 in 2030 and almost £200 in 2050.

2.28. While this scenario is consistent with the long-term policy favoured by the Committee on Climate Change and supported by the DfT in its recently published aviation framework (Department for Transport, 2013b), it is recognised that there is on-going uncertainty on scope of the EU ETS and the outcome of ICAO negotiations to agree a global deal on aviation's emissions.

2.29. Given this uncertainty it is worth examining a pessimistic, worst case scenario to understand if this would result in different conclusions to those reached above. This would see;

- Aviation emissions not regulated through emissions trading,
- Improvements in aviation carbon efficiency as adopted by the Committee on Climate Change in its aviation review (Committee on Climate Change, 2009).

2.30. In this scenario, the Committee on Climate Change recommends that aviation's growth by 2050 should be no greater than a 60% increase in passengers from a 2005 baseline (equal to a circa 75% increase from 2010[5]), in order to remain consistent with the UK's long-term climate change target. This level of growth (160mppa) between 2010 and 2050 compares to an unconstrained hub capacity growth of approximately 105 mppa [6] projected in the DfT's latest demand forecasts (Department for Transport, 2013a) as shown in Figure 4 below.

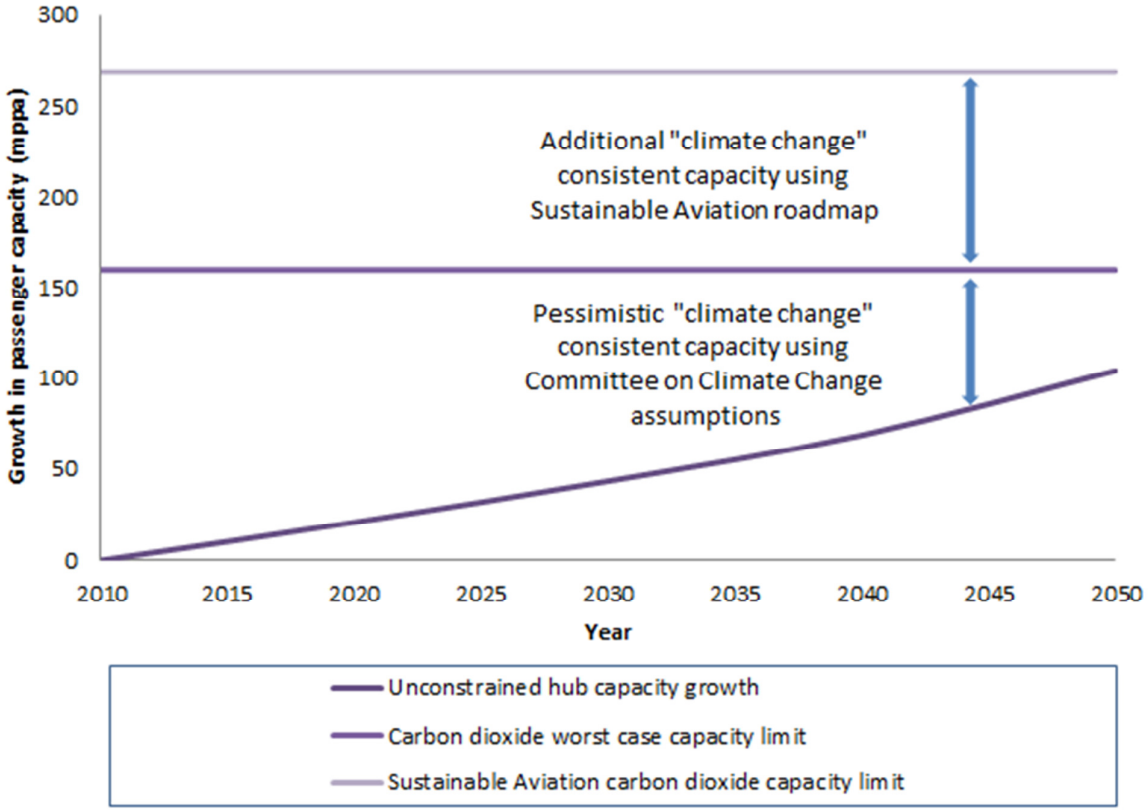
2.31. Furthermore, taking Sustainable Aviation's CO_2 roadmap (Sustainable Aviation, 2012) enables significantly more growth to be accommodated without compromising the UK's climate change objectives again shown in Figure 4 below[7].

[5] See p 37, Committee on Climate Change report "Statutory advice on inclusion of international aviation and shipping", 2012

[6] Hub capacity growth is taken to be analogous to the DfT's demand forecast for Heathrow.

[7] Taken as meeting all of the DfT's central growth forecast to 2050

Figure 4: CO_2 and Hub Capacity



2.32. The analysis presented in Figure 4 we believe indicates that growth of hub capacity in the UK is consistent with the UK's long-term climate change targets. This is irrespective of whether aviation is regulated through emissions trading at an EU and/or a global level in the longer term.

'Heathrow's public transport catchment and embodied carbon in existing infrastructure provides additional carbon efficiencies relative to other options'

2.33. West London and the Heathrow area is very well located and connected for UK passengers in the south east and businesses from across the country.

2.34. Heathrow has direct access to the M25 and M4, as well as being within 10 miles of the M40 and M3 and close to the M1. It is served by fast and frequent rail services into London, provided by Heathrow Express, Heathrow Connect and the Piccadilly Line. This infrastructure provides significant benefits in terms of reducing carbon from passenger journeys to the airport, as well as providing fast and convenient journeys for our passengers.

2.35. Looking ahead, further investments are planned that will continue to deliver low carbon transport options to the airport;

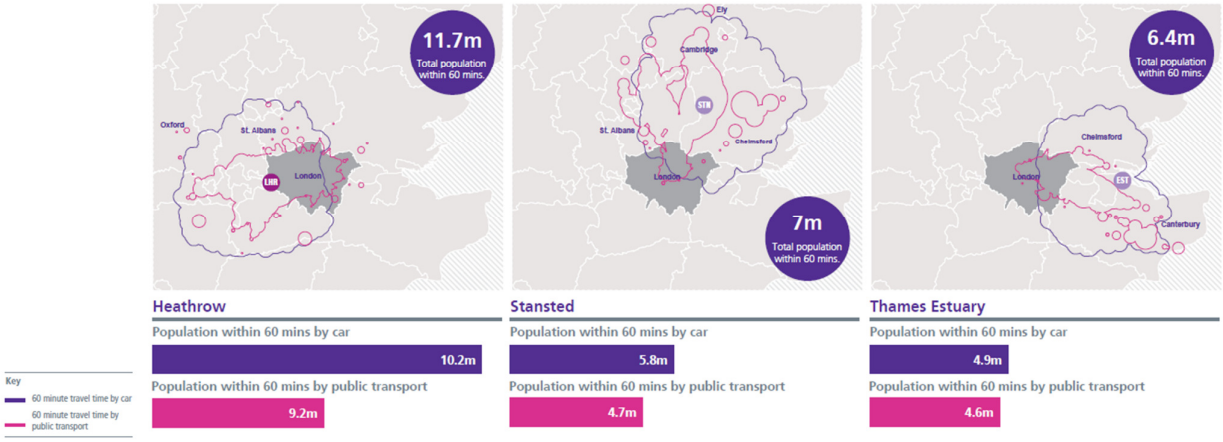
- By 2019, Crossrail will connect Heathrow directly to the city.
- By 2022, it is expected that Western Rail Access will be delivered. This will provide fast direct access to Slough, Reading and the Thames Valley and further improve journey times and carbon for journeys to the South West and South Wales. All would be poorly served by the UK's hub airport moving to the east of London.
- In 2026, Heathrow will be connected to the High Speed Rail network via a new passenger interchange at Old Oak Common served by Crossrail and Heathrow Express services providing fast low carbon access to the Midlands, North and Scotland as well as continental Europe via High Speed 1 (HS1).

- In 2033, Heathrow will be directly connected to the high speed network. The regeneration area surrounding Old Oak Common will have fast direct access to Heathrow and provide essential airport-related employment.

2.36. Comparing Heathrow's proposed transport infrastructure with other potential hub options, notably Stansted and a potential new hub airport in the estuary, Heathrow would have over four and a half million more people living within a 60-minute travel time catchment[8] (see Figure 5). As such, for most UK passengers, a hub airport to the east of London would be in the wrong place. Travel times, and by association carbon, would increase for 90% of hub passengers, with their average journey time increasing by 30 minutes[9].

2.37. In terms of carbon therefore, expanding hub capacity in the east will come with a material carbon penalty.

Figure 5: Catchment comparison



2.38. Furthermore, Heathrow's on-airport infrastructure, related surface access connections, and other associated infrastructure (eg hotels) are already significant with £11billion invested in Heathrow over the past 10 years, and £20 - 25 billion[10] invested in or committed to airport-related rail infrastructure since 1970. On top of that, the motorways that serve the airport, including the M1, M3, M4, M40 and M25, which provide critical road access to the airport and the surrounding businesses, would cost around £26 million per mile in today's prices[11] and 325 tonnes of CO_2 per lane kilometre[12].

2.39. Conversely, any new hub would need to build vast new infrastructure from scratch expending unnecessary carbon in the process.

2.40. Britain already has one of the world's most successful international hub airports in Heathrow. The UK should build on strength and continue to benefit from the significant carbon already embodied in Heathrow's infrastructure.

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[8] Analysis of 2011Census population data lying within 60 minute isochrones of Heathrow, Stansted and Estuary (Isle of Grain) sites based on assumed infrastructure required by each alternative site to provide fast, frequent rail services to London and direct access to the principal rail and motorway networks. Developed by Mott MacDonald based on publicly available information. Estuary option primarily based on Foster & Partners led scheme proposals.

[9] Analysis of existing Heathrow passenger origins (CAA Survey 2011). Average difference in car travel time between travelling to Heathrow or to an Estuary airport (Isle of Grain). Assumes average daily travel speeds and new road infrastructure between motorway network and Estuary site.

[10] Includes Great Western Main Line upgrade programme, Western Rail Link, Heathrow Express, Piccadilly Line extension Hatton Cross to T1, 2, 3 and 4, plus later extension to T5 and Crossrail funding envelope. Costs uprated to 2012 prices.

[11] Typical 1 miles motorway cost estimate provided by EC Harris, for Heathrow

[12] Transport Scotland, Embodied Carbon, 23 April 2012. Available at http://www.transportscotland.gov.uk/stag/td/Part2/Environment/7.4.2.7#

3. Responses to specific Discussion Paper 03 questions

Questions raised in Chapter 7

1. (Paragraph 7.2, bullet 1) – Do you consider that the DfT CO_2 forecasts present a credible picture of future UK aviation emissions? If not, why not?

We believe there are three issues that the DfT's CO_2 forecasts should recognise:

a) Carbon leakage and the need to account for it

We support therefore the analysis presented in the Commission's Paper to quantify the effect of capacity constraints on global carbon.

This clearly shows that constraining UK aviation capacity is ineffective since a significant proportion of traffic - and hence carbon - is leaked.

We have examined this effect at a Heathrow level and shown that the effect of constraining Heathrow is to increase global emissions (Heathrow Airport, 2011a).

We would therefore recommend that the effect of carbon leakage is fully examined and explicitly accounted for in the CO_2 forecasts used to inform the Airports Commission's on-going work.

b) Aviation carbon efficiency assumed to inform long term forecasts

The DfT's CO_2 forecasts are ranged on what we believe are conservative estimates of future capability to improve aviation's carbon efficiency[13].

As members of Sustainable Aviation we forecast that technological advances, operational improvements and sustainable biofuels will mean that the UK aviation's CO_2 emissions will fall to near 2005 levels by 2050 (Sustainable Aviation, 2012).

Similarly the Committee on Climate Change has three future scenarios of carbon efficiency improvements (Committee on Climate Change, 2009), ranging from 0.8 to 1.5% per annum. By comparison Sustainable Aviation's CO_2 Roadmap forecasts a fuel efficiency improvement of 1.2%.

We therefore suggest that the Commission considers examining alternative scenarios of carbon efficiency - including Sustainable Aviation's forecast.

c) Emission Trading and accounting for its effects

The Committee on Climate Change has recommended that aviation's international emissions are included in UK carbon budgets on a net basis (Committee on Climate Change, 2012). It therefore follows that forecasts of future CO_2 should be presented on a gross and net basis.

Recognising the uncertainty around the future scope of the EU ETS, and timescales around negotiations by ICAO, it would be prudent to address this uncertainty. This should be through analysis of alternative scenarios in the same way as modelling uncertainties around future demand, fuel efficiency, etc. has fed into the DfT's CO_2 forecasts.

2. (Paragraph 7.2, bullet 2) – 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?

[13] Carbon efficiency relates to potential for future efficiency from more fuel efficient fleets, operational efficiencies and use of biofuel.

We believe the analysis presented in the Commission's Paper supports the argument for additional airport capacity, and specifically, the need for additional hub capacity. We draw our conclusions based on the following evidence taken from this paper:

Table 1: Key conclusions

Evidence Presented in Airports Commission Paper 03	Reference	Conclusions that can be drawn
Aviation has delivered significant improvements in carbon efficiency historically – and this trend is set to continue.	See paragraphs 2.15 to 2.19	Continued carbon efficiencies can offset future growth in demand to a smaller or greater extent.
Aviation's emissions are presently capped at 2005 levels by the EU ETS until 2020, with some uncertainty on future role and scope of emissions trading.	See paragraphs 3.7 to 3.11	In a scenario that sees aviation continuing to be regulated through emissions trading, demand growth can be decoupled from growth in net emissions.
Constraining UK aviation capacity results in carbon leakage.	See paragraphs 5.1 to 5.27	Constraining capacity is environmentally and economically inefficient - global carbon emissions grow while the UK foregoes the economic benefits of lost demand.

Combining these conclusions with:

a) Advice from the Committee on Climate Change that estimates that aviation demand can grow, in its most conservative assessment, by at least 160mppa between 2010 and 2050 while remaining consistent with UK climate change targets (Committee on Climate Change, 2012),
b) DfT projections of additional unconstrained hub demand between 2010 and 2050 of circa 105mppa (Department for Transport, 2013a),

our view is that growing hub capacity can, even in the most pessimistic case (defined here as no emission trading and a conservative view on carbon efficiency), be consistent with the UK meeting its long-term CO_2 reduction target.

However, we believe as an industry, that emissions trading and carbon efficiency improvements can play a much larger role. This will facilitate the future unconstrained growth of UK aviation without compromising the UK's climate change commitments.

3. (Paragraph 7.2, bullet 3) – How could the analysis be strengthened, for example to allow for the effects of non-CO_2 emissions?

We recognise that aviation's climate effects are not limited solely to those from CO_2 emissions and are supportive of research and development to improve the understanding of its overall climate change effects. We note that this is an evolving area and that uncertainty on scale and nature of these effects is an on-going area of research, for example:

a. The radiative imbalance arising from aviation-attributable stratospheric water vapour has recently been shown to be much smaller than previously reported (Wilcox, 2012).
b. Estimates of the net radiative imbalance from the numerous effects triggered by aviation's NOx emissions has also been revised significantly downwards by recent papers (Holmes, 2011) and has taken into account a wider range of relevant effects.
c. The impact of contrails and aviation-induced cirrus has yet to be quantified with certainty and is the subject of continued research in the academic community.

Through Heathrow's membership of Sustainable Aviation we continue to support the continued improvement in understanding of the nature and scale of these effects and any implications for future policy (Sustainable Aviation, 2008).

Like the Committee on Climate Change (Committee on Climate Change, 2012) we believe therefore that until scientific understanding has improved it would be inappropriate to allow for those effects in policy making. This will avoid policy interventions that result in unintended and damaging consequences. For example, although contrail formation could be reduced or avoided by adopting different flight patterns, in particular lower cruise altitudes, this could have the unintended adverse effect of increasing CO_2 emissions.

4. (Paragraph 7.2 bullet 4) – How can we best deal with uncertainty around demand and emissions, including in relation to future carbon prices?

We suggest that the Commission might seek to characterise this uncertainty by testing the sensitivity of the demand forecast to a range of future carbon prices. Alternative scenarios for carbon efficiency can be sourced via the Committee on Climate Change that presents 3 future scenarios for carbon efficiency (Committee on Climate Change, 2009). We also continue to believe (see Section 6 of HALs submission to the Commissions paper on Aviation Demand Forecasting) that the DfT should strengthen its CO_2 emission forecast by taking into account incremental CO_2 generated by transfer passengers switching journeys out of Heathrow to non UK hubs as a consequence of UK capacity constraints.

Our demand forecasts have explicitly taken into account the demand effect of future carbon pricing up to 2030 (Department for Energy and Climate Change, October 2012). Given the latent demand at Heathrow (driven by the value placed on connectivity, and the difficultly of substituting for long haul travel) the effect on passenger demand is limited (up to -0.2%), and is consistent with conclusions reached in Chapter 4 of the Commission's paper.

5. (Paragraph 7.2, bullet 5) – 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 primary conclusion that should be reached is that capacity constraint is not an effective climate change policy tool.

As the analysis of carbon leakage in your paper shows, the amount of carbon leaked can exceed the apparent carbon saving. Not only is this harmful in a global climate context, it is damaging to the UK economy.

We support carbon abatement with a negative marginal abatement cost and have demonstrated through the Sustainable Aviation's CO_2 Roadmap (Sustainable Aviation, 2012) that CO_2 emissions from UK aviation can be limited to near to 2005 levels while growing demand in line with the DfT's unconstrained demand forecasts.

6. (Paragraph 7.2, bullet 6) – Are there examples of how other countries have considered carbon issues in relation to airport capacity planning that we should be looking at? (Please specify and briefly explain why.)

Apart from the CO_2 cap imposed on Stockholm Arlanda, we are not aware of any other examples that relate to capacity planning, with none in the context of hub capacity planning.

The UK is unique in being the only country with a legally binding long term climate change target that implicitly accounts for its international aviation emissions. This we believe, illustrates that it has already gone further than other countries and has a robust aviation and climate change framework in place.

7. (Paragraph 7.2, bullet 7) – What do you consider to be the main climate risks and adaptation challenges that the Commission will need to consider (a) in making its assessment of the UK's overall aviation capacity and connectivity needs, and (b) in considering site-specific options to meet those needs?

Heathrow has carried out a comprehensive climate change adaptation risk assessment and reported the outcomes of this review to Defra in response to the Adaptation Reporting Power (Heathrow Airport, 2011b) provided through the UK's Climate Change Act 2008.

Our review identified a small number of climate adaptation risks that we are addressing through our climate adaptation strategy.

These risks relate primarily to the need to continue to upgrade the airport's surface water capacity and flood mitigation, as well as reviewing and upgrading our building performance standards to ensure future infrastructure is climate ready. Due to our inland location, the review did not highlight a direct risk from sea level rise.

Our view is that the climate adaptation risks faced by inland airports will generally be similar and can, as we have found, be managed through proactive infrastructure investment.

Estuary and/or coastal airport developments however would, in addition be faced with climate adaptation risk from future sea level rise. We suggest that the Airports Commission might examine in detail the implications of this risk for any coastal and/or estuary airport options.

8. (Paragraph 7.2, bullet 8) – Are there any opportunities arising from anticipated changes in the global climate that should be taken into account when planning future airport capacity?

We believe there may be a number of opportunities, such as a reduced need for heating, reduced risk of snow events, and potential growth in inbound tourism. However, our view is that these are relatively small effects in the context of planning for future airport capacity.

As stated in response to Q7, our view is that the material consideration is the risk of sea level rise for any potential future airport option at a coastal or estuary location and we suggest that this is an issue which the Commission might take into account.

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