Transport for London

Airports Commission Discussion Paper 03

# Aviation and Climate Change

## *The Mayor of London's response*

*May 2013*

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### 1. Purpose of paper

1.1. In April 2013, the Airports Commission issued a Discussion Paper on Aviation and Climate Change inviting views and evidence. The paper set out a number of specific questions (see annex). This response addresses the questions posed under the following headings:

- Forecasting aviation emissions
- Aviation emissions and airport capacity constraints
- Adapting to climate change in the aviation sector

### 2. Background

2.1. The Mayor of London is committed to making London a world leader in tackling climate change. He is taking steps through his policies and programmes to reduce London's carbon dioxide ($CO_2$) emissions and to adapt to the effects of climate change.

2.2. Globally the aviation sector is responsible for about 1 to 2% of greenhouse gas (GHG) emissions[1]. In the UK, domestic and international aviation emissions account for about 6% of total GHG emissions[2]. The vast majority of aviation emissions are from international flights (95% in 2011)[3]. There is credible evidence that aviation produces several emissions that impact on climate, of which $CO_2$ is the most notable. It makes up about 99% of the aviation sector's GHGs[4] covered by the internationally binding emission reduction targets of the Kyoto Protocol and is therefore the focus of Government and Mayoral action.

2.3. The Government's new Aviation Policy Framework states other sectors are likely to decarbonise more quickly than aviation. Demand for air travel is forecast to increase

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[1] Aviation Policy Framework, DfT, 2013

[2] Ibid

[3] Aviation Factsheet, Committee on Climate Change, 2013

[4] Aviation Policy Framework, DfT, 2013

both globally and in the UK. If unconstrained by capacity, aviation's share of the UK's emissions is likely to increase.

2.4. The Mayor does not support unconstrained aviation growth, but believes that it should be allowed up to the level recommended by the Committee on Climate Change (CCC) in 2009.

## 3. Summary of key issues for the Airports Commission

3.1. The Mayor accepts the recommendation of the CCC which states that aviation passenger demand growth could be limited to 60% by 2050 (on 2005 levels) given prudent assumptions about technological improvements. The Mayor accepts these figures and supports the CCC's finding that aviation growth is possible within these limits. UK-wide, this means an additional 140 million passengers per annum (mppa) by 2050.

3.2. The Discussion Paper is wrong to suggest that capacity constraints at UK airports will be an efficient and effective way of reducing global carbon emissions. An alternative to Heathrow is required for London and the UK to remain economically competitive. A new hub airport not limited by capacity constraints, combined with technological and operational improvements, could substantially reduce the amount of $CO_2$ emitted per passenger. This includes the benefits of lower fuel usage that result from less time spent stacking in the air and taxiing on the ground. Such a new hub airport would also support and sustain the global economic position of London and the UK.

3.3. A new airport could be designed to be energy efficient and resilient to the likely impacts of climate change.

## 4. Forecasting aviation emissions

4.1. Credible forecasts of aviation emissions are essential for assessing the potential impacts of aviation on climate change and the implications for the future provision of UK aviation capacity.

4.2. The DfT's three-stage approach to forecasting aviation emissions is sound in principle. However, some weaknesses arise from its dependence upon the DfT's aviation demand forecasting and allocation models NAPDM and NAPAM. The Mayor noted concerns with these models in his response to Discussion Paper 01 which may compromise the $CO_2$ emissions forecasts which derived from them. These concerns include:

National Air Passenger Demand Model

- An oversimplification of the relationship between demand and Gross Domestic Product (GDP) related factors to a GDP multiple assigned across only five world regions

- A simplified low/high/central forecast approach rather than a probability-based approach to each demand driver
- The treatment of transfer traffic as a fixed, rather than dynamic input

National Air Passenger Allocation Model

- An overstatement of the likelihood of passengers, in the face of capacity constraints at airports in London and the southeast, travelling considerable distances to fly to far-flung destinations from regional airports

Fleet Mix Model

- A need for the model to increase aircraft size as well as load factors to offset a lack of slots
- A need for potential fleet changes post-2040 to be taken into account

$CO_2$ Emissions Model

- A need to use the latest available aircraft fuel efficiency information

4.3. The difficulties in accurately predicting aviation's impacts many decades in the future are acknowledged. However, accurate projections of aviation carbon emissions are essential in planning future aviation capacity and setting policy targets and it is important the Government allows for uncertainty.

## 5. Aviation emissions and airport capacity constraints

5.1. The following section addresses aviation emissions and airport capacity constraints under the following headings:

- Aviation growth within climate change limits
- The inefficiency of airport capacity constraints to reduce aviation's emissions
- Trip displacement and emissions 'leakage'
- Other examples of airports taking capacity and carbon into consideration

Aviation growth within climate change limits

5.2. Technological improvements have reduced aviation's rate of $CO_2$ emissions per passenger and will continue to do so. The CCC estimates that a combination of air traffic management and operational efficiency improvements could result in annual improvement in fleet fuel efficiency of between 0.8% and 1.5% per seat kilometre

between 2005 and 2050[5].

5.3. In 2009 the CCC assessed passenger demand growth of 60% on 2005 levels to 2050 would be compatible with keeping $CO_2$ emissions in 2050 no higher than in 2005, given prudent assumptions on technological improvements[6]. The Mayor accepts these figures and does not believe in unconstrained growth. However he does believe in allowing growth up to levels compatible with the CCC limits. This means an additional 140mppa by 2050. If London and the southeast maintain their current market share, this equates to 85mppa by 2050. This growth is best served by a new hub airport accessible to London. This will generate the greatest benefit for the UK.

The inefficiency of airport capacity constraints to reduce aviation's emissions

5.4. The impact of constraining capacity on reducing $CO_2$ was demonstrated as relatively cost ineffective compared to other options in the DfT report 'A Marginal Abatement Cost Curve Model for the UK Aviation Sector' (EMRC & AEA 2011).

5.5. Chapter 5 of the Discussion Paper outlines that airports operating at maximum capacity (such as Heathrow) might find it more difficult to implement operational improvements that could contribute to reduced fuel usage. A new, operationally efficient hub airport could achieve significant fuel efficiencies through reduced circling or stacking before a landing slot comes available and reduced taxi times and time spent waiting on aprons for available gates and stands.

5.6. There could be significant emissions savings per air traffic movement from the development of a world-class, energy efficient new airport. A new hub will enable average aircraft size to increase, by maximising the pool of passenger demand. It will be possible for airlines to deploy 'Large and Very Large' wide-bodied aircraft on many services. Several airlines are buying aircraft such as the Airbus A380 which typically have more than 450 seats. At Heathrow today, the average aircraft loading is 145 passengers. In 2050, a single hub airport could consolidate enough demand to increase average loads to more than 180 passengers.

Trip displacement and emissions 'leakage'

5.7. The Discussion Paper recognises the potential for 'leakage' of carbon emissions to foreign hub airports in the event of UK airport capacity constraints. The Mayor believes if effective capacity to support UK demand is not provided, foreign hubs such as Frankfurt, Amsterdam and Paris will grow instead. This leakage would do nothing to combat climate change and would instead severely damage the UK's global economic competitiveness.

5.8. The analysis presented in Chapter 5 of the Discussion Paper – and specifically the data presented in Table 5.1 and Figure 5.2 – must be treated carefully. With the

[5] Meeting the UK aviation target – options for reducing emissions to 2050, CCC, 2009
[6] Ibid

London airports system full by 2030, the Government's National Air Passenger Allocation Model assumes a significant proportion of the passenger flows divert to airports elsewhere in the UK. As discussed in section 4 above, some of these results stretch credulity; the reality is likely to be that many of these passengers would, if they cannot use London airports, simply not fly. As such, the data presented in Chapter 5 significantly underestimates the gap between the constrained and unconstrained demand – a substantial proportion of which will be leakage (not least as considerable international transfer traffic is thus squeezed out of Heathrow).

5.9. The suggestion that, at some point, increased capacity constraints reduce leakage should be viewed with caution. Notably, the proportion of leakage that represents international transfer traffic lost will not diminish as capacity is increasingly constrained; rather, this will likely continue to increase, as increased flows are all but excluded from the UK hub and divert to rival foreign airports.

5.10. As demand grows in a capacity constrained system, the gap between constrained and unconstrained demand will widen, with the balance between leakage and forgone trips shifting towards the latter (reflected in the last column of Table 5.1) – as more UK-originating traffic leaking via foreign hubs is unable to fly. But this should not be taken as cause for celebration – the gap between constrained and unconstrained constitutes a negative impact on UK connectivity – and by extension on UK economic growth – and one that increases over time, without any regard for the economic value of the connectivity that is lost.

5.11. The Discussion Paper appears to suggest that capacity constraints at the UK's airports would be an effective tool for reducing global aviation emissions. But capacity is a blunt policy lever with severe economic consequences – and one that cannot easily be adjusted. It is not an effective way of addressing global emissions – there will always be leakage if we constrain UK aviation capacity, with the emissions simply taking place elsewhere. At the same time, this constrain will greatly impact the UK's connectivity and will have a particularly pronounced effect in taking important feeder traffic away from the UK hub. Added to trips forgone, the loss of connectivity for the UK will have a strongly detrimental impact on economic prosperity – without a commensurate net reduction in aviation emissions.

5.12. Adopting a policy of no capacity growth, as per the DfT's capacity constrained scenario, would clearly have the effect of suppressing demand but this is not a cost-efficient way of reducing emissions (Table 5.2). We need to include in the costs of capacity constraints the loss to the UK economy of not having the right aviation connections. This is likely to outweigh the welfare losses, higher fares and airline profitability (the costs currently included in paragraph 5.22 of the Discussion Paper). Any approach to capping emissions must be sufficiently nuanced so as to recognise the benefits that different types of air services bring.

5.13. The Mayor would support an international carbon scheme and believes that $CO_2$

emissions can only be effectively managed through a binding international agreement. Application of a UK-only cap would struggle to avoid perverse consequences. To take the example of a passenger flying from Glasgow to Tokyo: if they transfer via Amsterdam Schiphol, their flight contributes 450 miles of $CO_2$ emissions to the UK total. If they transfer via London, they contribute around 9,000 miles of $CO_2$ emissions to the UK total. In both cases, their contribution to global emissions is broadly the same; yet a UK-specific cap would incentivise transferring via Amsterdam and bequeath the economic and connectivity benefits associated with the hub network to the Dutch.

5.14. Capacity constraints are not an appropriate tool for reducing emissions, especially at the UK's most congested airport, Heathrow. Its role as the UK's hub, albeit imperfect, means it accounts for 80% of our longhaul services. But leaving the UK's hub capacity constraints unresolved will merely push more passengers to use alternative hubs, outside the UK – exacerbated by the deteriorating passenger experience stemming from increased delays and disruption. Increasing constraints will also worsen emissions from arrivals as planes have to stack for even longer to land. It is important to note that these emissions are not accounted for in the DfT forecasts, which are based on departing flights.

Other examples of airports taking capacity and carbon into consideration

5.15. There are few examples of accounting for carbon in capacity planning per se. Changi airport in Singapore has an action plan to manage its committed growth targets to reduce emissions against a baseline.

5.16. Overall the Mayor supports taking a balanced approach to decision-making, but believes in allowing growth of 60% until 2050 within climate change limits recommended by the CCC.

## 6. Adapting to climate change in the aviation sector

6.1. The Mayor agrees there are a number of climate change challenges for aviation (increase in extreme weather events, temperatures, rainfall and changes in wind patterns). It is important the Airports Commission identifies not only the risks associated with these challenges but also any opportunities arising, e.g. a warmer climate could make the UK a more attractive tourist destination.

6.2. Similarly, opportunities might arise from developing airport capacity to address some of the wider challenges of climate change. One example is the proposals that have been put forward to develop significant flood defence infrastructure – to protect London in the face of rising sea levels[7] – in conjunction with an airport in an estuarine

[7] Sea levels rising so fast, London faces significant risk of flooding without Thames Barrier upgrade, The Independent, 15 May 2013

location.

6.3. Climate risks may be site specific. When understanding the risks at different sites it will be important that the current climate (including variability and extremes) is taken into account. Consideration should include all aspects of weather-related risk including fog, frost, lightening and storm surges.

6.4. It will also be important to consider the likely coincidence of weather extremes at different airports (nationally and regionally) and intra and inter airport flexibility in dealing with extremes.

6.5. When considering new airport capacity, resilience to the expected impacts of climate change must be incorporated into decisions about airport location, design, construction and operation and also transport and utility infrastructure. A well-planned, 'future-proofed' hub airport which can expand could ensure both an economically and carbon efficient airport while potentially also incorporating infrastructure to meet some of the wider climate change challenges faced. It could further accommodate changes in travel patterns associated with the change in global climate. The UK should have spare capacity to take advantage of any opportunities arising from climate change and a new hub will provide this.

**APPENDIX: Airports Commission questions presented in Discussion Paper 03 and the section of this document in which they are addressed**

| Question | Section |
|---|---|
| Do you consider that the DfT $CO_2$ forecasts present a credible picture of future UK aviation emissions? If not why not? | Section 4 |
| 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? | Section 5 |
| How could the analysis be strengthened, for example to allow for the effects of non-$CO_2$ emissions? | Background |
| How can we best deal with uncertainty around demand and emissions, including in relation to future carbon prices? | Section 4 |
| 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? | Section 5 |
| 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) | Section 5 |
| 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? | Section 6 |
| Are there any opportunities arising from anticipated changes in the global climate that should be taken into account when planning future airport capacity? | Section 6 |