

Aviation emissions cost assessment 2008

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Aim

The aim of the aviation emissions cost assessment is to provide a strategic view on the extent to which the aviation sector is covering its climate change costs. This information contributes to the evidence provided to inform decisions on major increases in aviation capacity.

Purpose

The aviation emissions cost assessment will be:

- a strategic assessment covering the UK as a whole;
- used to enhance our contextual understanding of the climate change costs of aviation when considering major increases in aviation capacity; and
- carried out approximately every three years. We anticipate this will coincide with the regular review and report on progress in delivering the Future of Air Transport agenda.

The emissions cost assessment is a national analysis and will not be carried out on an ad-hoc basis to inform the consideration by the planning system of individual airport development proposals, nor is it intended to cover all the external costs of aviation.

Methodology

The methodology for the emissions cost assessment is to compare:

- i) the value of the total climate change impact of air travel in the UK, with
- ii) the revenues from the aviation sector in terms of air passenger duty (APD) revenues (in future aviation duty revenue) and AVGAS receipts

The steps involved are:

- take the most recent available Greenhouse Gas Inventory estimates of UK carbon dioxide emissions from all domestic flights and departing international flights;
- indicatively account for the non-CO₂ climate change effects of air travel, applying a multiplier value of 1.9¹. To reflect the degree of uncertainty around this value, a sensitivity range of 1 to 4 will also be presented; then
- multiply this by the appropriate monetary value based on the Government's Shadow Price of Carbon, again using a sensitivity range to reflect the uncertainty; and
- compare this range of values with the air passenger duty/aviation duty and aviation gasoline duty receipts for the year concerned.

¹ Based on the most recent scientific evidence

Data sources

Information needed	Purpose	Sources
Most recent UK aviation carbon emissions	To demonstrate carbon emitted from all departing flights in the UK	Most recent UK Greenhouse Gas Inventory
Radiative forcing multiplier	To indicatively take account of non-CO ₂ climate change effects	IPCC and European Commission scientific research
Shadow price of carbon dioxide emissions	To place a monetary value on aviation carbon dioxide emissions	Published Government Guidance on Shadow Price of Carbon
Aviation sector contribution to its external climate change costs	To assess how much the aviation sector is currently paying in relevant taxation towards its climate change costs	Air Passenger Duty receipts (HM Revenue and Customs) Aviation gasoline duty receipts (HM Revenue and Customs)

Emissions cost assessment

Based on methodology explained above, the emissions cost assessment in 2008, calculated for the most recent data, 2006, can be found below (all in 2006 prices).

Figure 1: Summary of 2006 results

Scenario	Assumptions		Scenario A: Actual			Scenario B: Illustrative 2006 if APD rates had been doubled ²		
	Radiative forcing factor	Shadow price of carbon dioxide in 2006 (£/tCO ₂)	Climate change costs in 2006 (£bn)	APD and AVGAS duty revenues in 2006 (£bn)	Net coverage of climate change costs (£bn)	Climate change costs in 2006 (£bn)	AVGAS duty & APD revenues in 2006 (£bn)	Net coverage of climate change costs (£bn)
Central case	1.9	24.7	1.8	1.0	-0.8	1.8	1.9	0.1
Scenario 2	1	24.7	0.9	1.0	0.1	0.9	1.9	1.0
Scenario 3	4	24.7	3.8	1.0	-2.8	3.8	1.9	-1.9
Scenario 4	1.9	29.7	2.1	1.0	-1.1	2.1	1.9	-0.2
Scenario 5	1.9	22.2	1.6	1.0	-0.6	1.6	1.9	0.3

Notes:

Black: climate change costs are more than covered; in red: extent to which costs are not covered

² Recognising that the Government doubled the rates of Air Passenger Duty, with effect from 1 February 2007.

Explanation of scenarios

Scenario 1 (central case)	Central case shadow price of carbon, non CO ₂ impacts considered with carbon multiplier of 1.9.
Scenario 2	No non-CO ₂ impacts considered.
Scenario 3	Non-CO ₂ impacts considered with a carbon multiplier of 4
Scenario 4	Central case non-CO ₂ impacts with higher cost of carbon (£29.7/tCO ₂)
Scenario 5	Central case non-CO ₂ impacts with a lower cost of carbon (£22.2/tCO ₂)
Scenario A	2006 results
Scenario B	Illustrative 2006 results taking into account the doubling of APD in February 2007.

Results

The table demonstrates the 2008 emissions cost assessment results for the year 2006 aviation emissions under two scenarios (A and B):

- i) actual data is used for the value of the climate change impact and duty revenues
- ii) actual data is used for the value of the climate change impact but duty revenues have been illustratively doubled. This is to reflect the doubling of APD which took place in February 2007

Clearly, the extent to which aviation covers its climate change costs in this emissions cost assessment is fully dependent on tax revenues from APD and AVGAS. Presenting both cases of APD revenues in this ECA allows the reader to acknowledge the marked impact of the tax change.

In line with the previous (2005) results on which we consulted, the assessment for 2006 shows:

- Under the central case, the aviation sector's climate change costs in 2006 were around £1.8 billion but that £0.8bn of that cost remains uncovered by the industry;
- However, in the illustrative scenario B, the results are markedly different with aviation covering its climate change costs with an excess of £0.1bn;
- With a higher carbon cost and/or higher radiative forcing factor, a significant proportion of the climate change costs, in the region of £0.2 to £2.8 billion, remain uncovered, even if APD revenues had doubled in 2006;
- With a lower radiative forcing factor and/or a low cost of carbon, the costs are covered with current revenues and if APD revenues were doubled, the costs would have been covered with an excess of some £0.1 - £1bn

Assumptions and limitations

The emissions cost assessment inevitably relies on some key assumptions. These include:

- the emissions cost assessment should be based on the most recent emissions from all flights departing the UK. This therefore includes all passenger and freight flights making domestic trips or international departing the UK. This process is in line with the UK's inventory as reported to the UNFCCC.
- There is a lag between the publication of verified emissions and the year in which the emissions cost assessment is carried out e.g. the 2008 assessment must rely on 2006 data. This reinforces that the emissions cost assessment provides a broad indicator of the coverage of climate costs rather than a precise analysis.
- Emissions from incoming flights are not included, nor are emissions from airports buildings etc. This is in line with the conclusions of the consultation.
- Data sources are as listed above. As evidence and perhaps better sources of data emerge over time, these will be monitored and taken into account as appropriate, subject to their robustness. This will help to ensure the emissions cost assessment remains as current as practicable. However it may affect the ability to compare assessments on a direct basis over time.
- Air Passenger Duty (APD) and aviation gasoline duty (AVGAS) are assumed to count towards the climate change costs of aviation. However, the Government emphasises that whilst its domestic aviation tax regime is structured so as to send environmental signals, neither APD nor AVGAS should be seen as an environmental charge designed solely to capture the environmental cost of aviation.
- There are other external impacts of aviation on the environment for example that are not covered by the ECA.

Previous emissions cost assessments

In the 2007 emissions cost assessment consultation document, the DfT published an illustrative assessment using data for 2005. The results of this assessment can be found below.

Figure 2: Summary of 2005 results

Scenario	Assumptions		Scenario A: Actual			Scenario B: Illustrative 2005 if APD rates had been doubled		
	Radiative forcing factor	Shadow Cost of Carbon 2005 (£/tC)	Climate change costs in 2005 (£bn)	APD and AVGAS duty revenues in 2005 (£bn)	Net coverage of climate change costs (£bn)	Climate change costs in 2005 (£bn)	AVGAS duty & APD revenues in 2005 (£bn)	Net coverage of climate change costs (£bn)
Central case	1.9	84	1.6	0.9	-0.7	1.6	1.8	0.2
Scenario 2	1	84	0.9	0.9	0.04	0.9	1.8	0.9
Scenario 3	4	84	3.4	0.9	-2.5	3.4	1.8	-1.6
Scenario 4	1.9	163	3.2	0.9	-2.3	3.2	1.8	-1.4
Scenario 5	1.9	45	0.9	0.9	-0.03	0.9	1.8	0.9

Notes

- 1: Black: climate change costs are more than covered; in red: extent to which costs are not covered
- 2: This assumes that APD revenues are doubled because rates have doubled as from February 2007.

Conclusion

The calculations in this assessment demonstrate that using actual 2006 data for both the value of carbon dioxide emissions and tax receipts, aviation does not cover its climate change costs with a shortfall of some 0.8 billion.

However, Government took action in February 2007 to double the Air Passenger Duty rates, which reflects the framework now in operation in the UK; this will therefore be in the actual data of future emissions cost assessments. As demonstrated in the illustrative scenario B, this has a marked impact on the results of the emissions cost assessment. Under this scenario, aviation would cover its climate change costs with an excess of some £0.1 billion. However, the Government emphasises that whilst its domestic aviation tax regime is structured so as to send environmental signals, neither APD nor AVGAS should be seen as an environmental charge designed solely to capture the environmental cost of aviation.

While the emissions cost assessment looks to measure the extent to which climate change costs are covered by the airline industry, the range of uncertainties in such an assessment need to be acknowledged particularly with relation to the high range of non-CO₂ impacts of aviation and the future cost of carbon. These uncertainties are properly represented in the assessment we have produced. As a result the methodology, data sources and value ranges of the aviation emissions cost assessment will be kept under review to ensure it remains consistent with the most recent available data. As understanding develops it may be possible to produce assessments with narrower ranges if more certainty can be achieved on key elements. The current analysis represents our best understanding of the situation at present.