



Fallible Forecasts

A critique of the 2007 air passenger forecasts



This paper has been prepared by the Aviation Economics Group for AirportWatch, the umbrella organisation of bodies concerned about the rapid expansion of airports and air travel. It should not be taken as necessarily representing in detail the views of the individual members of AirportWatch.

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Front cover: Overview of UK Air Passenger Demand and CO₂ Forecasting. DfT 2007
Back cover: Forecasting CO₂ emissions. DfT 2007

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Executive Summary

The new forecasts produced by the Department for Transport are shown to be unreliable. They depend on a series of questionable assumptions.

The forecast increase in air traffic in the period to 2030, which underpins the proposals for new runways at Stansted and at Heathrow, and expansion at almost all other UK airports, depends on the unlikely assumptions that:

- **the price of oil falls to \$53 per barrel;**
- **there is no increase in tax on air travel in order to raise revenue;**
- **any tax imposed for climate change reasons (or the cost of emissions trading permits) will be at an exceptionally low rate;**
- **this low rate is based on an assumption that all other countries take drastic action to reduce their CO₂ emissions, with the UK taking no lead.**

The forecast for climate change damage by UK aviation in 2050 is a serious underestimate – because it is assumed that:

- **after 2030 government policy changes abruptly, so that no new runways are built, and the growth in air travel is constrained by lack of airport capacity;**
- **return flights by UK citizens are not included;**
- **the target for CO₂ reductions is 60%, whereas most experts believe that an 80% cut is necessary.**

If more realistic assumptions are made, with air travel continuing to expand at its present rate, by 2050 aviation is likely to account for nearly all UK climate change damage.

The forecast net economic benefit of new runways at Stansted and Heathrow is exaggerated because:

- **it is a cumulative total over 72 years to 2080 (per passenger it is less than the cost of a cup of coffee);**
- **it assumes that the price of oil will remain at \$53 per barrel until 2080;**
- **it assumes that in future people will value their time twice as highly as now;**
- **it includes benefits to foreign air passengers;**
- **it is based on an implausibly low cost of climate change damage, and discounts the risk of future loss of life – contrary to the recommendations of the Stern Review.**

Fallible Forecasts

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The new forecasts

1. In November 2007 the Department for Transport (DfT) published new forecasts for the growth in air travel and for the future CO₂ emissions by aircraft.¹ These update the forecasts published in 2000, and are designed to underpin the Government's airports policy. Forecasts for air passenger growth to 2030 provide the basis for plans for airport expansion; forecasts for the growth in aviation CO₂ emissions to 2050 show the industry's impact on the UK climate change target; and forecasts as far ahead as 2080 are calculated to show the cumulative economic benefits of new runways.
2. Although produced with a great deal of supporting statistical detail, the new forecasts are based on a number of crucial assumptions. When these assumptions are examined, it will be shown that they are highly uncertain and fallible. Perhaps that is why the forecasts were published without publicity, being made available on the DfT website and not in printed form.
3. Indeed the assumptions give the impression of being chosen to support the Government's plans for airport expansion, to minimise the climate change impact of aviation after 2030, and to maximise the economic benefits. It might be said that there is some resemblance to another 'dodgy dossier' where the evidence was massaged to support a pre-ordained decision.

Predict and Provide

4. The forecasts show total unconstrained demand for air travel more than doubling from 228 million passengers per annum (mppa) in 2005 to 495 mppa by 2030. The increase is equivalent to seven new full-length runways operating at full capacity: seven new airports the size of Gatwick.

5. The figure is surprisingly similar to the figure of 500 mppa in the 2003 Air Transport White Paper, despite the price of oil rising nearly fourfold since 2003, and despite mounting concern about climate change.
6. The forecast of 495 mppa is said to be for ‘unconstrained demand’, defined as the demand for air travel if there were no constraints on airport capacity – a fairly artificial concept since it assumes an unlimited number of runways at Heathrow. Heathrow’s central position means that many airlines operating from other airports would transfer there if there were sufficient capacity. Thus the figure for unconstrained demand assumes not just one extra runway at Heathrow but two extra runways operating at full capacity!
7. Ministers frequently claim that they are not pursuing predict and provide policies² because they are providing airport capacity for 480 mppa, not for the full 495 mppa. All this means is that they are proposing (at present) one extra runway at Heathrow, not two. At other airports the policy is pure predict and provide.

The cost of oil

8. For the purpose of the forecasts, oil prices (in real terms) are assumed to fall from about \$65 per barrel in 2006 to \$53 per barrel in 2030, with most of the decline occurring by 2012.³
9. Even if one sets aside the contentious question of when global oil production might peak, the forecast looks highly unrealistic given soaring demand in China and India, and political instability in the Middle East. In December 2007 the price of oil reached \$100 per barrel.
10. The International Energy Authority does provide some support for the forecast: it is confident that sufficient new oil reserves will come on stream.⁴ Nevertheless it estimates that the world will consume 115 million barrels of oil per day in 2030, compared with 82 million in 2004. And it is likely that the new reserves will prove more costly to develop.
11. A more pessimistic picture is given by a study by the German-based Energy Watch Group: they suggest that world oil production has already peaked and will fall by half as soon as 2030.⁵ The UK’s oil production peaked in 1999 and has already dropped by half. It is obviously impossible to predict what the cost of oil will be in 2030, but the impression is inescapable that the DfT forecasters have used the lowest possible figure.
12. The forecasts become even more dubious when the assumption that oil will remain at around \$53 per barrel (in real terms) is carried forward to 2050 in order to analyse aviation’s impact on the target to reduce CO₂ emissions by 60%; and

to 2080 to calculate the economic benefits of building a new runways at Stansted and Heathrow. The assumption that the price of oil will remain at around \$53 per barrel in real terms until 2080 beggars belief.⁶

Taxation

13. Another major flaw in the forecasts is that they assume that by 2030, or indeed by 2080, there will have been no increase in the taxation of air travel, except for that necessary to cover climate change costs. Since air travel is mainly used by the higher income groups, and since most trips are non-essential, it is in economic terms an almost ideal subject for a revenue-raising tax.
14. The unreality of the forecasts is brought home when the Department for Transport admit that they are based on the price of aviation fuel being 22p per litre in 2030, 22p per litre in 2050, and 22p per litre in 2080.⁷ Compare that to the price of petrol today at the local filling station.
15. Civil servants cannot, for obvious reasons, forecast a change of Government. But when both the main Opposition Parties are committed to some increase in tax on air travel, it does not make sense to assume no change in tax in the next twenty years. A more sensible forecast might have assumed that by 2030 some tax on aviation fuel and VAT on air fares would have been imposed. In 2003 a number of environmental organisations persuaded the DfT to re-run their forecast model on the assumption that tax on air travel would be gradually increased so that by 2030 it was at the same level as tax on car travel. The result showed air travel increasing by 2% a year instead of 4%, with no need for any new runways.⁸
16. There appears to be a disagreement within government as to whether air passenger duty (APD) is an environmental tax or a revenue-raising tax. The Emissions Cost Assessment consultation asked for views on this issue but no government decision has yet been announced. The Heathrow consultation document states that APD serves both purposes. So does the Aviation Duty consultation.⁹ The Air Passenger and CO2 Forecasts, however, assume that all revenues from APD count towards the climate change costs of aviation.¹⁰ That is a small but clear case of where the assumption has been chosen which is most favourable to the Government's plans for airport expansion.

Elasticity and sensitivity

17. The assumptions about elasticity of demand have been drastically reduced. In the 2000 forecasts a price elasticity of -1 was used (ie that a rise of 10% in air fares would cause a drop of 10% in demand). In the latest forecasts, based on academic research, a figure of -0.44 is used (ie that a 10% rise in fares would reduce demand by only 4.4%).¹¹

18. Thus, in the previous forecasts it was assumed, correctly, that the fall in air fares due to the advent of low cost airlines would lead to a great growth in air travel: now it is predicted that if air fares go up, or more tax is put on air travel, people will only slightly reduce their flying. It is assumed that the flying habit has become ingrained.
19. The effect of the low figure for the elasticity of demand is to give the apparent result, in a series of sensitivity tests, that whatever alteration in assumptions is examined – higher air fares, higher tax, higher cost of carbon – the demand for air travel will be little changed. Thus the sensitivity tests give the impression that the Government's plans for airport expansion are inevitable, unalterable, irresistible.
20. There are two reasons why this conclusion may be incorrect. The first is that during the past fifty years almost all the experience on which the calculations are based has been of a growing economy with falling air fares. It is possible that, if economic conditions get more difficult during the coming 25 years, the luxury of frequent air travel will be one of the first items to be cut back. A recent analysis by the Civil Aviation Authority (CAA) shows that the growth in demand for air travel closely follows patterns of consumer spending (albeit with a time lag). In fact the CAA has already identified a marked slow-down in air travel growth, beginning around the middle of 2005.¹²
21. The second is that elasticity may be greater in the long term than in the short term. When families have holidays already booked, when people working abroad need to return to see their partners, when migrants working in the UK need to visit their families, when a holiday house is owned abroad and needs to be visited regularly, then a rise in air fares or an increase in tax will make little difference. But in the long term people may decide to alter their life styles.
22. Another way in which the DfT sensitivity tests are misleading is in the narrow range of options tested. For example, a sensitivity test is given for the price of oil at \$80 a barrel in 2030 instead of \$53. Since the price has already reached \$100 a barrel, a more realistic sensitivity test would have been the effect of an oil price of \$200 or \$400 per barrel. Similarly a sensitivity test is given for the shadow cost of carbon to be raised by 20%, whereas Sir Nicholas Stern, in his Review of the Economics of Climate Change, indicated that (assuming 'business as usual') it should be 400% higher (see paragraph 38 below).
23. A weakness of the sensitivity tests is that they only show the effect of a change in one variable, whereas in practice there may well be two or more negative events occurring at the same time. For example, if the cost of oil rises to \$200, it is likely that annual world GDP growth will slow by 0.5% a year. A combined sensitivity test, based on the DfT figures, would show total UK (constrained) demand falling

by over 40%, reducing the total demand by 200 million passengers a year, equivalent to five new runways.

24. The use of a single overall elasticity figure in the sensitivity tests conceals some interesting features. For business travel the elasticity of demand in relation to air fares is given as zero, but for leisure trips as -1.0 . Thus tax increases which gradually over the next 25 years doubled air fares would halve the amount of leisure travel but would leave business travel unaltered.
25. That is particularly significant in relation to Heathrow. Business travel through Heathrow is forecast to grow from 18 mppa in 2005 to 37 mppa in 2030, while leisure travel grows from 29 mppa to 62 mppa.¹³ The effect of a gradual tax increase which doubled air fares would be to leave business travel at 37 mppa, while cutting leisure travel in 2030 to 31 mppa. Thus the total would be 68 mppa, with no need for a new runway. And since there would be no reduction in the growth of business trips, the main case for the new runway would disappear.

The CO₂ forecasts

26. The starting point for the forecasts is that: *aviation's CO₂ emissions have grown strongly, rising from 12 million tonnes of CO₂ (MtCO₂) in 1985 ... to 37.5 MtCO₂ in 2005. UK aviation in 2005 accounted for 6.3% of the UK's CO₂ emissions.*
27. Aviation emissions are forecast to rise to 59 MtCO₂ in 2030 and to 60 MtCO₂ in 2050. That is before allowing for radiative forcing effect but after allowing for improvements in technology.
28. The aviation industry often claims that modern aircraft are much more fuel efficient than the early jets but a study by the European research institute T&E concluded 'that the last piston-powered aircraft [in the 1960's] were as fuel-efficient as the current average jet.'¹⁴ The airlines also make much of their target of a 50% cut in CO₂ emissions by 2020, originally put forward by ACARE (Advisory Council for Aeronautical Research in Europe) in 2002. The DfT correctly recognise that this target only applies to new types of aircraft. Their forecast is based on average aircraft fuel efficiency increasing by 30% between 2005 and 2030, and by 1% a year from then to 2050. That looks optimistic: ACARE stated that: 'The consensus view is that the rate of progress for conventional engines will slow down significantly in the next 10 years. To maintain the same rate of progress as today to 2020 and beyond will require breakthrough technologies and consequently higher risk approaches.'¹⁵

29. It looks surprising that the forecasts show virtually no rise in CO₂ between 2030 and 2050. Close examination reveals that this is because it is assumed that after 2030, while aircraft efficiency continues to improve, *demand for air travel is constrained by airport capacity*.¹⁶ That is a dodgy assumption. If the Government believes that the economic case for building new runways is so strong between now and 2030, why has the case become less strong after 2030? Putting it the other way round, if for climate change reasons no new runways are built after 2030, why not take that decision now?
30. The assumption is similar to the prayer attributed to Saint Augustine: ‘make me chaste, Lord, but not yet’. The history of the past 50 years is littered with assurances that if just one more runway or one more terminal is permitted, no more will be required. In 1985 the government promised ‘unequivocally’ that there would never be another runway at Stansted. At Heathrow BAA promised that if T5 were built there would be no need for a new runway. So also the assumption of no new runways after 2030 is clearly designed to massage downwards the 2050 forecast of CO₂ emissions.
31. It is significant that BAA chief executive, Stephen Nelson, now refuses to rule out the possibility of a fourth runway and seventh terminal at Heathrow.¹⁷ If the forecasts were to be based on an assumption that demand for air travel between 2030 and 2050 continues to rise at the same rate as before 2030, and that this demand is met by the provision of new airport capacity, ie a continuation of the Government’s present policy, then aviation CO₂ emissions in 2050 would be around 80 MtCO₂.
32. By 2050, assuming that other industries achieve the target 60% cut in emissions, the DfT forecast states that UK aviation will account for 20.6% of total UK CO₂ emissions. After including a radiative forcing factor for aviation, and also for other industries, aviation is forecast to contribute 29.0 % of UK climate change damage.¹⁸ Most scientists, however, believe that a cut of at least 80% in emissions is essential, and this target has been endorsed by the leading US Presidential candidates and has been recognised by the British Prime Minister.¹⁹ If all other industries achieve an 80% reduction, and if aviation goes on growing at the present rate, it will account for almost all remaining UK emissions – obviously an impossible situation.
33. Furthermore, the forecasts include emissions only from departing aircraft which, it is explained, is *consistent with the UNFCCC recommended approach for reporting carbon dioxide emissions from international aviation*. An alternative method, supported by a number of other nations, is to count emissions according to the nationality of the passengers on both departing and arriving aircraft. Indeed there is a moral case for arguing that UK citizens should be responsible for all the emissions they cause whether flying out or flying back. Many smaller countries

see no reason why they should carry the can for British tourists on their return journeys. It is significant, if not entirely comparable, that the EU is planning that the emissions trading scheme should cover both departing and arriving flights.

34. The forecasts show that 77% of passengers using UK airports in 2005 were UK citizens; and that in 2030 the proportion will be 75%. If CO₂ emissions were to be calculated according to nationality, the forecast level of emissions would need to be multiplied by 75/50 – that is by 1.5. On that basis of calculation, and even after all the vaunted technology improvements, UK aviation alone would reach the upper limit of what will be permissible for the whole UK on climate change grounds well before 2050.

The cost of climate change

35. The forecasts are based on the assumption that *after 2010 passengers would face an additional cost reflecting their climate change emissions (both carbon and the warming effects of non-carbon emissions), phased in gradually over ten years.*
36. The timing seems curious. Why is a charge not introduced until after 2010? Could it have anything to do with the next election? Why is the charge to be phased in gradually: have the forecasters never read the Stern Review on the urgency of tackling climate change?
37. The cost of the climate change damage caused by aviation used in the forecasts is extremely low. It is based on *the DEFRA value for the shadow cost of carbon dioxide emissions, which rises from £19/tCO₂ [i.e. £19 per tonne of CO₂] in 2000 by 2% per annum in real terms.*²⁰ £19/tCO₂ is roughly equivalent to £70 per tonne of carbon in 2000 – about £90 now.
38. Curiously £70/tC was the cost of carbon as calculated by DEFRA in 2003.²¹ At that time it was stated that the figure did not include any allowance for possible climate catastrophes, and that it was only sufficient to meet Kyoto targets, not the more ambitious 60% target. These deficiencies were corrected in the Stern Review which produced a figure equivalent to £238/tC at 2000 prices, or £280 at current prices.
39. The figures were given in an answer to a Parliamentary Question on 28 February 2007 which is worth quoting in full: “*The Stern Review’s modelling suggests the current social cost of carbon: (i) with business as usual, is around £238 per tonne of carbon; (ii) but is £84 per tonne if the world is on a trajectory to stabilise emissions at 550 parts per million of carbon dioxide equivalent; (iii) and is £70 per tonne if the world is on a 450 parts per million of carbon dioxide equivalent stabilisation trajectory.*”

40. DEFRA have reverted to their original figure of £70/tC on the grounds that, if all countries implement measures to reduce carbon emissions to a level of 450 parts per million (ppm), future climate change damage will be less and the cost to society of emitting a tonne of carbon will be much reduced.²² The forecasts are based on the assumption that the UK can plan a large increase in air travel confident that all other countries in the world will make huge cuts in their carbon emissions. That ignores the need for the UK to set an example to the rest of the world, especially since the Brits fly more than any other nation.
41. Professor Paul Ekins has put the point well: “The government says it is committed to the [climate change target] and assumes it will be achieved, thus allowing it to use the lower carbon price. This in turn means that carbon-intensive projects such as new runways pass the cost-benefit test, which allows them to be built. In this way the government can claim to be committed to doing something about climate change (having adopted a relatively stringent carbon concentration target), and justify the building of the new runways to which it is also committed. The fact that the new runways and other carbon-intensive infrastructure that will be justified by this policy approach make it most unlikely that the climate target will be met is a problem that will not need to be faced until this government is well past its term of office.”²³
42. A sounder approach would be to set a cost for carbon which reflects the current situation. Not until international action has been agreed and implemented will it be sensible to reduce the cost. That would imply using Sir Nicholas Stern’s figure for ‘business as usual’ – £280 per tonne of carbon, four times as high as the figure used by DEFRA / DfT. And in turn that would suggest that the climate change tax should be four times as high.
43. Stern’s figure was based on a target of stabilising emissions at 500-550 ppm which he considered the lowest that would be politically feasible. To achieve 450-500ppm, Stern indicated that the current social cost of carbon would need to be around three times as high²⁴ – twelve times the DEFRA figure, and so high that it would rule out any growth in air travel.

The Emissions Trading Scheme

44. The treatment of the EU emissions trading scheme (ETS) appears somewhat simplistic. It is assumed that *growth in UK aviation CO₂ emissions above the 2004-6 average would be offset by emissions reductions in other sectors. ... The result would be that ‘net’ aviation emissions would effectively be capped.*
45. That will not be true unless the ETS includes a full allowance for the extra damage caused by aircraft at high altitude. If an increase in aviation CO₂ is matched by an equal reduction in CO₂ elsewhere, the extra effects go

unaccounted for, and any growth in aviation will continue to make climate change worse.

46. The forecasts do not include any allowance for the cost of carbon permits: this is contained within the item for the shadow cost of carbon. There is no recognition that, if the cap on total EU emissions is reduced in line with either the 60% or the 80% cut, other sectors will be hard put to find additional cuts to allow aviation to use around a high proportion of all available carbon.

The economic benefit of new runways

47. The forecasts include a prediction that building new runways at Stansted and at Heathrow would bring net economic benefits of £21-22 billion (Stansted £14 billion plus Heathrow £8 billion). The precision of this estimate is presented as implying that the policy must be correct. Yet this prediction is as fallible as all the other forecasts, in many ways more fallible since it combines and multiplies all their uncertainties.
48. The so-called economic benefit is a notional figure based on a computer calculation of the benefit to each passenger, and includes the notional benefit of being able to fly from an airport close to their home, and the notional benefit of having more frequent flights. Since there is no way in which each passenger could be charged separately for these abstract benefits, the 'net economic benefit' is quite different from the potential commercial return. That is why the airport operators, who don't wish to lose money on hare-brained notional schemes, have decided – despite the encouragement in the Air Transport White Paper – not to go ahead with a new runway at Birmingham and to scale down the plans for Luton; and why the airlines have shown no enthusiasm for a new runway at Stansted.
49. The predicted economic benefit of £21-22 billion sounds a lot of money, too good to be missed, but it is a cumulative total over the 72 years to 2080.²⁵ Over one year (merely dividing by 72), the benefit is £305 million, tiny compared to the annual tax subsidy to aviation of £9 billion. Divided among the forecast number of passengers at Heathrow and Stansted in 2030 the economic benefit amounts to £1.46 per head – less than the cost of a cup of coffee!²⁶
50. The calculation of economic benefits depends on a number of flawed assumptions. The first is that the price of oil remains (in real terms) at \$53 per barrel until 2080. The higher the cost of oil, the lower the economic benefit.
51. Another is that the cost of coping with climate change in the years between now and 2080 will continue to be measured at the low rate of £70 per tonne of carbon (in 2000, rising by 2% a year), which in turn depends on the assumption that the world will have introduced drastic measures to reduce CO2 emissions (for all

industries except aviation).

52. Another doubtful assumption is that future costs and benefits should be discounted (at 3.5% for the first thirty years, then 3%).²⁷ While it is correct to discount future economic benefits, on the standard grounds that future pleasures are less valuable to us than present enjoyment, Sir Nicholas Stern concluded that it was not correct to discount future climate change damage, on the grounds that it would be morally wrong to say that the welfare and lives of future generations are worth less than the welfare and lives of people living today.²⁸
53. While the correct rate of discount to use has been one of the main areas of debate about the Stern Review, this is another case of where the DfT have chosen an assumption which minimizes the impact of climate change.
54. The economic benefits also depend on the assumption is that there will be no increase in tax for revenue purposes on air travel between now and 2080. When challenged by environmental groups in 2003, a re-run of the DfT computer model showed that, if by 2030 tax on air travel had been raised to the same level as tax on car travel, the economic benefit of a new runway at Stansted would be negative.
55. The predictions also depend (if they are calculated in the same way as those in the Air Transport White Paper) on an assumption that the value people put on their time will have doubled by 2030.²⁹ When the environmental groups asked DfT to re-run their computer model on the assumption that the value of time remained at the present level, the economic benefit of building new runways was halved.
56. The economic benefits at Heathrow include the benefits of reduced delays from the introduction of mixed mode. Yet that depends on the unlikely assumption that the number of flights is not increased to take up the additional capacity.
57. It is not mentioned that part of the £21-22 billion economic benefit will accrue to foreign air passengers. Failure to mention this point is contrary to Treasury guidance (September 2007) which states: ‘All impacts, including cost benefits both direct and indirect, on non-UK residents should be identified and quantified separately...’ Nevertheless the information has been obtained by means of a Parliamentary Question and shows that for both the proposed Stansted runway and the proposed Heathrow runway one third of the benefits would accrue to non-UK residents.³⁰
58. For the British Government to demolish a village of 700 houses at Heathrow, increase the danger of flights over London, destroy beautiful countryside and historic houses at Stansted, and make millions of the British public subject to higher noise levels, partly for the benefit of future foreign tourists seems

remarkably altruistic!

Conclusion

59. Many members of the public, press and Parliament feel instinctively that the rapid growth in air travel, with the proposed expansion of many airports across the UK, and with the high profile decisions to build new runways at Stansted and Heathrow, cannot be reconciled with tough climate change targets. Yet the Government presses ahead, basing its policy on forecasts of rapidly rising demand, on forecasts that the climate change impact will be comparatively small, and on forecasts of large economic benefits.
60. The Department for Transport forecasting model is complex and sophisticated. Ordinary members of the public find it difficult to contest the conclusions. Yet there is an old adage that, however good the machine, if you put rubbish in, you get rubbish out.
61. Our examination has unearthed over a dozen instances of where the fundamental assumptions are unreliable. In several cases, for instance in the assumption that the cost of oil will remain at \$53 a barrel (and aviation fuel at 22p per litre) throughout the period to 2080, the basis on which the forecasts are prepared looks just plain silly. In every case the assumptions appear to err on the side of supporting Government policy.
62. This analysis shows the public have got it right. The Government have got their sums wrong. The basic foundations of the Government's aviation policy are unsound.

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- ¹ *UK Air Passenger Demand and CO₂ Forecasts*. DfT November 2007.
<http://www.dft.gov.uk/pgr/aviation/environmentalissues/ukairdemandandco2forecasts/airpassdemandfullreport.pdf>
- ² Predict and provide has long been abandoned as a formula for building new roads: it was realised that as new roads were built, people tended to travel longer distances. So also with air travel: the provision of more airport capacity for a highly subsidised industry merely promotes the adoption of life styles that involve frequent flying.
- ³ *UK Air Passenger Demand and CO₂ Forecasts*. DfT 2007. Paragraph 2.29. The source given as BERR White Paper on Energy. Actually the White Paper only gives the price of oil up to 2020, and shows it as \$53 per barrel in 2020.
- ⁴ <http://www.worldenergyoutlook.org/>
- ⁵ http://www.energywatchgroup.org/fileadmin/global/pdf/EWG_Oilreport_Summary_10-2007.pdf
- ⁶ That this is the basis of the forecasts was confirmed in the answer to a Parliamentary Question by Sir Paul Beresford. 5 February 2008.
- ⁷ Written Answer 5 February 2008
- ⁸ *The Hidden Cost of Flying*. Brendon Sewill. AEF. 2003
- ⁹ ‘...ensuring that aviation makes a greater contribution to covering its environmental costs, while ensuring that a fair level of revenue continues to be raised from the sector in order to support public services.’ Aviation Duty consultation. Treasury. January 2008.
- ¹⁰ Paragraph 2.32. It is also stated, inaccurately, that the Emissions Cost Assessment consultation proposed that APD should count towards climate change costs.
- ¹¹ Minus 0.56 if foreign travel is assumed to have the same elasticity as travel from the UK.
- ¹² *Recent Trends in UK Air Passenger Growth*, CAA 2008, page 5:
http://www.caa.co.uk/docs/589/erg_recent_trends.pdf
- ¹³ *UK Air Passenger Demand and CO₂ Forecasts*. DfT 2007. Table G2 page 111.
- ¹⁴ <http://www.transportenvironment.org/Publications/view/cid:503>
- ¹⁵ Quoted by DfT in *Aviation and Global Warming*. January 2004.
- ¹⁶ *UK Air Passenger Demand and CO₂ Forecasts*. DfT 2007 page 3. The assumption is even made (page 70) that there is no reallocation of demand away from the London area airports.
- ¹⁷ Times 23 January 2008
- ¹⁸ *UK Air Passenger Demand and CO₂ Forecasts*. DfT 2007 page 139.
- ¹⁹ “The evidence now suggests that as part of an international agreement developed countries may have to reduce their emissions by up to 80%. So we will put this evidence to the Committee on Climate Change, ask it to advise us as it considers the first three five-year budgets on whether our own domestic target should be tightened up to 80%.” Speech to WWF. 17 November 2007
- ²⁰ *UK Air Passenger Demand and CO₂ Forecasts*. Paragraph 2.34
- ²¹ *Aviation and the Environment: Using Economic Instruments* March 2003.
- ²² The 450 ppm target would require industrialised countries to make a cut in CO₂ emissions of at least 80% by 2050. The Government is resisting calls for the UK to adopt this target.
- ²³ Guardian 27 December 2007
- ²⁴ *Stern Review of the Economics of Climate Change*. Part iii, page 247
- ²⁵ *UK Air Passenger Demand and CO₂ Forecasts*. DfT 2007. Paragraph 4.18. (The Heathrow consultation document gives the date as 2076)
- ²⁶ This is of course an over simple calculation. Future benefits are discounted so it is not strictly accurate to divide them by 72. And we don’t know the likely cost of a cup of coffee in 2030. But the point is too good to miss!
- ²⁷ *UK Air Passenger Demand and CO₂ Forecasts*. DfT 2007. Paragraph 4.18.
- ²⁸ *Stern Review of the Economics of Climate Change*. Chapter 2.4
- ²⁹ Value of time for UK businessmen £41.69 per hour in 1998 rising to £80.44 in 2030; for UK and foreign leisure passengers rising from £6.98 per hour to £13.47. Guide to SPASM Model DETR 2003.
- ³⁰ Written Answer to Sir Paul Beresford. 5 February 2008.

