

**Doc. No. SSE/21/a**  
**Case Ref. 2032278**

Appeal by BAA Ltd and Stansted Airport Ltd following the refusal by Uttlesford District Council of planning application UTT/0717/06/FUL

## **Proof of Evidence on behalf of Stop Stansted Expansion**

### **The Materiality of Climate Change**

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# 1 INTRODUCTION

## 1.1 Personal details

- 1.1.1 My name is Roger Levett and I appear at the Public Inquiry on behalf of Stop Stansted Expansion ('SSE').

## 1.2 Qualifications and experience

- 1.2.1 I have a BSc (hons) degree in Politics and Philosophy from Bristol University (1979), 24 years experience in energy and sustainable development policy, strategy and management and I am a founding partner of Levett-Therivel Sustainability Consultants. Prior to that my career background included six years with the Department of Energy, three years with Scottish Enterprise Energy and Environmental Technologies Group and nine years as a Director of CAG Consultants specialising in sustainability policy and management.
- 1.2.2 Recent publications include: 'Leading the Way: how local authorities can meet the challenge of climate change', LGA<sup>1</sup>/Energy Saving Trust, 2005, 'A Better Choice of Choice', Fabian Society, 2005 (with Christie, Jacobs and Therivel) and 'Deconstructing Barker', 2007.
- 1.2.3 I had lead responsibility for the 'Sustainability Appraisal and Strategic Environmental Assessment of the Draft East of England RSS'<sup>2</sup> and for the 'Assessment of Climate Change Impacts of the Draft South West RSS'. I am currently advising Birmingham, Coventry and Black Country Chief Executives on carbon neutral policy and involved in preparing a climate change action plan for Buckinghamshire Strategic Partnership.

# 2 SCOPE OF EVIDENCE

## 2.1 Core evidence

- 2.1.1 In June 2006, I produced a report for SSE entitled 'Stansted Generation 1: Analysis of Climate Change Issues'. This was included in SSE's July 2006 submission (Volume 2) [CD/202] to Uttlesford District Council ('UDC').
- 2.1.2 I was commissioned by SSE to provide further analysis of climate change issues for the purposes of this Inquiry. My report is set down in the following pages and forms the core of my evidence.

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<sup>1</sup> Local Government Association.

<sup>2</sup> Regional Spatial Strategy.

## 2.2 Overall argument

- 2.2.1 This proof argues that the consequences of the proposed expansion of air traffic at Stansted are sufficiently grave as to make allowing the expansion incompatible with Government policy on climate change.
- 2.2.2 The appendix clarifies the reasons why climate change should be a central concern of the inquiry.

## 3 THE CENTRALITY OF CLIMATE CHANGE IMPACTS TO THIS INQUIRY

- 3.1 In a letter to the Inspector dated 23 March 2007, SSE included the following:

*'In our view these [climate change] impacts are a central issue to the Inquiry and we want to present extensive evidence about them. To exclude such evidence would be contrary to the undertakings given by the Secretary of State for Transport in his 'Detailed Grounds for opposing Judicial Review' as submitted to the High Court in September 2004 in connection with the 2004 Judicial Review of the Air Transport White Paper (ATWP). The relevant passages are as follows:*

*'10. For his part, the Secretary of State accepts: -*

*(i) that it is implicit in the concept of environment appraisal under EU law that the decision-maker, before he grants a 'development consent', must consider the content of the Environmental Assessment and decide whether, on the facts, the 'development consent' should be issued notwithstanding any adverse environmental effects revealed by the assessment. This necessarily means balancing those adverse effects against the need for the development;*

*(ii) on the facts of this case, it will accordingly be possible and legitimate for the Claimants in the present proceedings, or anybody else, to make a case at any inquiry (following an application for planning permission) that the adverse effects revealed by the environment assessment are such that any development consent should be refused notwithstanding the fact that refusal will frustrate national policy;*

*...*

*19 ... The ATWP is not, on any reasonable view, a 'development consent'; and as already indicated, the Secretary of State accepts that it will be necessary for subsequent decision-makers to consider the results of environmental assessment before deciding whether or not to issue such a 'development consent.'*

*These 'Detailed Grounds' were supported by a witness statement submitted on behalf of the Secretary of State for Transport in September 2004, paragraph 2 of which reads as follows:*

*"The Department and the Secretary of State accept that the obligation, in European Law, to consider an Environmental Impact Assessment before granting a development consent necessarily carries with it an obligation to consider whether that development consent should be refused because of alleged adverse environmental impacts, even if such a refusal would frustrate government policy."*<sup>3</sup>

*The significance of these undertakings cannot be understated because they were provided in the context of a legal challenge to the Government's policy of supporting expansion at Stansted in advance of a proper assessment of the environmental impacts, allegedly in breach of European Law. **It was a fundamental part of the Secretary of State for Transport's defence to make clear that Government policy on Stansted expansion was secondary to European Law and that it could be disregarded if, at the stage of 'any inquiry (following an application for planning permission)', the adverse environmental impacts of the proposed development were judged to outweigh the need for the proposed development.** ' [our emphasis]*

- 3.2 In particular, whilst the extra greenhouse gas emissions which would be caused by greater use of the existing runway at Stansted are a relatively small proportion of the UK's total, they nonetheless add to an impact which is already very significant, so under EU and UK environmental assessment law they must be treated as a cumulative impact.

## **4 IT IS VERY LIKELY THAT HUMAN ACTIVITIES ARE CAUSING CLIMATE CHANGE**

- 4.1 The Intergovernmental Panel on Climate Change (IPCC), an agency of the United Nations, is the world's authoritative source of scientific expertise on climate change, drawing on the work of thousands of scientists throughout the world. Most policy on climate change has been based on its Third Assessment Report, published in 2001. The first output of the Fourth Assessment Report, 'Climate Change 2007: the physical science base: summary for policy makers' was published in February 2007.

- 4.2 This includes the following summary statements:

- *'The understanding of anthropogenic warming and cooling influences on climate has improved since the Third Assessment Report (TAR), leading to very high confidence [defined as 'at least a 9 out of 10 chance of being correct;'] that the globally averaged net effect of human activities since 1750 has been one of warming, with a radiative*

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<sup>3</sup> Essex County Council et al v Secretary of State for Transport et al in the High Court of Justice, Queens Bench Division; CO1339/2004, 'Second Statement of MR Fawcett on behalf of the Defendant', 17 September 2004 [CD/206].

*forcing of +1.6 [+0.6 to +2.4] W m<sup>-2</sup>. [meaning the best estimate is 1.6 and there is an estimated 5% likelihood that the value could be above the range given in square brackets and 5% likelihood that the value could be below that range.]*

- *‘Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global mean sea level.’*
- *‘The last time the polar regions were significantly warmer than present for an extended period (about 125,000 years ago), reductions in polar ice volume led to 4 to 6 metres of sea level rise.’*
- *‘Most of the observed increase in globally averaged temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations. This is an advance since the TAR’s conclusion that ‘most of the observed warming over the last 50 years is likely to have been due to the increase in greenhouse gas concentrations’. Discernible human influences now extend to other aspects of climate, including ocean warming, continental-average temperatures, temperature extremes and wind patterns.’*
- *‘For the next two decades a warming of about 0.2degC per decade is projected for a range of SRES emission scenarios. Even if the concentrations of all greenhouse gases and aerosols had been kept constant at year 2000 levels, a further warming of about 0.1°C per decade would be expected.’*
- *‘Continued greenhouse gas emissions at or above current rates would cause further warming and induce many changes in the global climate system during the 21st century that would very likely be larger than those observed during the 20th century.’*
- *‘Anthropogenic warming and sea level rise would continue for centuries due to the timescales associated with climate processes and feedbacks, even if greenhouse gas concentrations were to be stabilised.’*

4.3 In sum: the climate is definitely warming; it is very likely that human releases of greenhouse gas emissions have caused most of the warming; the last time the earth was warmer than this, sea levels were 4 to 6 metres higher because of melted ice; more warming is now inevitable, and resulting changes are very likely to be greater this century than last; but cutting emissions could reduce the effects.

4.4 This is all markedly more definite, and pessimistic, than the Third Assessment Report.

4.5 There has been no serious dissent from or challenge of its main messages. However a number of well qualified scientists have stated that there is already strong scientific evidence that the dangers are greater, and action to reduce emissions much more urgent, than is acknowledged in the report, which was toned down to gain consensus from politicians as well as scientists.

## 5 CLIMATE CHANGE IMPERILS HUMANITY'S FUTURE

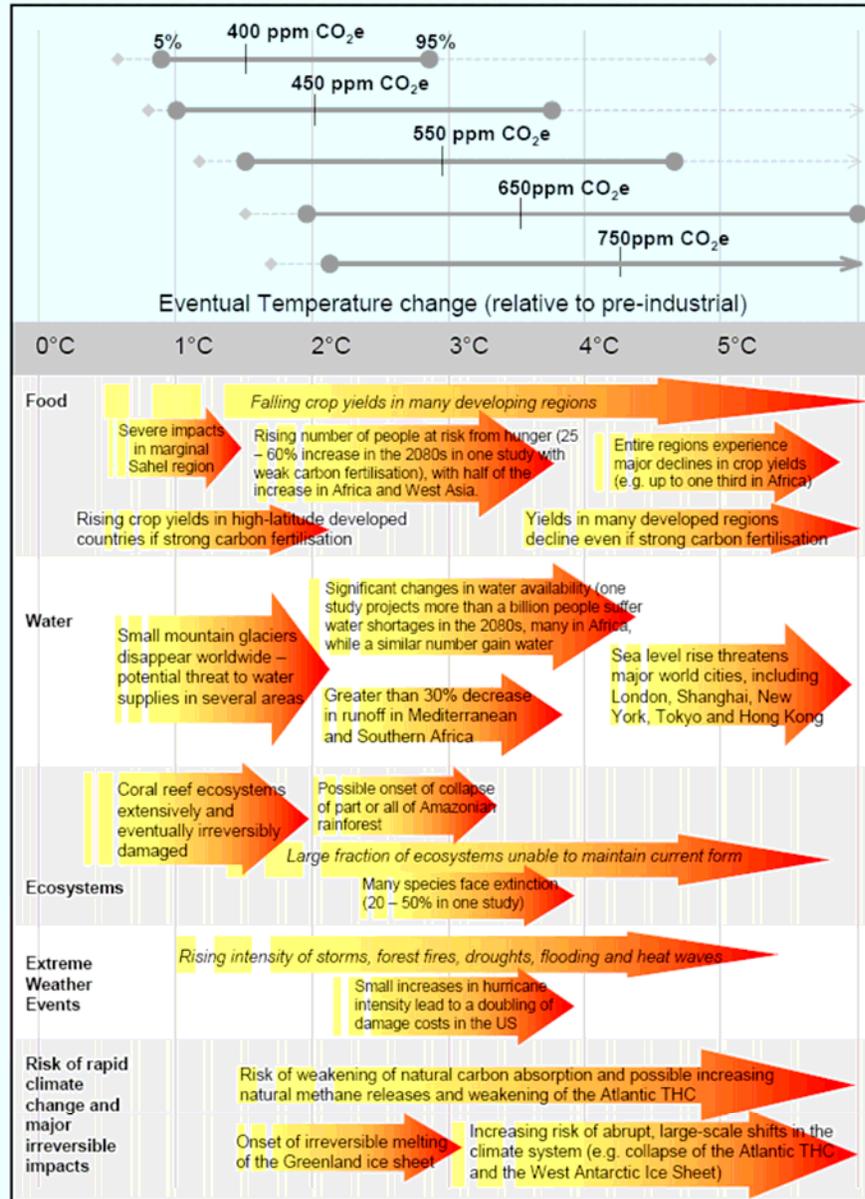
- 5.1 The Stern Review on the Economics of Climate Change<sup>4</sup> was commissioned by the Chancellor Gordon Brown and published in October 2006. The Government has described it as '*The most comprehensive review ever carried out on the economics of climate change*'. It was carried out by Sir Nicholas Stern, Head of the Government Economic Service and former World Bank Chief Economist.
  
- 5.2 The message is clear that the risk of grave, and potentially catastrophic, consequences increases markedly if global temperature rise compared to pre-industrial times exceeds 2 degrees, corresponding to a peak atmospheric concentration of about 450ppm. These figures – 2 degrees rise and 450ppm - have become established in the literature as rule of thumb thresholds of (relative) climate security.
  
- 5.3 The following figure (Executive Summary, page v) summarises the likely impacts of climate change:

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<sup>4</sup> 'Report of the Stern Review on the Economics of Climate Change', HMT, Oct 200 [CD/157].

**Figure 2 Stabilisation levels and probability ranges for temperature increases**

The figure below illustrates the types of impacts that could be experienced as the world comes into equilibrium with more greenhouse gases. The top panel shows the range of temperatures projected at stabilisation levels between 400ppm and 750ppm CO<sub>2</sub>e at equilibrium. The solid horizontal lines indicate the 5 - 95% range based on climate sensitivity estimates from the IPCC 2001<sup>2</sup> and a recent Hadley Centre ensemble study<sup>3</sup>. The vertical line indicates the mean of the 50<sup>th</sup> percentile point. The dashed lines show the 5 - 95% range based on eleven recent studies<sup>4</sup>. The bottom panel illustrates the range of impacts expected at different levels of warming. The relationship between global average temperature changes and regional climate changes is very uncertain, especially with regard to changes in precipitation (see Box 4.2). This figure shows potential changes based on current scientific literature.



<sup>2</sup> Wigley, T.M.L. and S.C.B. Raper (2001): 'Interpretation of high projections for global-mean warming', *Science* **293**: 451-454 based on Intergovernmental Panel on Climate Change (2001): 'Climate change 2001: the scientific basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change' [Houghton JT, Ding Y, Griggs DJ, et al. (eds.)], Cambridge: Cambridge University Press.

<sup>3</sup> Murphy, J.M., D.M.H. Sexton D.N. Barnett et al. (2004): 'Quantification of modelling uncertainties in a large ensemble of climate change simulations', *Nature* **430**: 768 - 772

<sup>4</sup> Meinshausen, M. (2006): 'What does a 2°C target mean for greenhouse gas concentrations? A brief analysis based on multi-gas emission pathways and several climate sensitivity uncertainty estimates', *Avoiding dangerous climate change*, in H.J. Schellnhuber et al. (eds.), Cambridge: Cambridge University Press, pp.265 - 280.

## 6 PROMPT DECISIVE EMISSIONS REDUCTION IS ESSENTIAL FOR CLIMATE SECURITY

6.1 The Stern Report states:

***'The benefits of strong, early action on climate change outweigh the costs.'***

*The effects of our actions now on future changes in the climate have long lead times. What we do now can have only a limited effect on the climate over the next 40 or 50 years. On the other hand what we do in the next 10 or 20 years can have a profound effect on the climate in the second half of this century and in the next.*

*No-one can predict the consequences of climate change with complete certainty; but we now know enough to understand the risks. **Mitigation - taking strong action to reduce emissions - must be viewed as an investment, a cost incurred now and in the coming few decades to avoid the risks of very severe consequences in the future.'**<sup>5</sup> [our emphasis]*

6.2 Unfortunately, on current trends the commonly accepted threshold of 450ppm will be reached in about 10 years. Stern tempers scientific rigour with pragmatism on this point:

*'The current evidence suggests aiming for stabilisation somewhere within the range 450 - 550ppm CO<sub>2e</sub>. Anything higher would substantially increase the risks of very harmful impacts while reducing the expected costs of mitigation by comparatively little. Aiming for the lower end of this range would mean that the costs of mitigation would be likely to rise rapidly. Anything lower would certainly impose very high adjustment costs in the near term for small gains and might not even be feasible, not least because of past delays in taking strong action.'*<sup>6</sup>

6.3 Stabilising in this range requires rapid cuts:

- *'Stabilising at or below 550ppm CO<sub>2e</sub> would require global emissions to peak in the next 10 - 20 years, and then fall at a rate of at least 1 - 3% per year... By 2050, global emissions would need to be around 25% below current levels. These cuts will have to be made in the context of a world economy in 2050 that may be 3 - 4 times larger than today - so emissions per unit of GDP would need to be just one quarter of current levels by 2050 ...'*
- *'To stabilise at 450ppm CO<sub>2e</sub>, without overshooting, global emissions would need to peak in the next 10 years and then fall at more than 5% per year, reaching 70% below current levels by 2050.'*

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5 'Report of the Stern Review on the Economics of Climate Change', HMT, Oct 2006 [CD/157], Executive Summary, page i.

6 Ibid, page xii.

- *‘Stabilisation at 450ppm CO<sub>2</sub>e is already almost out of reach, given that we are likely to reach this level within ten years and that there are real difficulties of making the sharp reductions required with current and foreseeable technologies. Costs rise significantly as mitigation efforts become more ambitious or sudden. Efforts to reduce emissions rapidly are likely to be very costly.’<sup>7</sup>*

6.4 However, after shrinking from endorsing 450ppm on these pragmatic grounds, Stern does warn that any further indulgence – in either delaying action or allowing for atmospheric concentrations to go higher before coming back – is too dangerous to accept:

*‘Theoretically it might be possible to ‘overshoot’ by allowing the atmospheric GHG concentration to peak above the stabilisation level and then fall, but this would be both practically very difficult and very unwise. Overshooting paths involve greater risks, as temperatures will also rise rapidly and peak at a higher level for many decades before falling back down. Also, overshooting requires that emissions subsequently be reduced to extremely low levels, below the level of natural carbon absorption, which may not be feasible. Furthermore, if the high temperatures were to weaken the capacity of the Earth to absorb carbon - as becomes more likely with overshooting - future emissions would need to be cut even more rapidly to hit any given stabilisation target for atmospheric concentration.’<sup>8</sup>*

*‘An important corollary is that there is a high price to delay. Delay in taking action on climate change would make it necessary to accept both more climate change and, eventually, higher mitigation costs. Weak action in the next 10-20 years would put stabilisation even at 550ppm CO<sub>2</sub>e beyond reach – and this level is already associated with significant risks.’<sup>9</sup>*

6.5 Perhaps the most directly relevant point Stern makes is: ‘The investments made in the next 10-20 years could lock in very high emissions for the next half-century, or present an opportunity to move the world onto a more sustainable path.’<sup>10</sup> Providing for further aviation growth is clearly an example of the former.

6.6 In a Treasury collation of responses to the Stern Review<sup>11</sup>, four Nobel Prize winning economists (together with other eminent commentators) show uncharacteristic unanimity in emphasising the importance of prompt action. Quotations include:

- *‘Sooner is much better.’ Robert M. Solow, Nobel Prize economist 1987;*
- *‘Governments have a clear and immediate duty to accept the challenge it represents.’ James Mirrlees, Nobel Prize economist 1996;*
- *‘What is particularly striking is the identification of ways and means of sharply minimizing these penalties through acting right now, rather*

<sup>7</sup> Ibid, page xv.

<sup>8</sup> Ibid, page xi.

<sup>9</sup> Ibid, page xv.

<sup>10</sup> Ibid, page xxii.

<sup>11</sup> [http://www.hm-treasury.gov.uk/media/9F3/38/20061028\\_Quotes-7.pdf](http://www.hm-treasury.gov.uk/media/9F3/38/20061028_Quotes-7.pdf).

*than waiting for our lives to be overrun by rapidly advancing adversities. The world would be foolish to neglect this strong but strictly time-bound practical message.’ Amartya Sen, Nobel Prize economist 1998;*

- *‘It makes clear that the question is not whether we can afford to act, but whether we can afford not to act. To be sure, there are uncertainties, but what it makes clear is that the downside uncertainties - aggravated by the complex dynamics of long delays, complex interactions, and strong non-linearities - make a compelling case for action.’ Joseph Stiglitz Nobel Prize economist 2001;*
- *‘the benefits of strong, early action on climate change outweigh the costs.’ Claude Mandil, Executive Director of the International Energy Agency;*
- *‘I support the Stern Review’s conclusion that there is a strong economic case for taking early, effective action to reduce greenhouse gas emissions.’ Sir Rod Eddington Adviser to the UK Government on the long term links between transport and economic growth.*

6.7 Of course this is not necessarily the consensus view of economists (assuming there can ever be such a thing.) However, in so far as the Treasury had to go out of its way to garner (and perhaps even to prompt) such comments, that itself might be significant as evidence that the Government is seeking to build momentum for early action.

6.8 Stern also argues that ‘The removal of barriers to behavioural change is a third essential element [together with pricing and technology], one that is particularly important in encouraging the take-up of opportunities for energy efficiency.’<sup>12</sup>

6.9 Stern’s recognition of the importance of getting people out of energy-inefficient behaviour despite the difficulty of changing entrenched behaviour makes a piquant contrast with the proposed development’s effect of enabling people to adopt more energy-intense behaviour than at present by catering for further increases in predominantly holiday flying.

6.10 In sum: stopping emissions from continuing to rise, and starting to reduce them as soon as possible, is the paramount requirement for climate security.

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<sup>12</sup> Ibid, page xx.

## 7 THE GOVERNMENT ACCEPTS STERN'S ANALYSIS AND FINDINGS AND RECOMMENDATIONS

7.1 The Stern Report is a report to Government, not a statement of Government policy. It is only relevant to this inquiry in a formal way (as opposed to logical or moral) in so far as Government endorses it. Both Tony Blair, current Prime Minister, and Gordon Brown, Chancellor and probably future Prime Minister, did so in ringing terms at its launch. Both made clear that they accepted the thrust of the Stern analysis and recommendations.

7.2 The following are excerpts from Tony Blair's speech:<sup>13</sup>

*'This is the most important report on the future published by the Government in our time in office. Some will always make a case for doubt in an issue such as this, partly because its implications are so frightening. But what is not in doubt is that the scientific evidence of global warming caused by greenhouse gas emissions is now overwhelming. It is not in doubt that if the science is right, the consequences for our planet are literally disastrous. And this disaster is not set to happen in some science fiction future, many years ahead, but in our lifetime.*

*What is more, unless we act now, not some time distant but now, these consequences, disastrous as they are, will be irreversible. So there is nothing more serious, more urgent or more demanding of leadership, here of course but most importantly, in the global community ....*

*This report will be seen as a landmark in the struggle against climate change. It offers a stark warning but also hope over climate change. It also gives us the clearest evidence yet that bold and decisive action can still prevent it. But without radical international measures to reduce carbon emissions within the next 10 to 15 years, there is compelling evidence to suggest we might lose the chance to control temperature rises. Failure to act will make an increase of between 2 and 5 degrees in average temperatures almost inevitable. The consequences are stark, for our planet and for the people who live on it, threatening the basic elements of life - access to water, food production, health and our environment.*

...

*Stern shows that if we fail to act, the cost of tackling the disruption to people and economies would cost at least five per cent - and possible as much as 20% - of the world's output. In contrast, the cost of action to halt and reverse climate change would cost just 1%.*

*Or put another way for every £1 we invest now, we can save at least £5 and possibly much more. And it shows how this can be done without capping the aspirations of rich or poor countries.*

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<sup>13</sup> <http://www.pm.gov.uk/output/Page10300.asp>.

*The Stern Review has done a crucial job. And I thank Nick and his team for all their hard work.*

*It has demolished the last remaining argument for inaction in the face of climate change. We know it is happening. We know the consequences for the planet. We now know urgent action will prevent catastrophe and investment in preventing it, will pay us back many times over.*

*We will not be able to explain ourselves to future generations if we fail.'*

7.3 Gordon Brown's comments<sup>14</sup> include the following:

*'Let me start by thanking Nick Stern and his team for their report – the most comprehensive analysis yet done of not just the challenges, but the opportunities from climate change.*

...

*For tackling climate change - the world's biggest market failure - not just an environmental and economic imperative, but a moral one: as much an injustice between generations as it is between nations, with the poorest people in the world suffering worst. So, just as in recent years Britain has led the world in securing a low interest rate, stable economy, founded on low inflation, so today I set a new ambition for Britain in future years: to lead the world in creating a stable and sustainable economy founded on low carbon – a Britain that is both pro-growth and pro-green.*

...

*Now it is time to move towards a global system – as Stern challenges us to do, so we propose a long term framework, a worldwide carbon market: not the old way of rigid regulation; but the modern way working with the market, harnessing its power to set a global price for carbon, incentivising the most efficient and innovative ways of tackling to climate change.*

...

*The foundation of our approach is our recognition as government that we have a responsibility to put in place the right long term policy framework with clear, certain, credible and forward looking signals.*

*So, to provide this, alongside leading efforts internationally to secure a global carbon trading scheme, later today, David Miliband will confirm we will now legislate for a Climate Change Bill to enshrine our commitments in legislation:*

- *putting into law the government's long-term goal to reduce carbon dioxide emissions by 60 per cent by 2050;*
- *establishing an independent body to work with the government on how efforts to reduce emissions should be spread over time and across the economy;*
- *strengthening monitoring and reporting arrangements to Parliament;*

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<sup>14</sup> [http://www.hm-treasury.gov.uk/newsroom\\_and\\_speeches/speeches/chancellor/exchequer/speech\\_chx\\_301006.cfm](http://www.hm-treasury.gov.uk/newsroom_and_speeches/speeches/chancellor/exchequer/speech_chx_301006.cfm)

and

- *creating new enabling powers to put in place new emission reductions measures to help meet our goal.*

## **8 GOVERNMENT POLICY IS NOW TO INCLUDE INTERNATIONAL AVIATION IN CLIMATE CHANGE REDUCTION POLICIES**

- 8.1 The Kyoto Protocol excludes international aviation. The reason was entirely pragmatic. Throughout the Kyoto negotiations it was far from certain that any meaningful international agreement on emissions reductions could be secured. The additional technical, administrative and political problems presented by international aviation made it sensible to leave it out to increase the chances of getting a deal at all. Subsequent UK climate change targets (including in the current draft Climate Change Bill) have followed the precedent of leaving out international aviation, again for good pragmatic reasons: it makes sense to align national policy targets with international obligations, and the particular problems the sector presents that make it hard to address internationally make it harder for one country to address unilaterally.
- 8.2 So at a legalistic level it could be argued that Government could meet its stated climate change targets while letting international aviation rip, and therefore that none of the policy so far quoted has any bearing on decisions about air traffic expansion. However this would make UK climate change policy absurd and dishonest. The only point of any GHG emissions target is to reduce climate change. Excluding international aviation from targets does not stop it actually affecting the climate. There is no sense in having targets and actions to reduce some climate changing activities while ignoring others: this would be as pointless as putting multiple locks and security grilles on the front door while leaving a side door unlocked. Molecules of carbon dioxide do not read the Kyoto Protocol and refrain from causing radiative forcing if they were released from an international flight.
- 8.3 In any case this possible line of argument has already been renounced by the Government. The ATWP Progress Report<sup>15</sup> clearly acknowledges that the impacts of international aviation must be included in climate change reduction policy regardless of whether they are counted in treaty targets. One of its four main chapters – 8 pages out of 35 – is on ‘the global challenge of climate change’. The introduction contains the following:

*‘1.3 The Stern Review has stressed the need for an urgent and effective international response to the global problem of climate change. Aviation emissions contribute to climate change regardless of the country in which they are emitted.*

*1.4 Our national climate change strategy sets out our commitment to reduce climate change emissions right across our economy, including domestic*

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<sup>15</sup> CD/88.

*aviation, by 60 per cent by 2050. We are strongly committed to achieving this goal, and aim to do so in the most effective way.*

*1.5 The Stern Review also recommended that the best way to tackle the complex pattern of carbon emissions is to ensure that each activity which consumes carbon is priced in the way that reflects its true cost to society, and to the environment. The Review thus supported the policy set out in the 2003 The Future of Air Transport White Paper which stated that the price of air travel should, over time, reflect its environmental and social impacts.*

*1.6 As a result:*

- We continue to pursue the inclusion of aviation emissions in the European Union (EU) emissions trading scheme (ETS) as soon as practicable, and to do so for all flights departing from EU airports, whatever their destination. This trading scheme ensures that carbon emissions from all sectors of the economy that are included in the scheme are properly priced. Inclusion of aviation in the EU ETS is the most efficient and cost-effective way to ensure that the sector plays its part in tackling climate change. It avoids artificial targets for each sector which would distort economic decision-making.*
- However, the Government has always recognised that its focus on EU ETS should not preclude examining other economic instruments to ensure that aviation reflects its environmental costs*
- We propose to consult on the development of a new emissions cost assessment to inform Ministers' decisions on major increases in aviation capacity. This assessment would consider whether the aviation sector is meeting its external climate change costs.'*

8.4 At the launch of the UK consultation on aviation in the ETS, Environment and Climate Change Minister, Ian Pearson, said:

*'Much of UK industry already plays its part in the EU ETS which now covers nearly half of the UK's carbon emissions ... While still relatively small, aviation is the fastest growing source of emissions in the UK and, like other sectors of the economy, the aviation industry needs to take its share of responsibility for tackling climate change.'*<sup>16</sup>

8.5 In short, the Government recognises that international aviation has to be included in any meaningful policies and actions to reduce climate change, and strongly supports including aviation in the ETS because it believes the ETS will be an effective means to make the aviation sector 'play its part' and 'take its share of responsibility for tackling climate change' but Government is ready to apply other instruments if needed to achieve these goals.

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<sup>16</sup> Department for Transport (National) press release: Consultation Launched on Aviation and Emissions Trading Friday 30 March 2007.  
<http://www.gnn.gov.uk/environment/fullDetail.asp?ReleaseID=275652&NewsAreaID=2&NavigatedFromDepartment=False>.

- 8.6 Two implications of these statements are significant for this Inquiry. First, they rightly treat the ETS as a means not an end in itself, and a means whose success cannot be taken for granted. It follows that any claim that inclusion in the ETS in some sense ‘solves’ aviation’s contribution to climate change should be tested against evidence of its effectiveness. We do this below.
- 8.7 Second, on any reasonable interpretation, for international aviation to ‘play its part’ and ‘take its share of responsibility’ for a policy goal which Government accepts requires substantial reductions in climate changing emissions starting as soon as possible cannot be compatible with substantial increases in emissions at just the point when starting to reduce them is most important. ‘Playing one’s part’ in *solving* a problem cannot, on any reasonable interpretation, mean *adding* to the amount of the problem others have to deal with: that would mean that Baghdad suicide bombers are ‘playing their part’ in bringing peace and stability to Iraq. For aviation to take its ‘share of responsibility’ for reducing greenhouse gases cannot mean *increasing* its own emissions so that others have to reduce theirs even faster: that would mean that joyriding car thieves are taking their ‘share of responsibility’ for road safety.

## 9 AVIATION IS HIGHLY CLIMATE CHANGE DAMAGING

- 9.1 Aviation is one of the most highly climate damaging economic sectors, for two reasons. First, it is highly carbon intensive, for the rather simple and obvious reason that lifting people and goods miles into the air, keeping them up and pushing them through the air at several hundred miles per hour takes a lot of energy, and fossil hydrocarbons are the only practicable way to provide this energy, both now and for the foreseeable future. Second, releasing jet engine exhausts from fossil fuels high in the atmosphere has several additional affects which add significantly to the overall warming effect. We will consider first the ‘raw’ carbon dioxide effects of aviation expansion and then the additional effects.

- 9.2 First, carbon emissions. The 2004 Transport White Paper [CD/121] states:

*‘If UK aviation is defined as all domestic services plus all international departures from the UK, then the aviation sector currently contributes about 5.5 per cent of the UK’s CO<sub>2</sub> emissions’.*

This corresponds to the figure of about 8.8 MtC (million tonnes of carbon) released by aviation in 2004 calculated by Cairns and Newson<sup>17</sup> from Government figures, almost double the 1990 figure of 4.6MtC.

- 9.3 Cairns and Newson review three separate sets of projections of future emissions: the Government’s in the ATWP and two published in peer reviewed research by independent academic research groups. Their conclusions are as follows:

*‘By 2020, aviation CO<sub>2</sub> emissions will increase to between 13.3MtC and 17.3MtC. An increase of about 15MtC (the Department for Transport’s forecast) would mean that, if other sectors meet their targets, aviation*

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<sup>17</sup> ‘Predict and Decide: Aviation, Climate Change and UK Policy’, Cairns and Newson, Environmental Change Institute, Oxford, 2006 [CD/155].

*emissions would constitute 11–12% of all emissions from UK activities by 2020, which would be approximately double their relative contribution in 2000. By 2030, all forecasts suggest that the emissions from aviation will more than double in absolute terms, compared with the 2000 level of 8.8MtC reported by the Department for Transport. Since other sectors are aiming for a further reduction in emissions over that period, the relative contribution of aviation emissions would also increase.*

*By 2050, estimates of aviation's CO<sub>2</sub> emissions range from 17.4MtC to more than 44MtC. This would mean that aviation emissions increased by between 4 and 10 times by 2050 compared to the 1990 level of 4.6MtC reported by the Department for Transport. Moreover, the Government target [to achieve the 60% reduction committed in the Climate Change Bill] is that all UK emissions should equal 65MtC. Hence, aviation could account for between 27% and 67% of all UK target emissions by that point, requiring other sectors to cut their emissions by between about 71% and 87% of 1990 levels.'*<sup>18</sup>

- 9.4 Tyndall Centre research papers [CD/154, CD/247, CD/249 and CD/250] reach very similar conclusions. In particular, Bows and Anderson (2007),<sup>19</sup> by comparing the range of Government air traffic projections with emissions profiles needed to achieve a 60% greenhouse gas cut by 2050, predict 'the aviation industry accounting for between 25% and 51% of the UK's 2050 carbon budget if 550 ppmv is the stabilisation target.'
- 9.5 The implication of these calculations that aviation will account for at least a quarter of the UK's total carbon budget by 2050 may seem startling enough. However this is only the *low* estimate from the projection which is most favourable to the industry (the Government's). The Government's own *high* projection is double this, and the two independent academic studies also give higher projections.
- 9.6 Moreover these figures are all based on a 60% cut in UK greenhouse gas emissions by 2050. This, as explained above, relates to a target of stabilising atmospheric CO<sub>2</sub> at 550 parts per million. Stabilising at 450ppm instead – which, as we have reported, is what the best available science suggests is the maximum level which does not bring a significant risk of catastrophic climate change – implies an 80% cut by 2050 not 60%. On that basis, the aviation industry would account for a minimum of 50% of the UK's remaining carbon budget, not 25%.
- 9.7 We now consider the non-carbon impacts of aviation. Cairns and Newson explain these as follows:

*'As well as carbon dioxide, the combustion of kerosene also emits:*

- *Nitric oxide and nitrogen dioxide, together termed NO<sub>x</sub> (which form ozone, a greenhouse gas, at altitude);*
- *Particulates (soot and sulphate particles);*

<sup>18</sup> Ibid, p15.

<sup>19</sup> 'Policy clash: Can projected aviation growth be reconciled with the UK Government's 60% carbon-reduction target?', Bows and Anderson, Transport Policy 14, 2007 [CD/250].

- *Water vapour (which leads to the formation of contrails and cirrus clouds at altitude);*
- *Other compounds including sulphur oxides, carbon monoxide, hydrocarbons and radicals such as hydroxyl.*

*The combined effect of these other emissions is to add significantly to the climate change impacts of aviation, over and above those caused by its CO<sub>2</sub> emissions alone. The fact that aviation's climate impacts are 'significantly worse' than those caused by its carbon dioxide emissions is scientifically uncontroversial.*<sup>20</sup>

9.8 It follows that considering just the CO<sub>2</sub> emissions of aviation would underestimate its climate damage compared to other human activities, and therefore that some uplift factor should be applied to treat them on an equal footing. As Cairns and Newson explain, the IPCC approached this by seeking to measure how much more warming aviation had caused up to 1992 than could be explained by just its CO<sub>2</sub> emissions. Their estimate was 2.7. From this they estimated that

*'over the period from 1992 to 2050, the overall radiative forcing by aircraft (excluding that from changes in cirrus clouds) for all scenarios in this report is a factor of 2 to 4 larger than the forcing by aircraft carbon dioxide alone.'*

9.9 Subsequent researchers and policy makers have tended to invoke these numbers – a range of 2 to 4 around a best estimate of 2.7 – as general purpose correction factors to multiply aviation CO<sub>2</sub> emissions by in order to make them equivalent to emissions from other sectors. However this raises three major problems.

9.10 First, the various effects are caused in different ways, some much better understood than others. For example recent research has tended to 'put less emphasis on the importance of contrails relative to other effects. It is widely believed<sup>21</sup> that aircraft emissions may indirectly cause the formation of more cirrus cloud, and some studies suggest that this could be having a larger warming impact than any of the other non CO<sub>2</sub> impacts, but it is unproven and therefore left out of most calculations, which therefore may be considerably underestimating the total.

9.11 Second, the various effects are not caused uniformly. They vary depending on weather and other circumstances. It has been suggested that night flying is much more climate damaging than day because daytime contrails reduce their net warming effect by reflecting solar energy back into space: this would seem to be borne out by a statistically significant increase in the drop in night-time temperatures across the USA in the days following 11 September 2001 when all civilian flights were grounded. Effects also vary with operating practices. Flying at higher altitudes is more likely to cause contrails, so lower cruising, and short haul flights which are climbing and descending a larger proportion of their flight time, will generally cause less contrail impact in proportion to their CO<sub>2</sub> (though at the price of more CO<sub>2</sub> per aircraft kilometre, so these are not quick fixes for climate impacts) . Ground operations do not cause these upper atmosphere effects.

<sup>20</sup> 'Predict and Decide: Aviation, Climate Change and UK Policy', Cairns and Newson, Environmental Change Institute, Oxford, 2006, p16 [CD/155].

<sup>21</sup> For example see Sausen et al, Aviation Radiative Forcing in 2000: An Update on IPCC (1999) Meteorologische Zeitschrift 2005, in print [SSE/21/c Appendix 1].

9.12 Third, the effects all last for different lengths of time. CO<sub>2</sub> stays in the atmosphere about 100 years or more. All the non CO<sub>2</sub> effects are much shorter: possibly only a few hours for contrails although indirect feedbacks may extend this. This means that the relative importance of the different effects depends very strongly on the time period one is concerned with. Cairns and Newson quote a study by Forster et al (2006) to illustrate this. This estimates 'how the CO<sub>2</sub>, NO<sub>x</sub> and contrails generated by aviation activity in 2000 will affect the climate over time.' Over a 100 year time frame, this predicts the effects of all emissions would only be 1.7 times greater than the CO<sub>2</sub> emissions alone, i.e. below the bottom of the IPCC range. But if just the next 20 years are considered this rises to 3.7, near the top of the IPCC range. Over just the year following a flight, they estimate its climate impact as 36 times that of just the CO<sub>2</sub>.

9.13 This is particularly significant given the strong message of the Stern report already quoted, that long term climate security depends particularly on what we do or don't do over the next few years and decades. Our chances of averting catastrophic climate change are much greater if we can first stop emissions growing and then start reducing them within this period. The 'front end loading' of aviation's non-carbon impacts means that, compared to other climate changing activities, they are disproportionately damaging in precisely the timeframe in which it is most urgent, and valuable, to avoid and reduce impacts.

9.14 Thus in sum: on the most optimistic (from the industry's point of view) case in the most optimistic credible published projections (the Government's), CO<sub>2</sub> from aviation will equal a quarter of the UK target for greenhouse emissions by 2050. Less optimistic projections from the peer reviewed scientific literature could at least *double* this proportion. Aiming for a lower 2050 emissions total, to stabilise at a relatively safe 450ppm of atmospheric CO<sub>2</sub> rather than a relatively risky 550ppm, would exactly *double* this proportion. Applying the lower limit of the IPCC's correction factors for aviation's non CO<sub>2</sub> climate impacts would *double* this proportion; using the higher limit – which would better reflect the Stern Review's emphasis on the pivotal importance of the next few years – would *double* it again. Proportionally more low, short, daytime flights might reduce this, but on the other hand cirrus clouds might increase it.

9.15 These four potential doublings are not mutually exclusive. Arguably they are all largely justified. If so, in 2050 aviation alone will be causing not a *quarter* of the total of climate impact allowable from all activities in the UK, but anything up to *four times* that total.

## **10 PROSPECTS FOR TECHNICAL MEASURES TO REDUCE AVIATION'S CLIMATE CHANGE DAMAGE ARE LIMITED, AND IN ANY CASE ALREADY ASSUMED IN THE CURRENT PROJECTIONS**

10.1 Fixed-wing denser-than-air aviation is mature technology. Its intrinsically high energy intensity has always given a strong commercial incentive to adopt energy-minimising technologies and operating practices. It should therefore not come as

any great surprise that there are no dramatic easy opportunities to de-carbonise the industry just waiting to be taken up. Had there been any such opportunities, they would have been taken up already.

10.2 The Royal Commission on Environmental Pollution ('RCEP') in 2002<sup>22</sup> and more recently both Bows and Anderson (2007) [CD/250] and Cairns and Newson (2007) [CD/155] review the future opportunities for both management improvements (e.g. better routing of planes, higher load factors, more frugal ground operations) and technical innovations (including different shapes and designs of plane, further refinements to existing engines or new propulsion systems, alternative fuels).

10.3 Cairns and Newson conclude:

*'the carbon dioxide emissions from aviation can be reduced, to an extent, by better air traffic management and improvements in aircraft operations and efficiency. In particular, if all potential gains are realised, the largest achievable reductions are likely to be that better air traffic management could reduce emissions by 6–12% and that aircraft could be 40–50% more fuel efficient than existing aircraft by 2050. As already highlighted, there are concerns that such aspirations are over-optimistic.'*<sup>23</sup>

10.4 Moreover, optimistic assumptions about such savings are already built in to the estimates of future emissions reviewed above. In other words, it must not be assumed that management and technology might ameliorate the alarming scale of impacts identified there. Rather, failure to achieve the high rates of improvement already assumed in those figures might make them even worse.

10.5 One of the arguments for the new super-large planes just coming onto the market (especially the Airbus 380) is that they are more fuel efficient. However they depend on expansion of passenger volumes for viability. In climate change and sustainability terms they are therefore self-defeating: they will only bring increases in efficiency together with increases in volume that will swamp any benefits.

10.6 This has particular relevance to Stansted. Using larger planes within the same total number of air traffic movements would be bad for climate change, not good, if the fuel used per flight increased, even if the fuel efficiency per passenger kilometre or tonne kilometre improved.

10.7 The news in April 2007 that 'Virgin plans to run 747 on biofuel in 2008',<sup>24</sup> about a decade sooner than had previously been assumed, and that 'Virgin hopes that biofuel-powered aircraft could be operating commercially within five years' might suggest that this analysis is too pessimistic. However a media announcement of a future intention to do something popular by an airline particularly keen on marketing and image is not the same as actually doing it. And even if Virgin achieve what they hope, it may make things worse rather than better, for several reasons:

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<sup>22</sup> 'The Environmental Effects of Aircraft in Flight', RCEP, 2002 [CD/298].

<sup>23</sup> CD/155, p20.

<sup>24</sup> [http://business.timesonline.co.uk/tol/business/industry\\_sectors/engineering/article1695912.ece](http://business.timesonline.co.uk/tol/business/industry_sectors/engineering/article1695912.ece).

- Just switching to biofuel will make no difference to the non-carbon impacts of aviation on the climate, which, as explained in chapter 6, are probably between half and three-quarters of all the impacts of aircraft in flight;
- All currently available biofuels carry less energy per weight than mineral fuels. Planes using them would either have to refuel more often, or carry more fuel relative to payload. Either way, energy intensity goes up. It is in principle possible to chemically reformulate biofuels to increase their energy density, but that too takes energy;
- There is increasing evidence,<sup>25</sup> and concern, that the kinds of biofuel production actually being carried out and planned to provide transport fuels often cause more climate damage than they save (through fossil fuel use in processing and carbon emissions from forest clearing and soil degradation);
- Commercial biofuel production is in any case competing for finite land with both food production and biodiversity. Given the likelihood of global total food scarcity as a result of increasing human population and reduction in the productivity of current croplands due to climate change, attempts to meet any significant proportion of current transport fuel demands from biofuels are likely to further increase the numbers of people short of food, or to accelerate destruction of forest ecosystems which provide resilience to climate change as well as important carbon sinks.

10.8 In short: while there may be exciting opportunities in the longer term, there is no realistic prospect of more than incremental improvement in the energy efficiency, and therefore the climate impacts, of the commercial aviation industry over the first half of this century – the period in which, as the Stern report emphasises, decisive action is needed. Larger planes may be more efficient, but their introduction both relies on and enables growth in traffic that wipes out the savings. Biofuels may cause more climate and wider damage than they save.

10.9 In any case future impact projections already make optimistic assumptions about technical improvements, so the main question is not whether things may be better if unanticipated improvements occur, but whether things may be worse if anticipated ones do not.

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<sup>25</sup> for example a range of research papers on <http://www.biofuelwatch.org.uk/background.php>.

## 11 POSSIBLE FUTURE INCLUSION OF AVIATION IN THE EU EMISSIONS TRADING SCHEME DOES NOT RECONCILE AVIATION EXPANSION WITH CLIMATE CHANGE

11.1 As the quotations above make clear, the Government is relying on inclusion of aviation in the European Union Emissions Trading Scheme (EU-ETS) to reconcile aviation expansion with climate change. This was recommended by the IPPR in 2003,<sup>26</sup> as one component in a package of measures intended to achieve strong demand restraint. Experience since then has shown there are several reasons why it would be unreasonable to rely on this prospect as the sole, or even a major part of, the solution.

11.2 First and most obvious, ***it has not yet happened, and nobody can be certain it will.*** The European Commission has proposed a Directive to this effect,<sup>27</sup> and this has strong political support from the UK Government among others. However that is no guarantee that it will be agreed. As the UK consultation document on the proposal dryly points out:

*'This proposal will be subject to the co-decision process within the EU. Both the European Parliament and the Council of Ministers must agree the Directive. The UK Government are pushing for rapid progress on the negotiations of this proposal. The German Presidency has announced that they will provide a progress report to the next Environment Council in June 2007. We do not expect the proposal to have its first reading in the European Parliament until summer 2007 and it is anticipated that the directive will not be finally agreed by both Council and Parliament until 2008.'*

11.3 As a result of this timetable the Commission proposes that flights within the EU join the scheme on 1 January 2011 and all flights starting or ending in the EU from 1 January 2012. Even this seems optimistic given the complexities of implementation. So the second reason why it would be unreasonable to rely on the ETS to reconcile aviation expansion with climate change is that even if all goes to plan ***it can not begin to have any beneficial effect for 3½ to 4½ years at the earliest.*** This is not compatible with Stern's repeated insistence on the paramount importance of early action to curb emissions.

11.4 We use the term '*beneficial effect*' since the scheme can have *malign* effects well before it is introduced, indeed as soon as there is any significant possibility of its introduction, through giving airlines an incentive to expand their operations and put off climate mitigation measures so as to gain the maximum number of anticipated 'grandfathered' (or pseudo-grandfathered under some possible benchmarking schemes: see below) allowances and the greatest opportunity for windfall profits through 'easy wins' after the scheme comes into force.

11.5 Many kinds of regulation begin to achieve beneficial effects as soon as they are proposed, by giving their potential targets an incentive to change their behaviour in

<sup>26</sup> 'The Sky's the Limit', Bishop and Grayling, IPPR, 2003 [CD/246].

<sup>27</sup> [http://ec.europa.eu/environment/climat/aviation\\_en.htm](http://ec.europa.eu/environment/climat/aviation_en.htm)).

the direction the regulation seeks in order to be better prepared if and when the regulation comes in to force. For example, each discussion of higher thermal standards in building regulations has encouraged the construction industry to develop lower-energy methods. In contrast, discussion of possible future emissions trading schemes gives the sectors targeted an incentive to put off energy saving behaviour, because if allocation of allowances is in any way dependent on earlier performance, the worse they do before the scheme comes in the more they can profit if and when it does come in.

11.6 In any case there can be no certainty the timetable just stated can be met. Controversial draft Directives have frequently been caught in the EU's decision processes for years. For example the Environmental Impact Assessment (EIA) Directive took from 1975 to 1985 to be agreed, and the Strategic Environment Assessment (SEA) Directive (which started as an offshoot of EIA) a further 16 years up to 2001. The recent expansion of the EU without the agreement of a new EU Constitution (which was initiated precisely because of widespread concerns that an enlarged Union could not continue to function effectively without extensive procedural reform) means delays are likely to increase rather than decrease.

11.7 Even if the principle of including international aviation is agreed, there are, as the EU and UK consultation documents make clear, a large number of potentially highly contentious questions of implementation to be decided, including:

- Geographical coverage: EU only, or including flights to and from non EU destinations;
- Commercial coverage: EU based airlines only, or those based anywhere;
- Treatment of aviation's non-carbon climate impacts, for example by applying a correction factor or through other policy instruments;
- Whether allowances are 'grandfathered', i.e. given out for free in proportion to historic emissions, 'benchmarked', i.e. allocated according to some performance measure(s), or auctioned, or any permutation of these;
- Whether the total of allowances provided for aviation should match actual emissions at any particular date (given the rapid expansion of the industry, the earlier the date the tighter the cap!) or on some other basis;
- How trading of aviation emissions (which are outside the Kyoto Protocol) with emissions from other sectors (which are inside it) can avoid confusing or distorting country targets under the Kyoto Protocol;
- The possibility of exemptions for particular kinds of flight, e.g. servicing peripheral regions.

11.8 These issues specific to international aviation are over and above those raised by the ETS itself, including:

- How to ensure that national and EU wide allocations are tight enough to require actual reductions;
- How to ensure political commitment when the scheme actually bites;

- How far countries should be allowed to buy external emissions credits as an alternative to reducing emissions at home;
- Whether proceeds of permit auctioning must be ‘earmarked’ to carbon reduction measures.

11.9 The third reason why it would be unreasonable to rely on the ETS to reconcile aviation expansion with climate change is that ***whether including aviation in the ETS will actually secure real emissions reductions is highly dependent on the answers eventually agreed to these currently unresolved and potentially highly controversial implementation questions.*** For example:

- If flights to destinations outside Europe are exempted, the effects will be reduced;
- If non EU airlines are exempted, the effects will be reduced, both directly through fewer flights being covered, and indirectly because it will be politically impossible for the EU to make the scheme strong enough to set its own airlines at a significant competitive disadvantage;
- ‘Grandfathering’ allowances gives the biggest polluters the greatest windfall profits. The possibility of grandfathering gives airlines an incentive to secure the biggest share by (a) expanding their operations in the run-up to the introduction of trading and (b) to put off energy efficiency improvements so as to maximise their historic energy use – a possible contributor to the UK aviation industry’s simultaneous enthusiasm for expansion and emissions trading;
- ‘Benchmarking’ can create a positive incentive if it is done on the basis of output measures such as passenger miles flown, but not if it is done on the basis of inputs such as aircraft miles flown. As the UK consultation paper itself warns, benchmarking on input measures can easily boil down to just disguised grandfathering if (for example) airlines get more allowances as a result of having aircraft with poor fuel efficiency or occupancy patterns;
- Generous initial allocations and indulgent rates of reduction can negate the scheme’s effectiveness;
- There is growing concern about the validity of external emissions credits.

11.10 There are two particular reasons for concern about possible delays. First, important points are contentious even among EU members which generally support the proposals. For example the consultation paper on the proposal issued by the UK, arguably the staunchest supporter of the proposal in general, includes the following:

*‘The Commission proposal states that the proceeds from auctioning must be used to mitigate and adapt to the impacts of climate change. Centrally dictated hypothecation in this way is not acceptable to the UK Government since decisions on this matter must be for each Member State to consider in the light of their particular circumstances and to ensure that the Government spends its resources in the most efficient way possible, including on measures to mitigate and adapt to the impacts of climate change.’*

11.11 Given the evidence that guaranteeing that environmentally related charges and levies will be spent on addressing the problems they arise from greatly increases their public and political acceptability, both the substance of this statement – that the UK insists on keeping the option of using carbon permit auction proceeds as a stealth tax to boost general government revenue – and the manner – a flat veto on being told what to do by Brussels unpleasantly reminiscent of the Thatcher Government’s tone towards Europe – carry an obvious risk of sparking the kind of rancorous argument that (for example) contributed to the 16 years it took to negotiate the Strategic Environmental Assessment Directive as already mentioned.

11.12 Second, this proposal has an extra dimension of complexity in that it needs the agreement of non EU countries. As Cairns and Newson<sup>28</sup> points out:

*‘The Commission has said that, from an environmental point of view, it considers the scheme should apply to all carriers operating from EU airports, (e.g. all departing flights) without regard to nationality, and that this would also avoid compromising the competitiveness of EU airlines. While the CE Delft report concluded that this would be legally feasible, others have argued that it will prove extremely difficult to gain agreement to this from many non-EU states (House of Lords, 2006). The US Federal Aviation Administration has stated that US companies should be exempted from inclusion, and has questioned the legality of the scheme.’<sup>29</sup>*

11.13 Thus our second reason why it would be unreasonable to rely on the ETS to reconcile aviation expansion with climate change needs two additions: ***it can not begin to have any beneficial effect for 3½ to 4½ years at the earliest, disagreements and negotiations about any number of contentious issues could very easily put this back years more, and it may have malign effects until whatever point it comes into force.***

11.14 We also need to consider whether, if and when an agreement is reached, it will be the right one. The House of Commons Environmental Audit Committee’s report on the first phase of the scheme in March 2007<sup>30</sup> states:

*‘4. While the Scheme so far has been an administrative success, its record in reducing carbon emissions is far less impressive. It appears to us that Phase I will have very little impact on carbon emissions across the EU. Allocations of allowances to emit carbon were too generous, and the market price of them consequently too low, to drive a transformation in business strategies and technical processes. Overall, the emissions projections appear to have been inaccurate and inflated, and the national caps derived from them too unambitious. There is some excuse for this in Phase I, given the difficulties in collecting accurate baseline data and the compromises needed to achieve speedy implementation of the initial phase of the Scheme; and for these reasons it has always been characterised as a ‘learning by doing’ phase. But*

<sup>28</sup> Cairns S and Newson C Predict and Decide:aviation, climate change and UK Policy, Environmental Change Institute, Oxford 2006 [CD/155].

<sup>29</sup> EurActiv, 2005, p71.

<sup>30</sup> The EU Emissions Trading Scheme: Lessons for the Future. <http://www.publications.parliament.uk/pa/cm200607/cmselect/cmenvaud/70/70.pdf> [‘Conclusions and Recommendations’ appears in SSE/21/c Appendix 2].

*lessons must actually be learnt, and things radically improved, in Phase II and beyond. ...*

*6. Overall, the extent to which the EU ETS, and any other trading schemes, is judged a success should depend on two main things: the extent to which emissions are reduced, and the extent to which a stable and effective carbon price is generated. To date, the EU ETS has had very questionable effects on both measures. In particular, it has been undermined by weak caps and inaccurate and unsatisfactory methods of allocating allowances to individual sectors and installations. Both shortcomings have been exacerbated, if not wholly caused, by the instrumental role of a multiplicity of national bureaucracies, which have set caps and allocations through a methodology which was not just cumbersome, but prone to being influenced by industrial lobbying. ...'*

- 11.15 After complimenting the UK Government on setting the only National Allocation Plan for phase 2 which the European Commission did not then revise downward, it continues:

*'8. That most of the draft National Allocation Plans originally proposed by Member States for Phase II were so inadequate suggests a worrying lack of public and political understanding of the dangers of climate change, and of the need to tackle it, across the EU as a whole. This highlights the vital role which must be played by the Commission, given its ability to operate at one remove from the competitive national interests of individual Member States, to impose the cutbacks in allocations required by the Scheme as a whole. A corollary of this is that the UK Government must do its utmost both to persuade other EU states of the need for greater action, and to bolster the position of the Commission in guiding Member States in the right direction.'*

- 11.16 After likewise complimenting the European Commission's decisions on the National Allocation Plans for Phase II both for 'making it more likely that the EU ETS will begin to drive real carbon abatement in its Second Phase', (i.e. acknowledging that the first phase has not done so) and for 'increasing confidence in the entire viability and future development of the Scheme, it makes an important caveat:

*'10. While the Commission's decisions on the Phase II NAPs are encouraging, it is important to keep the potential impacts of Phase II in perspective. Its effectiveness in driving carbon reductions depends on several variables, not all of which can be known with certainty at this stage. And while it looks likely that it will put the EU roughly on course to meet its Kyoto commitments, this cannot yet be known for sure. Furthermore, in order to meet UK and EU climate change targets beyond 2012, much greater action both within the EU ETS and in the form of complementary policies will be needed, and soon.'*

- 11.17 It also points out that at least one major decision about Phase II has already been made in the wrong direction:

*'11. One decision on the shape of Phase II, which will have a profound effect on its efficiency and effectiveness, and with which we are signally disappointed, was taken long in advance: the maximum limit of allowances which can be auctioned. Under the ETS Directive, a maximum of only 10% of*

*allowances can be reserved for auction in Phase II, rather than being allocated to firms for free. We believe it was wrong of Member States and the Commission to impose such a restrictive limit on auctioning in Phase II. In our view, auctioning allowances should lead to more accurate allocations, reduced public costs and bureaucracy, and greater internalisation of environmental costs in business decisions. In sectors where there are not strong concerns as to the effects on competitiveness of requiring firms to purchase their allocations upfront, we strongly support 100% auctioning.'*

- 11.18 Thus the Committee concludes that, with regard to the operation of the scheme so far – the only matter on which there can be actual evidence as opposed to prediction, assertion, or mere aspiration – ‘Phase I will have very little impact on carbon emissions across the EU’; that while there have been some promising moves toward improving it, there have also been some extremely negative decisions (notably the decision already taken to limit auctioning of permits); that it cannot be certain even to secure the EU’s (modest) Kyoto targets, and that even if it does, ‘much greater action’ will be needed to meet UK and EU targets beyond 2012.
- 11.19 The fourth reason why it would be unreasonable to rely on the ETS to reconcile aviation expansion with climate change is that ***phase 1 of the scheme has achieved little, there is no justification for assuming that future phases will be reformed to do significantly better, and there are currently not even proposals to make them do well enough to meet post-2012 emissions targets.***
- 11.20 The UK consultation on including aviation in the ETS includes the statement that: ‘This trading scheme ensures that carbon emissions from all sectors of the economy that are included in the scheme are properly priced. Inclusion of aviation in the EU ETS is the most efficient and cost-effective way to ensure that the sector plays its part in tackling climate change.’ This purports to be a statement of fact. The evidence just presented shows that it can at best be considered a statement of hope or aspiration. The best that can be said of the ETS is that it may have potential to achieve these admirable ends. It is not doing so yet, and the available evidence does not give any justification for assuming that it will ever do so at all, let alone soon enough to have any relevance to the additional climate change emissions of the present application. And for as long as inclusion of international aviation in the scheme is under negotiation (which may be a very long time) it may be giving the industry a perverse incentive to delay rather than expedite responsible action on climate change.
- 11.21 In any case the basic principle of reliance on emissions trading raises problems. The following excerpts from the 2007 Environmental Audit Committee report already cited summarises them:

*‘Overall, there are perhaps two main and related weaknesses in the Government’s statements on emissions trading which it needs to recognise and resolve. The first is the contradiction between the Government’s reliance on the EU ETS all by itself to set a price on carbon high enough to incentivise investment in low carbon infrastructure, and its enthusiasm for expanding the Scheme in order to lower the price (and resulting cost impacts on business*

*and consumers), and thus make it more politically and economically acceptable.'*

11.22 In other words, the Government cannot rely on the scheme to give carbon both a *high* price to drive real savings and a *low* price to be painless.

*'The second [weakness] concerns the Government's ambition for relatively tough carbon reduction targets for the UK and EU, which themselves depend on global targets in which the whole of the developed world makes steep cuts, while the whole of the developing world has to meet challenging caps on its growth. The contradiction here lies in the Government's endorsement of and reliance on making up shortfalls in such national targets by buying carbon credits from other countries: if everyone thinks like this, then nobody will reduce any emissions, and nor will there be any surplus credits to buy. Exactly the same applies between different economic sectors. The Government must face up to the fact - and start challenging the British population, other governments, and global businesses to do likewise - that ultimately neither the UK, nor any country, nor any industry, can simply buy its way out of meeting its carbon commitments.'*

11.23 These concerns are supported by increasing evidence that carbon credits bought from developing countries – an important component of the ETS – may signify minimal or indeed illusory carbon reductions. For example, on 22 April 2007 the Sunday Times reported<sup>31</sup>, under the heading 'Indians make cool £300 million in carbon farce', that a chemical plant which invested £1.4 million in equipment to neutralise a waste greenhouse gas would make about £300M from the Kyoto Protocol's clean development mechanism, which it calls 'the bizarre arrangement that is supposed to combat climate change'. In detail: 'The plant produces a chemical called HCFC-22, which is used for refrigerators and air-conditioning systems. A byproduct of its manufacture is a gas called HFC-23 (trifluoromethane) - one of the world's worst greenhouse emissions as it traps large amounts of the sun's heat. It is relatively cheap to install equipment to destroy the gas and most western producers have voluntarily done so. It is now illegal to let the gas escape into the atmosphere in Britain. This is not so in India. SRF ... vented the gas into the air for 15 years until 2004. It stopped when new measures to save the planet made the gas - or more accurately the absence of it - a licence to print money.'

11.24 On 25 April the Financial Times gave front page coverage<sup>32</sup> to an investigation which, it said, revealed:

- *'Widespread instances of people and organisations buying worthless credits that do not yield any reductions in carbon emissions;*
- *Industrial companies profiting from doing very little - or from gaining carbon credits on the basis of efficiency gains from which they have already benefited substantially;*
- *Brokers providing services of questionable or no value;*

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<sup>31</sup> <http://www.timesonline.co.uk/tol/news/uk/article1687531.ece>.

<sup>32</sup> <http://www.ft.com/cms/s/48e334ce-f355-11db-9845-000b5df10621.html>.

- *A shortage of verification, making it difficult for buyers to assess the true value of carbon credits;*
- *Companies and individuals being charged over the odds for the private purchase of European Union carbon permits that have plummeted in value because they do not result in emissions cuts.’*

11.25 These subsequent revelations underline the wisdom of the Environmental Audit Committee’s conclusion that:

*‘Above all, the Government must ensure that it is not investing a magical belief in emissions trading as a miracle cure for global warming – something which will, all by itself, necessarily reduce carbon emissions, necessarily lead to a step change in technology, and necessarily achieve this at low cost and without harming productivity. The most important role for emissions trading is to add a cost to carbon. This can help to incentivise low carbon technological development and market transformation, but in doing so it is likely to raise costs and impinge on economic activities in some areas, even if the trading element will help to constrain these costs. Moreover, it cannot guarantee sufficient progress in the timescale required; and if new technologies cannot deliver enough reductions in time, then ultimately we will have to reduce the volume of our carbon-related activities. Emissions trading will not spare us from making difficult decisions and personal or collective sacrifices on the road towards meeting our global carbon reduction targets.’*

11.26 This is particularly applicable to aviation expansion given the scale of aviation’s impacts reviewed in chapter 9 above. Even making all possible allowances for propitious conditions and indulgent attitudes in other countries, it is stretching credibility to hope that in 2050 other sectors across the European Union will have sufficient spare allocations to sell to offset the equivalent to 25% of the UK’s total permitted emissions when they will have had to reduce their own emissions by around 60% on average – or nearer 70% if other countries also wish to expand their aviation. It is irresponsible to expect allowances bought from developing countries to bridge the gap in any genuine way. It is frankly fantasy to hope that any permutation of actions in other sectors anywhere in the world can offset aviation’s impacts if, for any of the reasons summarised in para 9.14, they are equivalent not to a quarter of total UK permitted emissions but to all of them, or four times all of them. Yet this is what relying on the ETS implies.

11.27 Given these warnings, it is clear that avoiding emissions increases that have not yet taken place, and for which there is no overriding need, would be a more foolproof and sincere approach than invoking the possibility of offsetting them through emissions trading as an alibi for allowing them. Moreover as Cairns and Newson argue, avoiding increase in air travel dependence now will be cheaper, easier and more equitable than allowing it and then having to compensate for or attempt to reverse it.

11.28 The fifth reason why it would be unreasonable to rely on the ETS to reconcile aviation expansion with climate change is that **emissions trading is in any case only a means to incentivise and share out reductions. They still need to be made somewhere. It is not credible to hope that other sectors, and other countries, which will have to achieve big emissions cuts themselves, will**

**also be able to offset impacts on the scale implied by aviation expansion. A sincere commitment to reducing emissions would start by avoiding increases, not by raising the total needing to be offset by reductions in existing activities.**

## **12 CONSEQUENTIAL IMPLICATIONS FOR GOVERNMENT POLICY**

- 12.1 As politicians from the Prime Minister down now frequently remind us, climate change is the gravest challenge the UK and indeed the whole human race faces. The latest IPCC assessment increases both the confidence and the pessimism of the scientific case that human activities are responsible for much of the dramatic changes in global climate that are already observable.
- 12.2 The Stern review makes clear that action to stabilise and then begin to reduce human contributions to climate change within the next ten or at most twenty years is likely to prove decisive in determining whether humanity can continue to prosper in relative security, or fall victim to climate driven catastrophes we are unable to halt. The best scientific evidence currently available overwhelmingly indicates that starting to cut emissions as quickly and deeply as possible is likely to be decisive for future human security, and an extremely sound investment for future prosperity.
- 12.3 The Government has strongly endorsed Stern's findings and recommendations, and explicitly recognised that henceforth international aviation must be included in any meaningful climate change policy and action.
- 12.4 However the Government has also recently re-confirmed the 2003 White Paper's support for major continued expansion of aviation at Stansted and elsewhere.
- 12.5 Aviation is highly damaging to the climate both because it is energy intensive and because plane exhausts in the upper atmosphere cause further warming effects, roughly doubling or quadrupling the effect of the carbon emissions alone. These other effects are proportionally more significant over shorter periods: on one estimate they are thirty six times the carbon effects over one year following a flight. Any further increase in aviation would be disproportionately climate damaging over just the timeframe in which Stern says action is most important and valuable.
- 12.6 On the most favourable (to the industry) credible projections and assumptions, by 2050 aviation's CO<sub>2</sub> emissions alone will equal a quarter of the UK target for greenhouse emissions. On other projections and assumptions from peer reviewed scientific literature, in 2050 aviation could be causing not a *quarter* of the total of climate impact allowable from all activities in the UK, but *four times* that total.
- 12.7 There is limited potential for improvements in operational practices or technology to reduce the climate impacts of aviation over the first half of this century. Future impact projections already assume such improvements anyway. Rather than hoping things may be better if unanticipated improvements occur, we should be concerned things may be worse if anticipated ones do not.

12.8 The Government's only current concrete proposal for reconciling climate change policy with aviation expansion is to include international aviation in the EU Emissions Trading Scheme. We have therefore considered its potential in detail, and conclude that:

- It has not yet happened, and nobody can be certain it will;
- It can not begin to have any beneficial effect for 3½ to 4½ years at the earliest, disagreements and negotiations about any number of contentious issues could very easily put this back years more, and it may have malign effects until whatever point it comes into force;
- Whether including aviation in the ETS will actually secure real emissions reductions is highly dependent on the answers eventually agreed to these currently unresolved and potentially highly controversial implementation questions;
- Phase 1 of the scheme has achieved little, there is no justification for assuming that future phases will be reformed to do significantly better, and there are currently not even proposals to make them do well enough to meet post-2012 emissions targets;
- Emissions trading is anyway only a means to incentivise and share out reductions. They still need to be made somewhere. It is not credible to hope that other sectors, and other countries, which will have to achieve big cuts themselves, will also be able to offset impacts on the scale implied by aviation expansion.

12.9 We therefore conclude that:

- Managerial and technical fixes have no realistic prospect of decoupling climate impacts from aviation enough to make the expansion in aviation of which this application is part compatible with the Government's stated policies on climate change over the period that matters most, the next two decades;
- There is no basis in evidence for assuming that including aviation in the European Union Emissions Trading Scheme will do so either, given the disappointing performance of the first phase, the complexity and contentiousness of the issues to be resolved not only within the EU but internationally before it can happen, and the high chance that politically acceptable resolutions of these could make the resulting scheme ineffectual;
- In any case emissions trading merely moves responsibility for reducing emissions around, and could therefore only genuinely offset the impacts of aviation expansion to the extent that somebody, somewhere, is ready to reduce emissions from existing activities which will already have generally been subject to cuts of the order of 60% or more by 2050 – an assumption that could most politely be described as extremely optimistic;
- It is possible that despite all the technical and political difficulties agreement will be reached briskly on including aviation in the European ETS, that its future phases will, unlike the first, actually drive significant emission

reductions, and that enough genuine offsets can be brought to market quickly at an acceptable price to counteract the full climate change impacts of aviation growth. However on the basis of the best available evidence these are all such unlikely outcomes that assuming that even any one of them will come to pass can only be described as faith based policy, and it is not possible to rely on the aspiration to include aviation in the EU ETS as reconciling a policy to expand aviation activities with tackling climate change.

- 12.10 It is also possible that some currently unknown technology will be discovered that will enable aircraft to be built with a fraction of current climate change emissions; that it will be developed from first inkling to full scale commercial exploitation in less time than is currently spent developing each new conventional plane, and that it will be so overwhelmingly commercially advantageous that it will justify scrapping most of the world's current planes decades earlier than the airlines, their shareholders and bankers are planning.
- 12.11 Once again, however, on the available evidence it is not possible, to rely on such technology emerging to reconcile the ambition to expand aviation with tackling climate change.
- 12.12 Thus it is possible to have an *evidence-based* policy for air traffic expansion or for climate security, but not both together. Indeed, it is only possible to support air traffic expansion and climate security together by replacing a respect for evidence with a *vague hope* that 'something will turn up' to rescue us from the contradiction which all current evidence points to.
- 12.13 It is therefore not possible for a decision either to allow this appeal or to refuse it to be consistent with Government policy on air traffic expansion, climate security and respect for evidence simultaneously. It is, accordingly, impossible for the inquiry to avoid taking a position, implicitly or explicitly, on the relative merits of the three.
- 12.14 The Government has rightly made it clear that tackling climate change is the gravest of all contemporary challenges. That objective must therefore take priority. In the light of the above evidence and analysis, if the Government means what it says about climate change, in aviation there is no realistic and responsible alternative to the simplest and most obvious response of avoiding further increases in aviation emissions by refraining from allowing any further increases in aircraft or passenger movements, and therefore upholding Uttlesford's rejection of the application which concerns this inquiry.
- 12.15 This is one issue where sustainable development unavoidably entails constraining consumer demands. This should not be assumed to be a bad thing. Other proofs show that the economic benefits of the proposed expansion are highly questionable, while it would have severe impacts on human health and wellbeing. There is, accordingly, no compelling reason why this expansion needs to go ahead, and a range of reasons quite separate from climate change why it should not.

12.16 In conclusion, then, allowing an inessential *increase* in climate impacts at just the point when *reduction* is most urgent and important would seriously undermine the Government’s credibility on climate change. The only decision which could potentially reconcile climate security with expansion would be to allow the expansion to proceed if and when – but not until – some combination of technical improvements or emissions trading can be demonstrated to have actually achieved a net reduction of climate change impacts from aviation in line with Government and EU targets for reduction of other categories of emissions.

Appeal by BAA Ltd and Stansted Airport Ltd following the refusal by Uttlesford District Council of planning application UTT/0717/06/FUL

## **The Materiality of Climate Change Appendices**

1. **Aviation Radiative Forcing in 2000: An Update on IPCC (1999)**
2. **'The EU Emissions Trading Scheme: Lessons for the Future', Second Report of Session 2006-07, The House of Commons Environmental Audit Committee**