Aviation and the environment, using economic instruments (SDC report)

03.07.03

Sustainable
Development Commission

Aviation and the Environment: Using Economic Instruments

The Sustainable Development Commission's response to the discussion document published by HM Treasury and the Department of Transport

The Sustainable Development Commission is the government's independent advisor on sustainable development, reporting directly to Tony Blair and the devolved administration leaders. Chaired by Jonathon Porritt, it has twenty-one members drawn from business, NGOs, local and regional government and academia (see Annex 1)

Our mission is to inspire government, the economy and society to embrace sustainable development as the central organising principle. Our task is to advocate sustainable development across all sectors in the UK, review progress towards it and build consensus on the actions needed if further progress is to be achieved.

The Sustainable Development Commission advocates holistic policy approaches which look at the pillars of social, environmental and economic interests together and try to deliver benefits to all three at the same time. We recognise the need for the use of economic instruments to address current disparities, but they should address all three pillars. We also believe that there is a real opportunity for the UK to take a leadership role in using such instruments in achieving the universal desire for a better quality of life in the round. The principles of sustainable development are central to this, and as a Commission we offer the following views on the use of economic instruments to address aviation.

Principles of sustainable development

1. In approaching all subjects related to sustainable development, the Commission seeks to apply a consistent approach based on six fundamental principles (see Annex 2):

- Putting Sustainable Development at the Centre
- Valuing Nature
- Fair Shares
- Polluter Pays
- Good Governance
- Adopting a Precautionary Approach.

2. In the Commission's view, the six principles can be applied with considerable benefit when developing and assessing economic instruments to address aviation and the environment – see below.

The growth of air traffic and its impacts

3. Air traffic has grown rapidly and geometrically over the past 50 years. During the 1990s, growth averaged 5% per annum and is currently projected to go on increasing rapidly for several decades to come. Clearly this growth has been associated over much of that time with significant economic benefits. The manufacture of aircraft, the operations of the aviation industry and all the associated services have provided direct economic benefits to those employed in these sectors. The services provided have given the growing volumes of passengers the opportunity to travel for business and pleasure to more and more distant places. The movement of people and freight has been a major contributor to the growth of world trade.
4. But disbenefits are now growing rapidly as well. Noise from air flight is becoming increasingly unacceptable to those impacted by flight paths. Congestion around airports is becoming more acute. Mass travel is having serious impacts on local communities and local environments at favourite destinations. Air pollution around airports and at the sensitive boundary between the troposphere and the stratosphere is becoming more serious.
5. Above all, CO_2, NO_x, H_2O and other emissions from aircraft are becoming a more and more significant contributors to climate change. The contribution of air traffic to this crucial global problem must no longer be disregarded
6. It is a key theme of the approach to sustainable development agreed at Johannesburg, and of the climate change strategy embodied in the Kyoto agreement, that both economic growth and improvement in the quality of life must be decoupled from growth in the consumption of energy and other natural resources and from the consequent growth in environmental pollution. The unconstrained growth of air traffic is a classic example of the failure to achieve that decoupling. Current levels of air traffic already cause major environmental disbenefits, and those disbenefits will grow at least in line with the growth in aviation if measures such as economic instruments are not put in place to curb them.

Aviation and the Environment; Using Economic Instruments

7. The Commission welcomes the opportunity to comment on the joint HM Treasury and Department for Transport consultation paper "Aviation and the Environment; Using Economic Instruments". Following the Commission's earlier submission (Annex 3) on "Air Transport and Sustainable Development" (November 2002) it finds much to agree with in the general approach of the new consultation document, and would like to offer to work constructively in partnership with the two departments and other stakeholders in exploring the further development and implementation of this thinking.
8. The Commission asked Brian Pearce (Director for Sustainable Investment, Forum for the Future) to produce a report on the consultation paper and the Questions for Discussion for our consideration. Mr Pearce's report to the Commission is attached (Annex 4.). The Commission has not collectively discussed and endorsed every point in Mr Pearce's report. But they consider that in general terms it has successfully applied the Commission's principles of sustainability to the problem of aviation and to the questions posed by the consultation, and they commend this report for the Departments' attention. In the light of that report we set out below in paragraphs 17-24 some of the main areas where we would like to see progress.
9. The Commission would like to highlight the following key issues which they believe the Government will need to clarify in the White Paper, and on which the Commission would be glad to engage further in more detailed consultation.

The Principles of Sustainable Aviation

10. The consultation document gives great emphasis to ensuring that aviation meets its external costs (Para 1.3 and even more strongly in Para 2.2). The Commission agrees that this is extremely important in accordance with the polluter pays principle. But they do not believe that this is by itself a sufficient characterisation of a fully rounded sustainable aviation policy. The other five principles need to be brought into play as well. The Commission would like to offer to work further with the departments on a fully rounded characterisation of the principles of a sustainable aviation policy for the future.
11. This is not just a theoretical or theological point. To give predominant attention to internalising external costs will tend to point strongly towards levying taxes or charges of various kinds as a means of capturing the relevant external cots and imposing them on the providers or users of aviation. This must be a desirable objective wherever it is practicable, but would not by itself deliver a fully sustainable aviation policy for the future. The polluter pays principle is not enough by itself.
12. To adopt a broader approach taking account of natural limits or environmental carrying capacity of the atmosphere may point more strongly towards the use of targets for maximum emission levels and arrangements for allocating these efficiently by arrangements for trading emission permits. Particularly for greenhouse gas emissions such an approach might in the medium term bring aviation more smoothly within the emerging post-Kyoto international framework for handling climate change issues. It is becoming increasingly clear that aviation must play its part in working towards the long-term reduction of greenhouse gas emissions. If emissions trading within a cap is successfully established as the best way to deliver long-term emission reductions on a global scale, aviation must be brought within that framework as soon as possible.
13. The Commission believe that in relation to climate change, which is the single most important sustainability challenge for the aviation industry, both approaches (taxation and trading within a cap) will probably be needed, and could be justified in combination. They need not be regarded as alternatives and should not be advanced as such - not least because opponents of any change may then try to postpone action by playing them off against one another in the various national and international fora. The Commission would be glad to discuss in more detail how a combined policy might best be articulated.
14. All the experience of the Commission and others who have dealt with sustainable development is that sustainability requires the engagement, commitment and cooperation of groups and organisations at all levels of society. The governance of aviation poses particularly acute problems in this regard. Many of the basic rules and standards under which aviation operates

derive from international agreements and bodies – necessarily so, because of the international character of aviation. On the other hand many of the environmental and social impacts and problems arise very locally. This mismatch of scale has led to many of the conflicts of the past between the global economic drivers of the expansion of aviation worldwide and local protest and resistance from those most immediately affected. The slowness of the international regulatory framework to respond to growing concerns about pollution and noise, and its inability to do much to allow flexible local solutions to acute local issues, have exacerbated this problem.

15. The SDC believe that one test of how far the White Paper manages to meet the challenge of sustainability will be how far it manages to reconcile and respond to these different perceptions of needs and problems at local, national, European and global levels, and to develop a policy and governance framework which plays well at all these levels.
16. Two general principles seem to the Commission to be important here. First the principle of good governance which includes the principle of subsidiarity suggest that wherever possible some of the decisions about mode and time of operations and precautions to be taken should be handled as locally as possible by authorities directly responsive to the needs and concerns of those living in the vicinity of airports. Secondly the principle of equity or fairness indicates that there should be generous compensation or mitigation arrangements for those most affected by environmental impacts or social costs. If any economic instruments involve levying charges or taxes on operators or users there is a strong case for using a significant part of the proceeds either to compensate those affected or to mitigate the problems. Once again the Commission would be glad to discuss further how to shape an integrated policy framework that contains an appropriate balance of actions and opportunities for action by stakeholders at all levels.

Specific comments on the use of economic instruments

In the light of the above, the Commission would like to make the following specific comments on the use of economic instruments in the context of aviation and the environment.

Focus

17. It is important to focus the economic instruments on the organisations that have the mandate to address the issues in question. In the aviation context airlines are best placed to address upper atmosphere pollution and climate change, and airports local air quality and noise. There is also a case for developing instruments appropriate to air and ground traffic control (see 19 below).

Cap and Trade and Taxation Schemes

18. Cap and trade schemes have much to offer, and will act as an incentive for indefinite improvement in the field of greenhouse gas reduction. They should be based on modeled emissions of CO_2, NO_x and H2O developed as a function of aircraft and engine type, landing and take off cycle and cruise sector length. The use of modeled rather than actual fuel burn to achieve this avoids the potential of the instrument being perceived as a fuel tax, and thus being in contravention of the Chicago convention.
19. The use of modeling as the basis for cap and trade schemes does not address environmental damage caused by inefficient air and ground traffic control; a problem that is well documented. Instruments should be developed to incentivise the relevant organisations to improved performance; these might achieve significant benefits in the shorter term.
20. Taxation can be used to provide compensation for those most affected by aviation or to finance schemes to mitigate the environmental impacts of aviation. Through the use of variable landing charges this has been successfully used to address the issue of noise at some European airports.

Local Air Quality

21. Addressing the economic instruments for local air quality and noise on an airfield basis will permit the inclusion of all airfield related pollutants. In turn this will incentivise an integrated approach to transport planning and energy provision.

Disclosure

22. The Commission would endorse the introduction of disclosure based measures along the lines of white goods labeling. Not only would this enable consumers to make more informed choices, but would provide suppliers (airlines

and airports) opportunities to demonstrate positive differentiation to their customers.

Research

23. The Commission encourages the government to give further active support to research into climate science that will lead to a more accurate understanding of the environmental impacts of aviation, and thus the appropriate levels of economic instruments that should be applied. However this should not stop the introduction of instruments as soon as possible based on the best information currently available, with the provision for adjustment in the light of improved information.

Action in International Fora

24. The movement to address the environmental and consequent social and economic impacts of aviation in ICAO has been disappointingly slow. The EU, by contrast, is showing resolve in this matter and has enough critical mass to make the proposed economic instruments effective within its borders. The Commission urges the UK government to take leadership in this issue through:

- at the earliest opportunity treating aircraft emissions from flights between UK destinations as part of the UK Kyoto commitment and requiring actual or traded reductions,
- actively supporting the EU towards the introduction of EU wide measures as soon as possible, and in advance of the second Kyoto commitment period,
- demonstrating to the global community that these are feasible measures and that a collection of regional schemes is just the precursor to a global scheme, and working in ICAO towards that aim.

ANNEX 1

Members of the Sustainable Development Commission

Jonathon Porritt (Chairman) Director of Forum for the Future; **Maria Adebowale** Director of Capacity; **Rod Aspinwall** Deputy Chairman of the Enviros Group and Professor of Environmental Management at Cardiff University; **Councillor Maureen Child** Lead Member for Finance, Edinburgh City Council; **Rita Clifton** Chairman of Interbrand; Lindsey Colbourne Coordinator of InterAct; **Anna Coote** Director of the Public Health Programme at the King's Fund
Ed Crooks Economics Editor, Financial Times; **Valerie Ellis** Assistant General Secretary of Prospect; **Nicky Gavron** Deputy Mayor of London and the Mayor's Advisor on Planning and Spatial Development; **Brian Hanna** President of the Chartered Institute of Environmental Health; **Alan Knight** Head of Social Responsibility, Kingfisher; **Walter Menzies** Chief Executive of the Mersey Basin Campaign; **Tim O'Riordan** Professor of Environmental Sciences at the University of East Anglia and Associate Director of the Centre for Social and Economic Research on the Global Environment; **Derek Osborn** Chairman of the Stakeholder Forum for our Common Future; **Anne Power** Professor of Social Policy at the London School of Economics and Deputy Director of the Centre for Analysis of Social Exclusion; **Charles Secrett** Executive Director of Friends of the Earth; **Richard Wakeford** Chief Executive of the Countryside Agency; **Jess Worth** Campaigner with People and Planet; **Graham Wynne** Chief Executive of the Royal Society for the Protection of Birds; **Raymond Young** Board member of Forward Scotland, a member of the Scottish Welfare to Work Advisory Task Force and Chair of the Environment Task Force in Scotland.

ANNEX 2

The SDC's working principles for sustainable development

Defining sustainable development

- Sustainable development provides a framework for redefining progress and redirecting our economies to enable all people to meet their basic needs and improve their quality of life, while ensuring that the natural systems, resources and diversity upon which they depend are maintained and enhanced both for their benefit and for that of future generations.
- Sustainable development is inevitably a contested idea, dependent of finding the right balance between different and often conflicting objectives through much more integrated policy-making and planning processes. Putting its principles into practice demands debate, experimentation and continuous learning, and therefore requires a thriving democracy to allow it to evolve and flourish.

The SDC's principles for sustainable development

Putting sustainable development at the centre

- Sustainable development should be the organising principle of all democratic societies, underpinning all other goals, policies and processes. It provides a framework for integrating economic, social and environmental concern over time, not through crude trade-offs, but through the pursuit of mutually reinforcing benefits. It promotes good governance, healthy living, innovation, life-long learning and all forms of economic growth which secure the natural capital upon which we depend. It reinforces social harmony and seeks to secure each individual's prospects of leading a fulfilling life.

Valuing nature

- We are and always will be part of Nature, embedded in the natural world, and totally dependent for our own economic and social wellbeing on the resources and systems that sustain life on Earth. These systems have limits, which we breach at our peril. All economic activity must be constrained within those limits. We have an inescapable moral responsibility to pass on to future generations a healthy and diverse environment, and critical natural capital unimpaired by economic development. Even as we learn to manage our use of the natural world more efficiently, so we must affirm those individual beliefs and belief systems which revere Nature for its intrinsic value, regardless of its economic and aesthetic value to humankind.

Fair shares

- Sustainable economic development means "fair shares for all", ensuring that people's basic needs are properly met across the world, whilst securing constant improvements in the quality of peoples' lives through efficient, inclusive economies. "Efficient" simply means generating as much economic value as possible from the lowest possible throughput of raw materials and energy. "Inclusive" means securing high levels of paid, high quality employment, with internationally recognised labour rights and fair trade principles vigorously defended, whilst properly acknowledging the value to our wellbeing of unpaid family work, caring, parenting, volunteering and other informal livelihoods. Once basic needs are met, the goal is to achieve the highest quality of life for individuals and communities, within the Earth's carrying capacity, though transparent, properly-regulated markets which promote both social equity and personal prosperity.

Polluter pays

- Sustainable development requires that we make explicit the costs of pollution and inefficient resource use, and reflect those in the prices we pay for all products and services, recycling the revenues from higher prices to drive the sustainability revolution that is now so urgently needed, and compensating those whose environments have been damaged. In pursuit of environmental justice, no part of society should be disproportionately impacted by environmental pollution or blight, and all people should have the same right to pure water, clean air, nutritious food and other key attributes of a healthy, life-sustaining environment.

Good governance

- There is no one blue-print for delivering Sustainable development. It requires different strategies in different societies. But all strategies will depend on effective, participative systems

of governance and institutions, engaging the interest, creativity and energy of all citizens. We must therefore celebrate diversity, practice tolerance and respect. However, good governance is a two-way process. We should all take responsibility for promoting sustainability in our own lives and for engaging with others to secure more sustainable outcomes in society.

Adopting a precautionary approach

- Scientists, innovators and wealth creators have a crucial part to play in creating genuinely sustainable economic progress. But human ingenuity and technological power is now so great that we are capable of causing serious damage to the environment or to peoples' health through unsustainable development that pays insufficient regard to wider impacts. Society needs to ensure that there is full evaluation of potentially damaging activities so as to avoid or minimise risks. Where there are threats of serious or irreversible damage to the environment or human health, the lack of full scientific certainty should not be used as a reason to delay taking cost-effective action to prevent or minimise such damage.

Working principles

These principles have been formulated to help the Sustainable Development Commission in delivering its work programme. We are a UK body, focussing primarily on the UK Government and other key sectors in the UK. These Principles are not therefore designed to be either a work of art or utterly definitive. Indeed, first and foremost, they are operational principles, in that we are using them to inform our own deliberations and to steer all external contributions we may seek from academics, partners, consultants and so on. They have been debated and agreed by the Commissioners themselves, embodying our own experience and conviction of what is most important in the sustainable development debate.

We acknowledge the work of many who have gone before us in seeking to define what is meant by Sustainable development. We respect the fundamental importance of the principles agreed by governments in the Rio Declaration of 1992 at the Earth Summit. The principles elaborated by the UK Government in DEFRA's sustainable development strategy cover similar ground. And for a more elegant articulation of the relationship between humankind and the natural world, we warmly recommend the approach of the Earth Charter (http://www.earthcharter.org).

ANNEX 3

Air transport & sustainable development – a submission from the SDC (November 2002)

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Our mission is to inspire government, the economy and society to embrace sustainable development as the central organizing principle. Our task is to advocate sustainable development across all sectors in the UK, review progress towards it and build consensus on the actions needed if further progress is to be achieved.

The Sustainable Development Commission fully understands the economic and competitive pressures in planning the future of air transport. However we believe that there is a real opportunity for the UK to take a leadership role in determining how economic aspirations need to embrace the universal desire for a better quality of life in the round. The principles of sustainable development are central to this, and as a Commission we offer the following views on the implications of sustainable development for the future development of air transport in the UK.

Principles of sustainable development

- In approaching all subjects related to sustainable development, the Commission seeks to apply a consistent approach based on six fundamental principles (see Annex 2):
  - Putting Sustainable Development at the Centre
  - Valuing Nature
  - Fair Shares
  - Polluter Pays
  - Good Governance
  - Adopting a Precautionary Approach.

- In the Commission's view, the approach set out in the air transport consultation documents (http://www.aviation.dft.gov.uk/consult/aircon sult/index.htm) falls seriously short of sustainability in respect of all of these basic principles. It appears to be based on a classic "predict and provide" model for planning major developments, and to avoid the much deeper analysis which a truly sustainable approach would require.
- Taking each of our six principles in turn, the approach in the consultation documents falls short in that:
  - They give over-riding importance to the economic significance of airport development, and do not give adequate weight to the social and environmental impacts of such developments - in other words, they do not put sustainable development at the centre of the approach;
  - They do not make an adequate assessment of the damage that may be done to the natural environment both in the locality of the proposed airport developments and more widely through the impacts of increased air traffic;
  - They place great emphasis on the employment generating effects of airport development and the benefits to those who will work there and those who will be able to travel by air more easily, but much less weight to those whose quality of life will be adversely affected by the developments;
  - They do not provide a full analysis of how to ensure that the aviation industry and airports (and their users) can be made to pay a proper price to reflect the environmental and social costs they impose on others, and of how far such measures might moderate the predicted growth in demand;
  - They envisage a speeded-up planning process to press the developments through rather than an extended national debate on the best aims of policy and development on these issues which would provide a better model for consensual governance;
  - Finally, they take much too little account of the very real dangers of climate change being exacerbated by the continuing growth of air traffic around the world, and the dangers which the world as a whole faces if we make our economies ever more dependent on continuing growth of air traffic.
- In the Commission's view, the present rate of growth in air traffic is unsustainable in the long or even the medium term, and policy should be seeking to manage growth rates towards more

sustainable levels. Airports policy should be directed to the same end. We would be glad to participate in further consultations and studies on how to bring about such a change of course.

The growth of air traffic and its impacts

- Air traffic has grown rapidly and geometrically over the past 50 years. During the 1990s, growth averaged 5% per annum and is currently projected to go on increasing rapidly for several decades to come. Clearly this growth has been associated over much of that time with significant economic benefits. The manufacture of aircraft, the operations of the aviation industry and all the associated services have provided direct economic benefits to those employed in these sectors. The services provided have given the growing volumes of passengers the opportunity to travel for business and pleasure to more and more distant places. The movement of people and freight has been a major contributor to the growth of world trade.
- But disbenefits are now growing rapidly as well. Noise from air flight is becoming increasingly unacceptable to those impacted by flight paths. Congestion around airports is becoming more acute. Mass travel is having serious impacts on local communities and local environments at favourite destinations. Air pollution around airports and at the sensitive boundary between the troposphere and the stratosphere is becoming more serious.
- Above all, CO_2 and other greenhouse gas emissions from aircraft are becoming a more and more significant component of the greenhouse gases that are causing climate change. The contribution of air traffic to this crucial global problem can no longer be disregarded, but needs to be addressed as a central issue in considering the future of air traffic and of airports policy. We have not attempted our own assessment of this problem, but we share the concerns of the Intergovernmental Panel on Climate Change. We understand that this analysis and concern is further reinforced by a report from the Royal Commission on Environmental Pollution that is being published in parallel with this submission.
- It is a key theme of the approach to sustainable development agreed at Johannesburg, and of the climate change strategy embodied in the Kyoto agreement, that economic growth or improvement in the quality of life must be decoupled from growth in the consumption of energy and other natural resources and from growth in pollution. The unconstrained growth of air traffic is a classic example of the failure to achieve that decoupling. Current levels of air traffic already cause major disbenefits, and those disbenefits will grow even more rapidly than air traffic itself if growth continues unconstrained.
- In the Commission's view, present trends in the growth of air traffic are leading the economy to an excessive and dangerous dependence on air travel and the resources that it consumes. Wise policy should be leading us towards decoupling the growth of economic well-being from growth in air travel, not reinforcing their connections. It should be steering towards a soft landing from the inflationary surge of air traffic that has characterised the past 50 years.
- Present policy heads us towards a very hard landing or crash when, either fuel becomes unacceptably expensive, or pollution loads (including the growth of greenhouse gases) become intolerable, or both. Given the lead times in this industry and the degree of interconnectedness with other parts of the economy the time to start planning for decoupling is now.

The consultation papers on air transport policy

- The consultation papers fail to take on board the sustainable development perspective. They approach air transport policy on the basis that the economic benefits of the growth of air traffic are so obvious and overwhelming that the primary objective of policy should be to provide sufficient airport capacity to enable growth to continue unconstrained by limitations on airport space. The papers are thus largely based on a classic "predict and provide" model. They appear to take the view that all the disbenefits can either be avoided or mitigated by careful location of new airport capacity, or by improved design and operation of planes. Or, insofar as they cannot be mitigated, they will have to be accepted as the unavoidable price of the desirable growth. The papers accept in principle that the cost of flying should fully reflect the cost of all associated externalities. However they argue that the elasticity of demand is so low that even if external costs were fully incorporated in prices the impact on demand for air travel would not be much diminished, and that new airport provision will still therefore be needed.

- We believe that it is time for a more radical rethink of this approach. Recent years have seen planning for road traffic move gradually away from simple "predict and provide" models towards a more sophisticated mix of demand management and intermodal shifts, as well as infrastructure provision, which should in due course enable a more sustainable road transport policy for the future to emerge. Planning for the growth of air traffic has however remained at a much more primitive level of analysis, dominated by "predict and provide" models. It would be timely now to move towards the more sophisticated approach in the air traffic sector, and to consider how best to introduce an element of demand management into policy.
- There are several elements that need to feature in such a transformation. At the most fundamental level, political leadership is needed to open up the debate and to begin to get the whole of society confronting the unsustainability of present trends. At present, the aviation industry and its supporters tend to characterise the debate as being between realists, who can see that the growth of air traffic brings short term economic benefits and must therefore be pursued for the general good regardless of other consequences, and an unrealistic alliance of sentimental environmentalists and local NIMBYs who are trying to hold back progress and growth. We believe that this characterisation does not do justice to the case for a fundamental rethink of the kinds of growth of quality of life that we really want to achieve as a society.
- All parts of society need to be engaged in working out together in a fair and acceptable way the alternative path forward. Then a suitable mix of policy instruments and actions to achieve the necessary transformation will need to be put in place.
- There are four basic sets of instruments - fiscal measures affecting relative prices; regulatory measures mandating standards; capacity constraints; and measures to encourage alternative modes of transport or to reduce the need or demand for transport at source. All will be needed. On the fiscal, side it seems to us to be imperative that the price of aviation fuel should begin to reflect the high externalities which air traffic imposes, above all through its growing contribution to the carbon load on the atmosphere and climate change. Airport charges or passenger levies may also have a part to play. Revenue from these funds could be used to provide infrastructure for efficient and sustainable land transport. On the regulatory side, some progress has been made in recent years in reducing noise and polluting emissions from aircraft, but progress on these fronts has not kept pace with the growth in the volume of traffic, so that the overall burden is still increasing.
- On the capacity side, physical limitations and planning restrictions on the growth of airports have clearly exercised some restraint on the growth of air traffic. Although these limitations constrain the economic growth potential for aviation in the UK, they also play an important part in limiting the adverse impacts of such growth. The planning system is in fact a crucial instrument for achieving sustainability in physical development, provided it is properly used to achieve appropriate balance between different societal objectives. It fails to deliver sustainability if it becomes dominated by a supposedly over-riding imperative to accommodate the economic growth of one sector at the expense of all other objectives. The planning system should be used positively to encourage the kind of development that reduces the demand for transport, and will encourage modal shifts towards less environmentally harmful modes of transport.
- Existing planning permissions already imply considerable scope for expansion of air traffic movement in the UK. The Commission believes that already permitted expansion is as much as can be sustainably provided for the future. Beyond that the planning system should be used as one instrument alongside fiscal and regulatory measures to constrain the further growth of demand for air travel and to divert it towards more sustainable modes of transport.
- In other European countries fast train routes have attracted additional investment and often compete with air. Faster shipping routes also have considerable potential. All of these possibilities should be considered much more seriously in the UK. A more proper level of taxation on the aviation industry which reflects the externalities it imposes on society and the environment could generate resources to finance investment in these preferable alternatives.
- The Commission believe that, rather than simply planning to provide sufficient airport facilities to accommodate an unconstrained growth of air

traffic, it would be better to invite a wider national debate on a range of options for the future development of air traffic and of airports in this country. The options should range from the growth models set out in the consultation documents to a much more constrained set implying modest growth tapering off to a stable plateau and possibly eventual reduction. For each option it would be important to analyse the set of policy measures that would need to be adopted, and the overall impacts on the economy, on society and on the environment in a comprehensive sustainable development assessment.

- It will be crucially important to engage the public and all stakeholders in wide-ranging discussion and participation in the decisions about the options and their implications for society. At present, it is probably true to say that the majority of the public want it both ways. In ever-increasing numbers they like to be able to fly to distant places for business and pleasure, and there is no sign of this demand levelling off. At the same time, there is growing concern about the impacts of continuing growth of air traffic, and a gradually growing recognition that things must be done to limit these impacts.
- Technical developments in the aviation industry can and should do something to bridge the gap and the fiscal and regulatory measures should be shaped to encourage these changes. They will do something to mitigate the impacts of continuing growth as quieter, cleaner and more efficient engines and more optimal air traffic management systems come on stream. But there is no current prospect of being able to cope with all the impacts of unconstrained growth in demand in this way. In particular any foreseeable increase in the energy efficiency of engines and air traffic management will not be sufficient to mitigate the ever-growing impact of greenhouse gas emissions from aircraft and their contribution to climate change.
- Sooner or later, therefore, society as a whole will have to face up to the necessity of accepting some constraints on the growth of demand for air travel so as to keep its adverse impacts to manageable proportions. In our view the adverse impacts are already so great that it would be unwise and unsafe to postpone the opening up of this debate. The controversies that have already arisen about the current proposals for airport development over the next twenty-five years show that there is already a considerable public appetite to debate these issues vigorously, and certainly no overwhelming popular mandate for continuous expansion of airports. Now would be an excellent opportunity to stand back from the local debates and controversies and to initiate a much wider-ranging public consultation on the proper objectives of a sustainable policy for aviation and airport development in the future within the context of a broader sustainable transport strategy. Air travel cannot be considered on its own. Other countries have reduced the demand for growth in air travel, particularly for short haul flights, by promoting high speed rail and other alternative modes. This should be an important element of a broader review.
- There is at present no generally agreed methodology for carrying out a comprehensive sustainability assessment for a whole sector of the economy and alternative future pathways for it. But it is vitally needed to turn sustainable development from a high level set of principles and goals into a practical working tool for shaping future policies in key areas. The aviation sector could be a prime test bed for developing such a new approach and using it to shape policy choice in a radically different way. The Commission would be glad to work with government and others in developing such an approach in this sector, and in helping to shape the public debate and consultation.

ANNEX 4

Aviation and the environment: using economic instruments

A report to the Sustainability Development Commission by Brian Pearce

SUMMARY

This report has been written for the Sustainable Development Commission (SDC) to respond to the consultation paper 'Aviation and the Environment: Using economic instruments' issued by HM Treasury and the Department for Transport. Its aim is to assess the extent to which the use of economic instruments to tackle aviation's impact on the environment would be consistent with the principles set down by the SDC, which is described in the main body of the document. It also describes how such economic instruments might be designed to create the financial incentives that would move the industry towards sustainability.

The context

- Basis for forecast exponential growth in airport passengers questioned;
- Aircraft noise at airports set to increase once more;
- Local air quality around airports forecast to deteriorate beyond mandatory EU limits;
- International aviation emissions pose an increasing threat to climate stability.

Questions posed by the consultation paper

What economic instruments could be used to tackle climate change?

- The main focus should be on integrating international aviation into the greenhouse gas trading schemes under the Kyoto Protocol;
  - An international cap and trade scheme would be environmentally effective compared to a tax;
  - High estimated abatement costs in aviation suggest an open scheme would substantially reduce the resource cost of emissions abatement;
  - Competitive distortions would be eliminated under a regional or global scheme (remember airline hub airports cannot be shifted to low cost developing countries), and a scheme based on emissions rather than fuel would prevent any 'tankering' distortions;
  - The feasibility of such a scheme is high. An emissions-based scheme avoids the legal problems with a tax or restriction on fuel. Administration could be undertaken by the UNFCCC infrastructure. Under ICAO the industry has already agreed this is the best option;
- An EU-level charge should be considered as an interim measure on CO_2 and as a separate instrument for the more regional effects of NO_x and condensation trails;
  - The second Kyoto commitment period is a decade away. The EC has already designed an EU aviation environmental charge that could be used as an interim measure to encourage the industry to manage its CO_2 and other Kyoto Protocol greenhouse gases;
  - NO_x and condensation trails are responsible for taking aviation's radiative forcing to 2.7 times the impact of CO_2 alone. However, NO_x emissions are not linked to CO_2 and neither NO_x nor water vapour are in the Kyoto group of greenhouse gases. Therefore, a separate economic instrument is necessary. Since they have regional climate effects an EU-wide charge is an ideal economic instrument.

Should there be a priority to reduce one particular aspect of aviation's contribution to climate change, such as CO_2?

- No. Total radiative forcing of aviation's emissions is in the region of 2.7 times that of CO_2 alone. Prioritising CO_2 alone could lead to a weak environmental impact at best, and a perverse one at worst.

What would the advantages and disadvantages of including international aviation in national totals for the second Kyoto commitment period be?

- The major advantage is one of feasibility. It is the only international agreement in town;
- It also has the advantage of including aviation in an open trading system which could substantially reduce the resource costs of CO_2 mitigation;
- As an international cap and trade system, if ratified, it will also be effective at achieving the target reduction in emissions. A tax or charge would not be certain to do this;
- The major disadvantage is that the second commitment period is a decade away. It could be used as an excuse to do nothing, which is why an EU charge as an interim measure would

be sensible in the absence of transport being part of the EU emissions trading scheme.

What measures could be introduced to encourage airlines to purchase assets which are less environmentally damaging?

- The advantage of an economic instrument is that it leaves the way in which emissions are reduced up to the economic agent, unlike a BAT or BATNEEC regulation;
- So airlines would be encouraged to purchase cleaner assets. However, if emissions were estimated using indices rather than directly measured there would be no additional incentive to save money by operational improvements that may include pressuring air traffic control and the airports to improve air and ground management. Any economic instrument should also present financial incentives to ATC and airports to carry out these operational improvements;
- An extremely important point to make is that the economic instrument must be designed well to create these supply-side incentives. This means a tax or permit on the emission. A passenger charge such as APD will be environmentally ineffective because it creates no incentive for the supply side, relying on rather weak impacts on demand. A fuel duty would be ineffective at creating an incentive for supply-side reduction in NO_x emissions since they are not directly connected to fuel usage.

What other measures might be effective at tackling climate change?

- Information or disclosure-based measures should be considered, along the lines of white goods labelling which the airlines could use to their advantage;
- The implementation of informed consumer choice could be improved by a labelling scheme for the 'greenhouse gasiness' of flights;
- Investor groups are an influential force for improvement. Disclosure would help their investment process, possibly through changes to the European Stock Exchange listing requirements.

Should domestic or EU-level measures be pursued in the short-term ahead of long-term international agreements?

- Environmental effectiveness for a global pollutant such as CO_2 is reduced but there would be advantages in adopting a leadership position and likely learning benefits. An EU-level measure would minimise competitiveness distortions;
- Certainly an EU-level charge should be pursued as a separate instrument for the regional effects of NO_x and contrails.

What economic instruments could be used to tackle impacts on local air quality and noise?

- Setting tradable caps or 'budgets' at airports would create new markets in aircraft noise and LTO emissions;
  - These would guarantee environmental targets are achieved (unless enforcement is difficult which may be the case with local air quality where, for instance, NO_2 emissions also come from surface transport. This could be addressed by allocating surface transport allowances to the airports);
  - Abatement costs for the industry would be minimised because of trading allowances;
  - If noise or LTO emission allowances were issued free then some noise or LTO emission sources would be able to abate cheaply and find themselves with credits to sell, while others would need to buy allowances to permit expansion. Competitive impacts would be minimal, though polluters without cheap abatement options would find expansion more expensive.
- A charge is another option which has been explored in the literature both for the UK and at the EU level;
  - A charge would create the financial incentives required to bring about the supply-side changes required in the long-run, but it would not guarantee achievement of the environmental target;
  - A charge would guarantee the cost. In fact, as with the charging regime at Zurich airport, it could be revenue neutral. Even if the charge is not revenue neutral, these pollutants are local and should be paid for under 'polluter pays'. Moreover, the levels of any charge are not likely to be excessive and, unlike, other industries, an airline cannot transfer its hub to a low cost developing country.

Should economic instruments vary by emissions, or noise, or both?

- Both;
- One of the key points to emphasise here is that to be effective an economic instrument must be designed well to create supply-side incentives

(such as a better fleet mix), because demand effect may be weak. This means a charge or allowance on emissions and not fuel or passengers (this way APD is ineffective as an environmental charge).

On which type of emission would it make most sense to base economic instruments?

- On those with significant environmental impacts.

Should economic instruments vary by aircraft type, or location, or both?

- Both;
- It has been shown to be feasible to design a charge that varies by aircraft type and location. The same methodology could be used to allocate permits;
- There is considerable variation in emissions by aircraft type and impact by location, because of different populations exposed around airports. The economic instrument should give an incentive to fly to less populated regional airports, giving both environmental and regional development benefits.

Is there a role for economic instruments to help meet mandatory EU limits for NO_2 and PM10?

- Possibly;
- A tax would not be suitable since there would be no guarantee of holding the limit;
- A tradable cap or air quality 'budget' may work and reduce compliance costs. However, it is argued that because the source of NO_2 emissions is from surface transport as well as aviation this may make such an economic instrument impractical. This could be addressed by allocating allowances for surface transport emissions to the airports, since they have a degree of control over surface transport options and therefore emissions;
- Regulatory instruments may be best for this issue.

Should economic instruments be based on estimates of external costs?

- Only if the best instrument is a charge;
- A cap and trade scheme looks the best instrument for most pollutants. In this case the price will depend on the cost of preventing further pollution and not the damage cost;
- The external costs in the consultation paper are low. This implies economic instruments can be used without serious financial difficulty for the aviation industry.

1. THE CONTEXT

The problem we face with aviation in the UK is that its unconstrained expansion will cause severe local environmental impacts, as well as adding significantly to global warming.

1.1 Basis for forecast exponential growth in airport passengers questioned

Department for Transport forecasts[1] suggest an exponential increase in passenger numbers at UK airports from 160 million in 1990 to 400 million by 2020 and 500 million by 2030, an increase roughly equivalent to five extra Heathrow airports. This is the context in which we are now discussing a possible expansion in airport capacity in the South East of England, and whether the resulting environmental impacts could be managed using economic instruments.

As an earlier submission by the SDC[2] to the consultation on the future of air transport in the UK pointed out it would be a retrograde step if the Government's approach was based on 'the flawed and old concept of 'predict and provide', which will only lead to unconstrained growth'.

This importance of this point was made when the DfT used their air transport passenger allocation model (SPASM) to look at the impact on passenger numbers of a phased removal of tax subsidies[3]. This subsidy was calculated by the Aviation Environment Federation as being an estimated £5.7 billion exemption from fuel tax, £4 billion exemption from VAT, £0.4 billion earned on duty free goods minus the £0.9 billion paid on Air Passenger Duty. The removal of subsidies (if the AEF's calculations are correct) would raise fares for flights out of the UK by 34% between 2000 and 2030, just offsetting the assumption in the DfT passenger forecasts of a 1% a year decline in the price of air travel. So after these changes forecast air fares end up no higher than in

[1] Department for Transport, May 2000, *Air Traffic Forecasts for the UK*, DETR.
[2] Sustainable Development Commission, November 2002, *Air transport & sustainable development – a submission from the SDC*, SDC.
[3] Brendon Sewill, February 2003, *The Hidden Cost of Flying*, Aviation Environment Federation.

2000. On this basis passengers rise to 315 million by 2030, compared to the DfT's forecast of 500 million.

At this passenger level in 2030 there would be no need for an expansion of airport capacity.
So even before consideration is made about paying for pollution there is a question about whether implicit subsidies to the industry are already causing a misallocation of the nation's resources towards an excessive provision of aviation capacity. The first rule for environmental policy-making has been to remove distorting subsidies to create a level playing field, before pricing externalities. Given the impact of removing these subsidies, as described above

1.2 Aircraft noise at airports set to increase once more

In the crowded South East of England the population exposed to aircraft emissions and noise around airports is substantial. In recent years there has been a fall in the population exposed to aircraft noise around airports, due to technological improvements and the phase-out of older 'Chapter 2' aircraft. However, the end of this phase out period and the continued traffic growth forecast above implies that airport noise will increase again.

ICAO forecast a 42% rise in noise at European airports by 2020 if no action is taken.

Although the health impacts of aircraft noise remain uncertain, there is clear evidence of welfare loss for residents within the 57 dBA noise contour. The study quoted in the paper[4] shows that house price differentials suggest residents value the aircraft noise nuisance around Heathrow airport at a minimum of £19 million a year, which translates to a cost of 36 to 40 pence per passenger. But clearly house price differentials do not capture the welfare loss of those who do not own their homes nor the detrimental impact on community activities. A study around Schipol airport[5] estimated that the monetary valuation of aircraft noise nuisance was considerably higher at 75 to 300 pence per passenger.

1.3 Local air quality around airports forecast to deteriorate beyond EU mandatory limits

There is also a major air quality issue around airport resulting from emissions leading to the formation of Nitrogen Dioxide (NO_2). Air quality modelling undertaken for the second stage of the South of England Regional Air Study[6] shows that NO_2 levels around Heathrow are likely to exceed EU limit values, which come into force in 2005.

The consultation paper gives a cost of £10,000 for every 100,000 people subject to an increase of 10 ug/m^3 of NO_2. It also omits any discussion of additional local pollutants from aircraft other than PM^{10}. The concern we have is that this underestimates the cost of local air quality impacts from aviation.

The approach taken in the consultation paper of looking only at exceedences of EU limits fails to take into account any environmental or health effects of the pollutants below those values. This is likely to be the case particularly with PM10 and an analysis of these costs should be possible given the increasing literature on the health effects of particles.

The table below shows the environmental impacts of local aircraft emissions as analysed by the CE (2002) study already discussed.

	Environmental and health effects
No_X	Acidification Eutrophication Summer smog (ozone) formation Health effects (via nitrate, ozone and NO_2)
PM_{10}	Health effects
HC	Summer smog (ozone) formation Health effects (via carcinogenic substances and ozone)
SO_2	Acidification Health effects (via sulphate)

The costs in the consultation paper appear to cover only a very small part of even the effects of NO_X. They are based on NHS hospital costs of a respiratory hospital admission for NO_2. To this must be added the human costs of the illness and lost output plus additional health effects from nitrate and ozone formation, and the impact of acidification and eutrophication.

PM10 concentrations appear to remain below levels which represent serious risks to public health, but the omission of any assessment of the external costs

[4] D.Pearce and B.Pearce, 2000, *Setting Environmental Taxes for Aircraft: A Case Study of the UK*, CSERGE Working Paper GEC 2000-26.
[5] CE, 2002, *External costs of aviation*, Delft.

[6] Department for Transport, July/August 2002, February 2003, *The Future Development of Air Transport in the United Kingdom*.

of Volatile Organic Compounds (including Hydro-Carbons HC) or Sulphur Dioxide (SO_2) is a concern. Although both the CE (2002) and Pearce (2000) studies suggested that the external costs of HC were an order of magnitude lower than NO_x, the latter study pointed to significant costs from SO_2.

The external cost of all four local air quality pollutants listed in the table above was calculated by CE (2002) as implying an extra 50 to 75 pence per passenger for a single flight.

1.4 International aviation emissions pose an increasing threat to climate stability

According to the Intergovernmental Panel on Climate Change (IPCC)[7] aviation was responsible for 3.5% of man-made global warming. This may seem small but the industry is growing rapidly, as the DfT forecasts above show, and emissions at high altitude have a much greater climate change effect than those emitted at ground level. Over the past decade total UK emissions of CO_2 have fallen but those from international flights from the UK have doubled[8]. The recent report by the Royal Commission on Environmental Pollution[9] indicates that, on optimistic assumptions about technology developments, by 2050 aviation emissions are likely to be responsible for 4-17% of total man-made global warming.

As the consultation paper points out the source of radiative forcing from aviation is not CO_2 alone. Emissions of NO_x and water vapour at environmentally sensitive altitudes in the atmosphere mean that aviation's total radiative forcing impact is 2.7 times that of CO_2 alone.

There is a substantial human cost to climate change, mostly to the relatively poor in low latitude countries and future generations. The consultation paper uses an illustrative external cost of carbon of £70 per tonne of carbon for 2000, rising by £1 a year to £100 per tonne of carbon in 2030. This gives a total external cost of £1.4 billion in 2000 and £4.8 billion in 2030. Expressed in terms of additions to passenger travel costs this implies an extra £5-10 on short-haul flights and £40-50 on long-haul flights.

There is considerable dispute around the £70 per tonne of carbon monetary valuation. This figure is based on the European Commission's ExternE project[10]. This study uses a relatively low rate of 3% with which to discount the future costs of climate change. Even though this can be considered a relatively low discount rate it still means that climate change damage caused more than 30 years hence (or the loss of utility to future generations) will be valued at zero.

The other important variable is equity weighting. A number of commentators arguing that the external cost of carbon is lower than £70 per tonne suggest that equity weighting should not be used. However, it is surely reasonable that the loss of utility to the poor in low latitude countries should not be understated because of lower income levels, which it is in the absence of equity weighting. Equity weighting puts a higher weight on low-income valuations to attempt to correct for this distortion.

2. THE USE OF ECONOMIC INSTRUMENTS AND THE SDC'S PRINCIPLES

The value of economic instruments is in the market signal they give to the many participants in the aviation industry to allocate existing capacity efficiently and to innovate new technologies and designs.

With perfect foresight regulatory instruments may be able to allocate existing capacity efficiently, but incentives to innovate are dulled by regulatory standards. This is why existing aircraft engine technologies have emission and noise characteristics clustered around the latest ICAO certification standard.

The financial incentive provided by an economic instrument, such as a tax or tradable emission permit, would encourage the design and invention of engines and airframes with lower and lower emissions and noise. This is a particularly important long-term source of external cost reduction for such a capital-intensive industry.

Economic instruments also allow those who can most easily cut emissions or noise from existing

[7] IPCC, 1999, *Aviation and the Global Atmosphere*, Cambridge University Press.
[8] Presentation by Graham Pendlebury, Department for Transport, 31st March 2003.
[9] Royal Commission on Environmental Pollution, 2002, *The Environmental Effects of Aircraft in Flight*, RCEP, London.
[10] Eyre et al, 1999, Global Warming Damages, Final Report of the ExternE Global Warming Sub-Task.

capacity to do more than those who find it costly. As a result the overall cost to the industry (and the economy in terms of resources devoted to compliance) will be lower under an economic instrument than a uniform regulatory standard.

Both the innovation incentive and resource saving aspects of using economic instruments are very attractive.

However, it is important that they are used as a complement to other policy instruments and not a substitute. We will discuss this in more detail below. But for instance where EU mandatory limit values on NO_2 concentrations are set to be exceeded a price-based economic instrument would not be suitable, since there would be no guarantee of meeting the target quantity. Regulatory instruments, such as ICAO's engine certification standards and planning regulations around airports, should also be used to set minimum standards particularly where there are thresholds beyond which aircraft noise or emissions cause serious environmental or health damage.

There may also be a role for voluntary or information-based schemes, such as labelling flights for their 'greenhouse gasiness' to improve the ability of consumers to make informed choices, or providing a carbon offset scheme for passengers. However, the success of voluntary schemes has been limited in the absence of a threat that a financial instrument would be applied in the event of no voluntary change.

2.1 Putting Sustainable Development at the Centre

The introduction of economic instruments to ensure that aviation pays for its external environmental costs would be an important step forward towards a sustainable aviation industry. However, the major concern must remain the weight placed on the economic importance of the industry in the earlier consultation documents.

The major research on aviation's economic benefits[11] was largely sponsored by the Air Transport industry and has been severely criticised for overstating the case. A report submitted to the consultation on the South of England Regional Air Study[12] by Berkeley Hanover Consulting pointed out that the size of the sector had been overstated, that its contribution could not be measured in terms of jobs, and that the study had not proved that improvements in aviation infrastructure will boost productivity across the rest of the economy.

This is not to say that air travel does not provide valuable consumer benefits. It does however caution against giving excessive weight to the economic benefits as against the environmental costs, when considering the case for further airport capacity.

2.2 Valuing Nature

Economic instruments are not suitable for all aviation environmental externalities. What has been omitted from the consultation paper is any serious consideration of externalities closely related to the infrastructure. These include barrier effects, fragmentation of the countryside with implications for eco-systems and visual disamenities. Arguably these are highly variable across different airports and are best addressed through the planning system or another regulatory instrument.

2.3 Fair Shares

It has been suggested that restricting the further expansion of aviation and the resulting increase in the price of air travel will unduely restrict fall on the poor and restrict the ability of the less well off to fly. It is certainly the case that the use of economic instruments, or any restriction on capacity, will raise prices and make it harder for those with limited income to fly. Unlike an income tax, an expenditure tax such as an aviation economic instrument, will be regressive.

However, there may be an even greater equity cost to doing nothing about the expansion of aviation. Ekins[13] points out that climate change will be negative for future generations, and have a relative greater impact on low-latitude countries, many of which have low per capita incomes. Clearly allowing the unconstrained expansion in aviation's greenhouse gases is not an equitable outcome.

[11] Oxford Economic Forecasting, 1999, *The Contribution of the Aviation Industry to the UK Economy*, Oxford.

[12] Bekeley Hanover Consulting, 2000, *The Impacts of Future Aviation Growth in the UK*, London.

[13] Prof. Paul Ekins, 24 April 2003, Supplementary evidence to the Select Committee on Transport, RECP.

As Ekins suggests there are well-established procedures for giving low-income people subsidised access to goods and services that are considered fundamental to their welfare or ability to participate fully in society. The benefits system transfers income from relatively wealthy taxpayers to those who are less well off or who have special needs. If flying were considered comparable to the need for old people to have adequate warmth, then as with winter fuel payments, the poor could be given money to enable them to fly more often.

Of perhaps more immediate relevance is the question of implicit subsidies to the industry or what might be called tax equity or fair shares between other transport modes and industry sectors. The study by AEF described on p1 estimates that the industry receives £9.2 billion of implicit subsidies to its output: exemption from fuel duty and VAT, revenues from duty free sales netting off the payment of Airport Passenger Duty. This is far in excess of the £4.8 billion the DfT calculate payment of the external environmental cost for climate change would cost the industry in 2030, and the much smaller totals for airport noise and local air pollution.

There are questions about the accuracy of some of these subsidy estimates. There are also issues about infrastructure costs, for which aviation pays and rail does not. Nonetheless, the numbers are such that there must be questions about whether national resources have been misallocated towards the aviation industry by implicit subsidies. These questions really should be addressed alongside or before the issue of payment for external environmental costs.

2.4 Polluter Pays

The use of economic instruments is fully in line with the principle of 'polluter pays'. There are however some caveats.

The major issue is with the free distribution (grandfathering) of CO2e emission allowances under a tradable permits scheme to address aviation's climate change impacts. Unless these permits are auctioned the industry will only pay for new emissions on any expansion of output. Existing output or air travel levels would not pay, although there will still be an incentive effective from the relative price change brought about by the permit system. If it is necessary to grandfather emission allowances initially to ease transition costs for the industry it would be important to phase in auctioning over time if the polluter is to pay.

The second caveat is that valuations are very uncertain. What is it that the polluter is paying for. The valuations reported in the consultation paper are estimates of the value of pollution reduction to humankind. There is no intrinsic value of the environmental asset included.

2.5 Good Governance

Economic instruments would certainly improve governance of environmental impacts by the aviation industry, by facing decision-makers with an explicit financial cost. However, good governance requires action from more than just the airlines. The planning authorities in particular could play a major role in improving the local environmental and social impacts of airports and air travel. The planning system cannot be replaced by any economic instrument, though the latter will offer a useful complement.

2.6 Adopting a Precautionary Approach

The need to adopt a precautionary approach suggests a more robust response to aviation's local emissions. Even though the evidence on health dose-response effects and the valuation of statistical lives is uncertain and still under research, this should not prevent an initial step being made to introduce instruments to manage local air quality around airports.

3. QUESTIONS POSED BY THE CONSULTATION PAPER

3.1 Climate change economic instruments

3.1.1 What economic instruments could be used to tackle climate change?

The main focus of policy-makers should be to integrate international aviation, as soon as possible, into the greenhouse gas trading schemes developing under the influence of the Kyoto Protocol.

- This would be environmentally effective as the cap would ensure CO_2 emissions are reduced to the target level
- An open trading system, such as under Kyoto, would be preferable since the evidence suggests marginal abatement costs for the industry are high. An indication of the steepness of the cost curve are indicated in simulations by ICAO's CAEP using the AERO and Stratus Consulting

models showed that a fuel tax would have to be up to €3,000 per tonne of carbon to achieve a 5% reduction in emissions below 1990 levels. So aviation would pay other industries to reduce carbon emissions more cheaply.

- There would need to be agreement on the allocation of international aviation emissions. One solution would be to add total fight emissions based on just departures to national totals. Another widely discussed solution would be to split all flight emissions between Annex 1 countries 50:50 and count flights to non-Annex 1 countries as 100.
- Legal studies by CE (2000) for the European Commission suggest that a tradable permit scheme based on emissions rather than fuel would be legal under the Chicago Convention and the bilateral Air Service Agreements.
- An international scheme would remove any competitive disadvantages to UK airlines and others in the aviation industry. Those with clean fleets would benefit but this would be a benefit to the economy rather than a competitive distortion. Moreover, a scheme based on emissions rather than fuel would avoid any economic distortions associated with 'tankering'.

3.1.2 Should there be a priority to reduce one particular aspect of aviation's contribution to climate change, such as CO_2?

No. The view of authoritative bodies such as the IPCC (1999) and the RCEP (2002) is that high-altitude aircraft emissions of NO_x and water vapour (forming condensation trails) are such powerful greenhouse gases that the total radiative forcing impact of aviation is around 2.7 times that of its CO_2 emissions alone.

Prioritising CO_2 could lead to ineffective or perverse environmental effects. The evidence to date shows that increased fuel efficiency, and therefore reduced CO_2 emissions, has led to engine technologies with hotter combustion chamber temperatures that in fact increase NO_x emissions. An economic instrument based on CO_2 alone may even increase aviation's contribution to climate change depending on the net effects.

This argues strongly for separate policy instruments. It has long been a law in macro-economic policy to have a separate policy instrument for each policy target. The same can be true for environmental policy. CO_2 emissions are linked to fuel burn, NO_x is not.

Aviation's CO_2 and other Kyoto greenhouse gases could relatively easily be integrated with the Kyoto Protocol's emissions trading.
At the same time a separate economic instrument needs to be introduce to provide a financial incentive to reduce NO_x emissions also. The proposal from IPPR[14] to introduce an EU-wide charge on aviation's intra-EU NO_x emissions should be given consideration. Since NO_x emissions have more regional climate effects, unlike the longer-lived and therefore more globally mixed CO_2 emissions, an EU-wide policy instrument makes a lot of sense.

The EC has already carried out considerable research on introducing an EU-wide aviation environmental charge[15] and concludes that a charge based on emissions would be feasible and effective. It has shown that such a charge would be environmentally effective, could avoid major competitive distortions, would not fall foul of the Chicago Convention or bilateral ASAs, and could be administrated through EUROCONTROL's en-route charging system.

This leaves a major question about how to manage aviation water vapour and the condensation trails it causes. CE (2002) estimate its external cost. It is uncertain but extremely large. Even while the science remains less than certain the precautionary principles would argue for the issue to be addressed. However, the uncertainty about the climate change impact and therefore the shape of the damage cost function means that an economic instrument such as a charge might not be the best option.

It is understood that condensation trails are created by aircraft flying in a relatively narrow band of the atmosphere, a band that increasingly can be predicted by meteorologists. A sensible option would be to introduce a regulatory or operational instrument to require aircraft to avoid flying in this narrow band, thus reducing the impact of water vapour emissions on climate change.

3.1.3 What would be the advantages and disadvantages of including international aviation in

[14] IPPR, 2001, *Plane Trading*, London
[15] CE, 2002, *Economic incentives to mitigate greenhouse gas emissions from air transport in Europe*, Delft.

national totals for the second Kyoto commitment period?

The major advantage of including international aviation in national totals for the second Kyoto commitment period is the obvious one that this is the one existing framework for controlling greenhouse gas emissions internationally. It has long been a Treasury maxim that a new tax is a bad tax. The fact that the Kyoto framework exists, and is expected to come into force if Russia ratifies as expected, is the key reason for participation. It is hard to believe that the benefits of negotiating a new international framework for managing aviation greenhouse gases, and setting up the associated infrastructure equivalent to that run by the UNFCCC, would exceed the undoubted costs.

The second advantage is that Kyoto would permit aviation to participate in an open trading system, which promises substantially lower compliance costs than a closed aviation-only system. Since the impact of CO_2 emissions does not depend who or where they are emitted, it is environmentally effective for aviation to pay another industry to reduce its emissions more cost-effectively for it. It is also much more resource efficient as CO_2 mitigation has a resource cost in almost all cases.

The disadvantage is that the second Kyoto commitment period is a decade away. Given current and projected growth rates that gives the industry a long time to increase its greenhouse gas emissions before being faced with the financial incentives of an economic instrument to deal with them. The danger is that this policy option could be used as an excuse to do nothing for ten years.

3.1.4 What measures could be introduced to encourage airlines to purchase assets which are less environmentally damaging?

An economic instrument, such as tradable pollution permits, leaves the way in which aviation reduces its environmental damage up to the business. Unlike some regulatory measures there are no BAT or BATNEEC technologies prescribed, and none of the resulting damage to incentives to innovate.

If an airline has to bid for extra CO_2 permits in order to expand its flying capacity then it will have an incentive to purchase assets which are less environmentally damaging. At least it will have the incentive to buy CO_2-efficient aircraft. If there is in addition a European charge on aviation NO_x emissions it will have an additional incentive to buy NO_x -efficient aircraft that it wishes to fly within or from EU airspace.

If emissions are calculated from emissions indices rather than measured directly then there will be no additional incentive for the airlines to save CO_2 permits and money by operational improvements. These could involve its own decisions about load factors, flight paths, or involve the airline putting pressure on air traffic controllers to improve routing and on airports to improve landing and takeoff procedures. It would be important for any economic instrument to also face ATC and airports with financial incentives to achieve these operational improvements.

This last point emphasises the importance of good design of the economic instrument. The charge or permit must apply to the emission or damage in order for incentives to be effective. This is why the APD is completely ineffective as an economic instrument, and why a fuel tax would not be effective at reducing NO_x emissions, which are not directly related to fuel-burn.

3.1.5 What other measures might be effective at tackling climate change?

Information or disclosure-based measures should be considered as additional policy instruments. Consumers and investors are increasingly influential drivers of corporate environmental and social responsibility.

The Carbon Disclosure Project is an investor initiative requesting disclosure of carbon emissions and management plans by the world's top-500 corporations. The scheme is backed by a group of institutional investors and fund managers with over $4 trillion of assets (and voting rights). The Investor Group on Climate Change is another investor initiative, led by the Universities Superannuation Scheme, to engage with the companies in which they are invested to improve any emissions performance that engages long-term investment performance. These and other investor initiatives could be assisted by measures to increase corporate disclosure in, for instance, European Stock Exchange listings.

Consumer choice could be assisted by a labelling scheme, for instance disclosing the 'greenhouse

gasiness' of flights, along the lines of white goods labelling which the airlines could use to their advantage. In addition carbon-offset schemes could be introduced giving passengers the choice of purchasing verified carbon-offsets to the climate impact of their flight.

3.1.6 Should domestic, or EU-level, measures be pursued in the short-term ahead of long-term international agreements?

With the second Kyoto commitment period a decade away there is certainly the case for considering domestic or EU-level measures in the interim. The caveat being that the environmental effectiveness of domestic or regional restrictions on CO_2 will be low. But there would be virtue in adopting a leadership position and likely learning benefits ahead of an international agreement.

An EU-level measure should certainly be considered since this would eliminate any competitive distortions within Europe.

The EU emissions trading scheme which comes into force in 2005 would be an ideal way to prepare the aviation industry for international trading under the second Kyoto commitment period. However, the EU scheme is focused on upstream power generators and other fixed point emitters and not downstream energy users such as the transport industry. It is not clear at present how and when the aviation industry could participate in the EU emissions trading scheme.

As a result the proposal for an EU-level charge on aviation emissions should be given serious consideration. It would an ideal economic instrument to address the regional NO_x impacts discussed above. It could also be used as a way of giving a financial incentive for aviation to manage its CO_2 emissions, ahead of the Kyoto second commitment period.

3.2 Local air quality and noise

3.2.1 What economic instruments could be used to tackle impacts on local air quality and noise?

The use of economic instruments for local environmental impacts, such as noise and air pollution, can be much more effective than those for global impacts such as climate change, where international agreement is required.

There are a number that should be considered, of varying suitability for the task in hand:

- Creating markets in noise and local air quality by setting caps or 'budgets' on airport noise and LTO emissions
- Introducing charges or taxes on noise and local air pollution.

The key for all local instruments is that they should be well designed to create the right incentives for supply-side, as well as demand effects.

Since the estimates of external costs presented in the discussion paper are relatively low the impact on demand (which we know has a strong income elasticity and therefore underlying growth) will be modest.

While technology improvements may be uncertain and a long way off (though that is no reason not to create a financial incentive with an economic instrument now) there are likely to be significant operational improvements. Economic instruments would create the financial incentives for these improvements to occur.

3.2.2. Should economic instruments vary by emissions, or noise, or both?

Both. One of the key points we would like to emphasise is that an effective economic instrument must be designed well. This means that it must be a charge or permit on the separate pollutant and not a proxy such as fuel, which will blunt its incentive effects.

There could be a single environmental charge, along the lines proposed by CE (2002) in its work for the EC or Pearce and Pearce (2000), but the separate emission components must be clearly identified to those paying. The importance of good design is particularly important given the relatively low level of external cost for noise and local air pollution quoted in the consultation paper.

Such a charge level levied as a fuel charge or APD would be so small as to have a mimimal impact on demand, which is why APD (a tax on passenger numbers) is so ineffective as an incentive to reduce environmental impacts.

3.2.3 On which type of emission would it make most sense to based economic instruments?

It would be sensible to use economic instruments for those emissions which have a significant impact and are not closely correlated to each other: noise, NO_X and PM10.

3.2.4 Should economic instruments be varied by aircraft or by airport location?

Both.

Economic instruments should certainly vary by location. The population exposed to noise and air pollution around airports varies considerably from airport to airport. There would be environmental as well as regional development benefits to creating a financial incentive for airlines to re-route at the margin to regional airports surrounded by fewer people.

There are also strong reasons for wanting to vary the level of the economic instrument by aircraft. One of the major sources of environmental improvement may come from a better fleet mix towards cleaner and quieter aircraft. Accelerated replacement and a better mix would be encouraged by an economic instrument that varied by aircraft type.

Pearce and Pearce (2000) provide a straight-forward methodology for calculating a charge which varies both by aircraft type and location. CE (2002) provide another.

3.2.5 Is there a role for economic instruments to help meet mandatory EU limits for NO_2 and PM10?

Possibly. Given the need to be certain about the level of NO_2 and PM10 emissions a charge or tax would not be suitable, but a cap and trade permit system might be. However, since many of these emissions are thought to come from surface transport as well as aircraft it may just be too complex to design an economic instrument. This problem could be addressed by allocating allowance or the charge for surface transport on airports, since they have a degree of control over surface transport options and therefore emissions.

The low estimates of damage cost from a basket of four local air quality pollutants (NO_x, PM10, SO_2 and HC) in the CE (2002) study of around 50 pence per passenger coupled with the complexity notes above suggests the costs of designing and implementing such an economic instruments might exceed the benefits.

A regulatory instrument may be best to enforce these mandatory EU limits.

3.2.6 Should economic instruments be based on estimates of external costs?

Only if a charge is the best instrument. In fact a cap and trade or baseline and credit tradable permit scheme is recommended for most of aviation's emissions. The price of permits will depend on the cost of preventing further emissions and be an outcome of the newly created market, rather than any estimate of their damage cost.

However, we assume the question is getting at the fact that the estimates of external cost quoted in the consultation paper are rather low. 36 to 40 pence on a ticket is not going to have much impact on aircraft noise. Neither will 50 pence on a ticket for local air pollution.

One point to make about these estimates is that stated preference valuation techniques (such as those being undertaken by the DfT at the moment) usually reveal larger valuations than the hedonic relative house price techniques used in the quoted studies. Moreover, the CE (2002) study shows a valuation for noise around Schipol an order of magnitude higher than the figures quoted in the consultation paper.

This argues for good design in the economic instrument so that the charge is on the noise or emission to create the incentive for supply-side improvements. It also suggests that a cap and trade permit scheme would be much more effective at hitting any environmental target.