

AVIATION IN A LOW-CARBON EU: HOW THE AVIATION EMISSIONS TRADING SCHEME PROPOSAL MUST BE IMPROVED



**Friends of
the Earth**

A Friends of the Earth summary of research by
The Tyndall Centre for Climate Change Research

THIS REPORT

This report summarises the conclusions of new research by the respected Tyndall Centre for Climate Change Research at the University of Manchester commissioned by Friends of the Earth England, Wales and Northern Ireland.

The research examined the role of the European Union's aviation sector within a low-carbon (450ppm CO₂) future, and the implications of such a future for carbon prices and aviation in the EU Emissions Trading Scheme (ETS).

The research incorporates the latest climate science and revisits

carbon budgets that have a reasonable probability of staying within a 2°C temperature increase on pre-industrial levels. It assumes growth rates and operational and technology improvements in aviation consistent with stabilising CO₂ concentrations at 450ppm.

On the basis of this research Friends of the Earth recommends a number of improvements to the proposal to include aviation in the ETS.

The full research on which this summary is based is available at http://www.foe.co.uk/resource/reports/aviation_tyndall_07_main.pdf

CO₂ equivalent (eq) gives the combined carbon dioxide concentration equivalent of all greenhouse gases; it is always higher than a given CO₂ concentration.

This is the second piece of research on climate change and aviation Friends of the Earth has commissioned from The Tyndall Centre (see Growth Scenarios for UK and EU Aviation, 2005).

CONTACT DETAILS

Simon Bowens
Transport Campaign
Friends of the Earth
74 Kirkgate
Leeds
LS2 7DJ
United Kingdom

Tel: 00 44 (0)113 242 8151
Fax: 00 44 (0)113 242 8154
E mail: Simon.Bowens@foe.co.uk

FRIENDS OF THE EARTH'S CONCLUSIONS

For aviation to play its part in a low-carbon EU, it must achieve efficiency gains much faster than in the past. This will only happen if the price of carbon is high enough. Current proposals to include aviation in the ETS will not deliver this high price for carbon and as a result, Friends of the Earth believes, would be selling

the climate short. The EU Council and Parliament must strengthen the aviation ETS significantly, introduce it in 2010 to cover all flights and initiate additional economic, technology and operational changes to curb the growth in aviation emissions as soon as possible.

RESEARCH FINDINGS

Why the aviation ETS proposal is inadequate and how it must be improved

The Tyndall research investigated the potential for low-carbon aviation emission pathways and how the EU ETS could facilitate them. It found that:

- Current and envisaged CO₂ prices of below €50/tonne will have virtually no impact on demand for flights – and hence emissions.
- Even a much higher carbon price of €300 per tonne would result in only a modest increase in ticket prices and therefore a modest reduction in demand and emissions growth.
- Efficiency improvements in aviation – for example, a step change in aircraft fuel efficiency – must happen much more quickly than in the past.

The Tyndall research concludes that in order for aviation to be part of a 450ppm CO₂ future, the aviation ETS proposal must be made much more effective. Specifically:

- Aviation should be included in the ETS as soon as possible, preferably in 2010 or before.
- A 1990 baseline measurement of CO₂ aviation emissions (or 50 per cent of 2005/06 levels, which is approximately equivalent) must be adopted.
- In order to provide maximum economic incentive for airlines to improve their technology and operations it is recommended that the ETS:
 - Allocates all carbon permits by auction.
 - Produces a carbon price an order of magnitude higher than currently envisaged.

Tyndall also finds:

- Aviation emissions are likely to grow substantially before the sector is included in the ETS. Immediate policies are therefore necessary to substantially constrain passenger-kilometre growth.
- The Aviation ETS will require additional and substantial flanking instruments (see page 7).

Friends of the Earth

Friends of the Earth EWN has a track record of working with policy makers to tackle the threat of climate change. Our Big Ask campaign has led to the UK Government proposing the world's first climate change law. When this comes into effect in 2008 it will set legally-binding carbon dioxide reduction targets. Aviation emissions from the UK's share of international flights are excluded from the draft law, making action at the EU level vital.

BACKGROUND

Aviation and climate change

Climate change is the most pressing environmental issue facing humanity. In 2007, the Intergovernmental Panel on Climate Change (IPCC) concluded that there is greater than 90 per cent certainty that anthropogenic carbon dioxide emissions are responsible for the warming evident throughout the 20th century.

The IPCC said the consequences for humanity of unchecked climate change will be devastating.

In 2006 Sir Nicholas Stern's report (*Stern Review: The Economics of Climate Change*) for the UK Government found that the economic costs of tackling climate change would be far exceeded by the economic damage associated with not acting.

Aviation is the fastest growing source of emissions in the European Union. Emissions from the sector have doubled since 1990. In 2005 The Tyndall Centre for Climate Change Research at the University of Manchester examined EU aviation growth trends. They found that if current rates of fuel efficiency improvements continue, aviation alone could account for 79 per cent of an EU budget that would be required to offer a reasonable chance of avoiding a global average temperature rise of more than 2°C above pre-industrial levels. That carbon dioxide budget was set at 450ppm for 2050.

Emissions trading – the proposed solution

The EC proposal to include aviation emissions in the EU Emissions Trading Scheme (ETS) from 2011/12

is the first serious policy proposal to address the growth in aviation emissions. The EU ETS started in 2005 and covers approximately 45 per cent of EU emissions. Aviation is likely to be brought into the ETS towards the end of phase 2, which will run from January 2008 until December 2012. The European Commission is carrying out a review of the ETS and this will influence the design of phase 3, which starts in January 2013.

The EC published a legislative proposal in December 2006 to include aviation in the EU ETS. The proposal is progressing through the co-decision process (in which the Council of Europe and the European Parliament have joint powers to decide) and a directive should be in place in 2008.

550ppm CO₂ equivalent (eq) (~500ppm CO₂). Recent research points to a more ambitious target of around 450ppm CO₂eq (~400ppm CO₂) being necessary to avoid a greater than 50 per cent chance of exceeding a 2°C increase.

However, as CO₂ concentrations were already 380ppm in 2005, and both EU and global emissions are still increasing, it will be extremely difficult to achieve a 400ppm CO₂ target. Therefore, for this study

a 450ppm CO₂ target has been chosen.

Using global figures from the IPCC's latest report Tyndall estimated an EU carbon budget of between 44 and 58 Gigatonnes of carbon (GtC) under a contraction and convergence policy regime between 1990 and 2100. Even if EU emissions stabilise at current levels the entire EU budget to 2050 could be used up as soon as 2030 — with no carbon dioxide emissions permitted after that date. The later substantial emissions reductions begin, the more drastic they will have to be.

Aviation growth trends and technology

EU aviation emissions doubled between 1990 and 2006. Aviation is the fastest growing EU source. EU passenger numbers are growing at 6-7 per cent per annum (pa) while emissions are growing by over 6 per cent pa. Improved aircraft technology is slowly cutting emissions per passenger kilometre but the rapid growth in flights is completely outstripping these improvements. Before the planned full coverage of the aviation ETS even starts in 2012, aviation emissions from EU departing flights are likely to increase a further 25-60 per cent from 2005 levels.

The Tyndall research examined a number of possible scenarios for passenger growth and technological and operational improvements for the periods 2012-2017, 2018-2030 and 2030-2050.

The Tyndall research assumed an EU aviation ETS start date of 2012 covering all arrivals and departures. The EC proposal also covers intra-EU flights for one year only from

Contraction and convergence

Contraction and convergence (C&C) is increasingly seen as the main policy route for bringing emissions from all countries to an equal level per capita in time to avoid dangerous climate change. It requires substantial cuts from industrialised countries while allowing industrialising countries to increase their emissions. Friends of the Earth believes the C&C model underplays the reductions industrialised countries should be responsible for as it neglects their very high historical emissions. EU climate policy is founded on the UN principle of "shared but differential responsibility". This recognises that all countries have a joint responsibility to ensure carbon concentrations are stabilised but that their contributions to achieving the goal will differ.

2011 as an interim step but this will only cover approximately 21 per cent of aviation emissions from all EU arrivals and departures for that one year. It has therefore been omitted from this study.

The Tyndall research concludes: "These scenarios illustrate what viable emissions pathways may look like, provided that radical policies are introduced to constrain emissions growth as a matter of urgency. Currently both the political and business communities stubbornly refuse to engage with either the quantitative scale of current and future emissions or the necessary timescale for action."

RESEARCH OUTLINE

What Tyndall did and what they found

Tyndall's research looked at recent aviation growth trends and developed suites of growth scenarios to show how emissions might change by 2050 depending on:

- various rates of growth in passenger-kilometres
- changes in technology and fuels; and
- operational improvements.

The research then examined the potential implications of the proposal to include aviation in the EU ETS. It found that:

- Emissions from aviation are likely to grow significantly before the aviation ETS starts.

- The current aviation ETS proposal will barely affect growth.
- Only if the price of carbon rises substantially will the ETS constrain aviation emission growth as necessary.

The Tyndall research concluded:

"We continue to delude ourselves if our aspirations for a 2°C future reside substantially in the current framing of the EU ETS and the low-carbon technologies and practices that may incentivise. Whilst technology undoubtedly has an important medium- and long-term role to play in reducing the carbon-intensity of aviation, it is negligent and irresponsible not to tackle the sector's short-term emissions

growth. The urgency with which the industry must make the transition to a low-carbon pathway leaves no option but to instigate a radical and immediate programme of demand management."

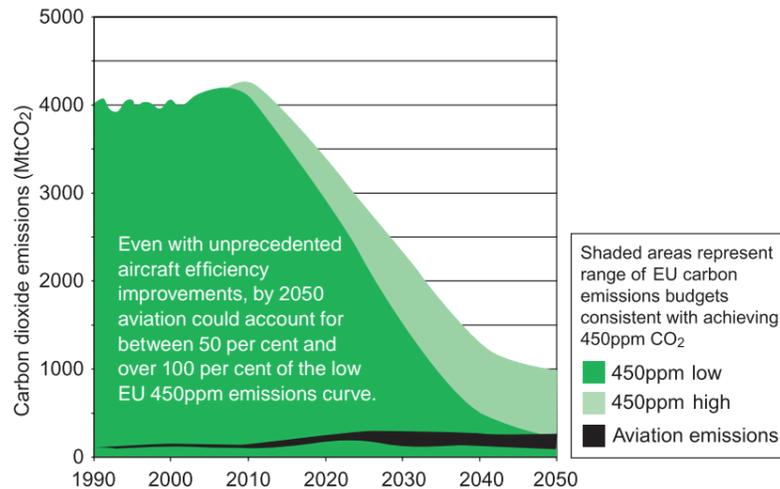
EU climate change policy

In 2007 the EU adopted a target of cutting emissions by 30 per cent by 2020 (assuming international action is forthcoming). It also recognises the need for developed countries to cut their emissions by 60-80 per cent by 2050. The aspiration is for the EU to play its part in limiting global temperature rises to 2°C above pre-industrial levels by stabilising greenhouse gas concentrations at well below

Carbon concentration overshoots

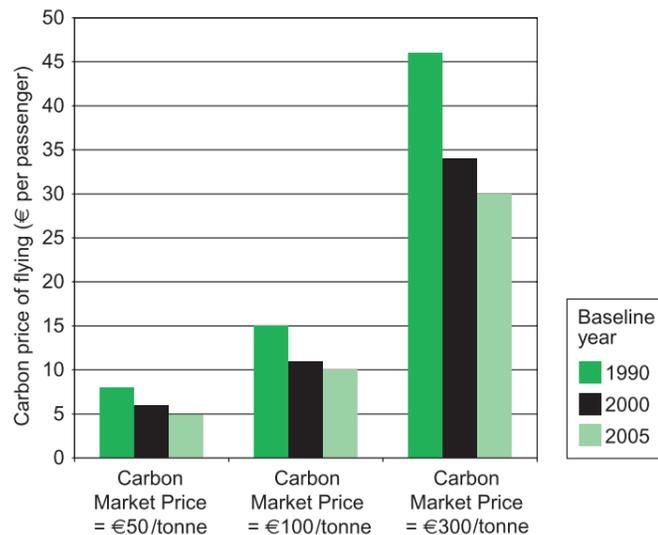
Tyndall chose what they regard as a realistic, if less than optimum, 450ppm CO₂ target because the atmosphere is already at 380ppm CO₂ (around 425-450ppm CO₂ eq). Friends of the Earth's view is that "peak and decline" scenarios rather than just "stabilisation" targets for global concentrations should be considered, so that whatever peak concentration occurs in the future, we continue to cut emissions sufficiently to reduce atmospheric concentrations in the longer term. Knowledge of this complex area of climate science is limited and resource constraints prevented further exploration. Yet we can be sure that if higher concentrations are reached in the shorter term, the policy responses to bring the concentration down will need to be stronger and more constraining than those identified in the conclusions of this report.

How much of the EU carbon dioxide budget could aviation account for?



Range of EU carbon dioxide emissions budgets compared with range of EU aviation emissions scenarios. The aviation emissions scenarios illustrate a range of possible growth and efficiency improvement rates. They are based on United Nations Framework Convention on Climate Change (UNFCCC) data so account for 50 per cent of international flights to and from the EU, and all domestic and intra-EU flights.

How will the choice of baseline year affect the cost of flying?



Illustrative 2016 carbon price per passenger for a typical short-haul flight (London-Barcelona) given a range of carbon prices and EU aviation ETS baselines. Assumes cost of carbon is added to ticket prices, in practice, airlines may choose to absorb some of this additional cost.

Growth and technology improvement rates modelled are middle of the range considered by Tyndall (termed "highest violet" scenario in full report).

Radiative forcing uplift:

Non-CO₂ emissions from aircraft have additional global warming impacts. A so-called uplift multiplier of around 2 is often used to represent these but this excludes the additional forcing from cirrus clouds. Because radiative forcing is a measure of historical emissions it may suggest a different policy response to a measure that takes into account likely future emissions; therefore a CO₂ uplift factor has not been applied to the scenarios in this report. That is not to say that these emissions are not important and do not demand urgent attention: Friends of the Earth has included the introduction of interim policy measures in our recommendations in this summary.

Technology improvements:

The Tyndall research assumes in all scenarios that efficiency savings from new technology and cleaner fuels will be much faster in the medium to long term than is the case now. It must be emphasised that these rates of improvement have never been achieved by the aviation industry in the past and that these are illustrations of what might be possible in an EU genuinely committed to a 450ppm future. They will require a step change in research funding, policies to force change and airline-wide fleet take-up.

FRIENDS OF THE EARTH'S RECOMMENDATIONS

Radical measures are needed to cut carbon dioxide emissions across all sectors including aviation, if the EU is to meet its stated aim of playing its part in avoiding a global temperature increase of more than 2°C over pre-industrial levels.

Carbon dioxide concentrations must be stabilised at 450ppm CO₂ or less: we are already at 380ppm CO₂. The EU is rapidly using up its carbon budget. Further delay will require even more drastic cuts later. Aviation emissions are rising rapidly at 6-7 per cent per year and must be constrained if the 450ppm target is to be met.

Since the current aviation ETS proposal will not produce the carbon price necessary to limit growth in aviation emissions, it must be strengthened significantly.

Price signals from the current aviation ETS proposal will prove too weak to bring about the growth and efficiency changes considered in the Tyndall scenarios. The following changes to the aviation ETS are recommended and amendments to the proposal that reflect them should be supported:

- The aviation ETS must be introduced as soon as possible to cover all arrivals and departures from EU airports, preferably in

2010 as recommended by a number of MEPs.

- A more ambitious emissions cap in line with the Kyoto Protocol, starting with a 1990 baseline (or 50 per cent of 2005/06 aviation emissions which is approximately the same).
- 100 per cent auctioning of carbon allowances in line with the polluter pays principle. Auctioning is the most economically efficient allocation method, which will avoid the likelihood of the industry benefiting from windfall profits. Paying for the right to pollute will provide airlines with an additional incentive to improve their efficiency.
- In the absence of dedicated policies to address non-CO₂ impacts from radiative forcing, an interim CO₂ multiplier of at least 2 must be introduced.
- In the absence of a dedicated aviation-only ETS, and to help to ensure that the aviation industry makes the necessary efficiency gains, it must have restricted access to carbon permits from other sectors. This access should be conditional on the aviation industry meeting at least its stated target of a 3.5 per cent annual per passenger-kilometre efficiency improvement from combined technology and operational improvements.
- Access to Kyoto mechanisms that allow the aviation sector to buy

credits from projects in developing countries must be limited to ensure significant emissions cuts in the EU and to provide incentives to investment in green EU technologies.

Even a strengthened ETS must be complemented with other measures.

The EU ETS is only a first step in addressing the climate impacts of aviation. Other measures are required as recommended by the European Parliament in its July 2006 resolution *Reducing the climate change impact of aviation*:

- Kerosene tax on domestic flights and where there is agreement on flights between two member states.
- Ending the VAT exemption on air tickets.
- Improvements to operational practices including air traffic control, load factors and ground handling procedures to reduce fuel burn.
- Much faster improvements in aircraft efficiency.
- A firm proposal for mitigating contrail formation and cirrus clouds through more research to improve air traffic control.
- A presumption against new EU airport infrastructure in the light of the need to restrain the growth of passenger-kilometres.

Aviation is the fastest growing source of climate-changing emissions in the European Union.

New research commissioned by Friends of the Earth from the respected Tyndall Centre for Climate Change Research at the University of Manchester examines the role of the aviation sector in meeting a low-carbon future and helping avert dangerous climate change.

This summary outlines the research findings. It concludes that the current proposal to include aviation emissions in the EU Emissions Trading Scheme falls far short of tackling aviation's growing contribution to dangerous climate change. The EU Council and Parliament must substantially strengthen the ETS, introduce it in 2010 to cover all flights and take additional steps to curb the growth in aviation emissions as soon as possible.

Friends of the Earth is:

- the most extensive environmental network in the world, with around one million supporters across five continents, and more than 70 national organisations worldwide

Friends of the Earth England, Wales and Northern Ireland is:

- the UK's most influential national environmental campaigning organisation
- a unique network of campaigning local groups, working in more than 200 communities throughout England, Wales and Northern Ireland
- dependent on individuals for over 90 per cent of its income



**Friends of
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Making life better for people by inspiring solutions to environmental problems

Friends of the Earth, England Wales and Northern Ireland
26-28 Underwood Street, London N1 7JQ, United Kingdom
Tel 020 7490 1555 Fax 020 7490 0881 Website www.foe.co.uk
Trust company number 1533942, charity number 281681