

<b>Institution: University of Manchester</b>
<b>Unit of Assessment: UoA12b Mechanical, Aerospace and Manufacturing Engineering</b>
<b>Title of case study:</b> Aviation, Policy and Climate Change
<p><b>1. Summary of the impact</b></p> <p>Tyndall-Manchester's research into UK aviation emissions was instrumental in overturning the prevailing orthodoxy, which regarded aviation as an unproblematic, small source of greenhouse gas emissions. Identifying drivers of growth and key characteristics of aviation's emerging emissions trajectory demonstrated that aviation could soon dominate national emissions if left unchecked. Tyndall-Manchester's research contributed to aviation's inclusion in sub-national, national and international climate policies. Specifically, it was highly influential in debates leading to including international aviation in the UK's 2050 emissions target; bringing aviation into the European Union's Emission Trading System. It continues to inform debate around future UK airport expansion, and is used to guide campaigning objectives of major environmental NGOs and lobby groups.</p>
<p><b>2. Underpinning research</b></p> <p>Key individuals in the aviation research:</p> <p>Alice Bows (Research Associate '03-'08, Lecturer '08, Senior Lecturer '11, Reader '13)        Kevin Anderson (Tyndall-Manchester Director '02 to present, Tyndall Director '08-10)        Sarah Mander (Research Associate '03-'08, Research Fellow '08 to 2010 on this topic)        Paul Upham (2004-11; Research Associate '04, Research Fellow '08 – now University of Leeds)        Ruth Wood (Research Associate '08-'10 on this topic)</p> <p><u>Analysing the potential future development of emissions from the aviation industry (2002-2007)</u></p> <p>The aim of the research was to understand implications of the growing aviation sector to situate it within the broader energy system and climate change policy. While aviation was widely taken to be an insignificant contributor to global warming, Tyndall-Manchester's in-depth analysis of the UK's emissions inventory and historical trends in aviation technology, operations and activity, revealed the danger of overlooking emissions from this growing sector. Coupling quantitative modelling with qualitative interviews and workshops with industry and policy stakeholders, likely drivers of current and future emissions growth were identified. Key findings included: (1) Existing technology developments and improvements in energy efficiency will take too long to deliver cuts to CO<sub>2</sub> within the timeframe necessary to meeting the UK's climate commitments. (2) That rates of passenger/airport growth anticipated by the industry and supported by transport and planning policy bring the sector into stark conflict with UK and EU climate change objectives. (3) That only a comprehensive measure to manage demand could enable the UK's aviation sector to remain commensurate with the UK's own emissions targets [1, 2, 5].</p> <p><u>Placing aviation analysis in the context of the full energy system (2004-2008)</u></p> <p>A whole economy energy system model was developed which was the first of its kind to include the emissions from international aviation and shipping. By incorporating the aviation scenarios developed into a quantitative analysis of the decarbonisation efforts required of the rest of the economy, Tyndall-Manchester analysis prompted the startling conclusion that, left unchecked, aviation could within a matter of decades come to account for the large majority, if not <i>all</i>, of the future CO<sub>2</sub> emissions generated in the UK and EU [1,3].</p> <p><u>Assessing aviation within the EU's Emissions Trading Scheme (EU ETS) (2006-2008)</u></p> <p>As debate around the inclusion of aviation within the EU ETS intensified, Tyndall-Manchester assessed the economic and emissions implications of including aviation within the EU ETS, finding only limited emissions reductions were likely to flow from a moderate carbon price coupled with a favoured 'partial representation' of the aviation industry within the scheme [4, 5].</p> <p><u>Emission apportionment and sub-global policy interventions (2008-2010)</u></p> <p>An investigation of the issue of policy influence and responsibility for the production of aviation emissions yielded a novel method for apportioning aviation emissions to sub-national regions,</p>

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demonstrating the significance of international aviation emissions at the local level, for use within sub-national climate policy mechanisms [6].

**3. References to the research**

Explicit policy, media and stakeholder orientation, in the terms of the Tyndall Centre grant and exemplified by this project, means that technical reports and discursive impacts preceded publication in the academic literature.

**Three key research outputs**

1. Bows, A., and Anderson K., 2007, Policy clash: Can projected aviation growth be reconciled with the UK Government's 60% carbon reduction target? *Transport Policy*, **14** (2), 103-110. Article published in the official journal of the World Conference on Transport Research Society Article cited 62 times Google Scholar. [DOI: 10.1016/j.tranpol.2006.10.002](https://doi.org/10.1016/j.tranpol.2006.10.002)
2. Bows, A., Upham, P. and Anderson, K., 2005 *Growth Scenarios for EU & UK Aviation: contradictions with climate policy*, report for Friends of the Earth Trust Ltd. Tyndall Centre for Climate Change Research (North), The University of Manchester, UK. First policy-relevant academic publication to question the on-going 'predict and provide' approach to aviation expansion, given climate change objectives. Research groups in Germany and Australia copied the approach in application to their own nations. Cited 47 times in Google Scholar.
3. Anderson, K., Bows, A., and Mander, S., 2008, From long-term targets to cumulative emission pathways; reframing the climate policy debate, *Energy Policy*, **36**, pp. 3714-3722 Analysis of emissions accounting and the importance of including aviation in national inventories published in *Energy Policy*, The International Journal of the Political, Economic, Planning, Environmental and Social Aspects of Energy. Cited 51 times in Google Scholar. [DOI: 10.1016/j.enpol.2008.07.003](https://doi.org/10.1016/j.enpol.2008.07.003)

**Three supplementary research outputs**

4. Bows, A., Anderson, K., and Footitt, A., 2009 Aviation in a Low Carbon EU, in *Climate Change & Aviation: Issues, Challenges & Solutions*, Eds: Stefan Gossling and Paul Upham. This chapter and its sister policy report reflected research exploring the implications of including aviation within the EU's Emissions Trading Scheme. Cited 10 times in Google Scholar.
5. Bows, A., Anderson, K., and Peeters, P., 2009, Air Transport, Climate Change and Tourism, *Tourism and Hospitality Planning & Development*, **6** (1), 7-20 International collaboration at the invitation of aviation 'authority' Professor Paul Peeters (Breda University of Applied Sciences in Netherlands). Presented by Bows and Anderson at a high level policy / stakeholder meeting held at UNESCO Paris. Cited 29 times in Google Scholar. [DOI: 10.1080/14790530902847012](https://doi.org/10.1080/14790530902847012)
6. Wood, F.R., Bows, A., and Anderson, K., 2010, *Apportioning aviation CO2 emissions to regional administrations for monitoring and target setting*, *Transport Policy*, **17**, (4), 206-215 Published in the official journal of the World Conference on Transport Research Society, presenting a new method for apportioning international aviation emissions to regions. This paper won an award at the European Transport Conference in 2010. Cited 7 times in Google Scholar. [DOI: 10.1016/j.tranpol.2010.01.010](https://doi.org/10.1016/j.tranpol.2010.01.010)

**4. Details of the impact****Context**

Fossil fuel use and greenhouse gas emissions are integral to modern economies and societies. Climate policy is a relatively new area of governance. Historically, international aviation has been overlooked at the national level and widely regarded as a trivial source of greenhouse gas emissions. For instance, the UK Aviation White Paper (2003) paid little attention to emissions, and aviation was excluded from the emissions reduction targets of international climate change

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agreements such as the UNFCCC Kyoto Protocol.

**Summary of pathway to impact**

The impact is founded on Tyndall Centre research funded by EPSRC/NERC/ESRC, from 2002 to 2010: researchers developed comprehensive approaches to decarbonisation, from national and international energy systems and policy frameworks through to personal energy behaviour.

**Tyndall-Manchester's research had demonstrable impact in four key policy areas:****1) Inclusion of aviation in the UK Climate Change Act & Climate Change (Scotland) Act.**

The research conducted within Tyndall Manchester has significantly contributed to climate policies in the UK and EU through formal evidence presented by its researchers to policymakers and statutory public bodies, including the Environmental Audit Committee [A] and HM Treasury aviation working group. Evidence from the research was also presented by invitation to the Scottish Parliament during their consultation on the Climate Change (Scotland) Bill [B]. These representations were highly influential in securing the inclusion of aviation emissions in the UK Climate Change Act's 2050 emissions reduction target as evidenced by statements from David Milliband MP, former Secretary of State for Environment, Food and Rural Affairs (2006–7), and author of Climate Change Bill [D]. Additional corroboration is provided by statements from Tim Yeo MP [E], Chair of House of Commons Energy and Climate Change Select Committee, Caroline Lucas MP, Member of the Environmental Audit Committee and former Member of the European Parliament and Colin Challen, former Member of Parliament and Member of House of Commons Environmental Audit Select Committee. Tyndall researchers are on-going participants in the Committee on Climate Change and the Civil Aviation Authority's aviation stakeholder consultations – with the Committee on Climate Change subsequently recommending inclusion of aviation within the UK's legally binding emission reduction target for 2050 [F].

**2) Inclusion of aviation in the EU ETS**

Tyndall-Manchester research contributed to the inclusion of aviation in the EU Emissions Trading Scheme, the EU's flagship mechanism for curbing the continent's emissions [G]. Further corroboration is provided by statements from Mike Childs, Head of Policy, Research and Science at Friends of the Earth and Caroline Lucas, MP. Debate regarding the inclusion of aviation within the EU's emissions trading system and in the UK's own emission budgets intensified following the publication of early Tyndall-Manchester research [1–5 above]. Tyndall-Manchester researchers were active participants in this debate, with the public record containing numerous instances of evidence provided by Tyndall-Manchester from 2005 onwards [H]. Whereas the decision on including aviation in the UK's climate change *budgets* has yet to be taken, since Jan 2012 all commercial airlines operating solely within the EU have to buy and surrender emissions permits. Furthermore, the EU policy surprised many in intending to incorporate more than the EU 50% 'fair share' of emissions.

**3) Cancellation / deferment of airport expansion at Heathrow and Stansted**

Tyndall-Manchester's aviation research has generated considerable impact indirectly through raising the public profile of the potential damage aviation does to the environment, and the importance of passenger or airport growth as a facilitator of such damage. This profile raising has in large part been through the research findings being taken up by high-profile campaigning groups in lobbying government to halt UK airport expansion on the basis of climate change concerns [G, I]. Groups including Friends of the Earth (corroborating statement available [L]), WWF, Plane Stupid and Climate Camp used Tyndall-Manchester aviation work as the scientific underpinning of a number of their campaign tactics [C], for which there is also photographic evidence. For instance, as the BAA chairman and chief executive were preparing to give evidence on airport problems, protesters chanted "no third runway at Heathrow" and handed out copies of a Tyndall report [2, above] to MPs and members of the public. Plane Stupid also used the research in their campaign against airport expansion on the grounds of damage to the climate – activists strapped copies of

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Tyndall research papers and reports to their bodies and created a banner, “Armed only with peer reviewed science”. The stunt was reported widely in the media, and the research report presented to aviation sector representatives on Newsnight. Dr Bows was later called to give formal evidence at trial for the defence of airport expansion protesters.

Such exposure unquestionably heightened the public profile of Tyndall-Manchester’s aviation research, prompting stakeholders such as Airbus, Easyjet and the Civil Aviation Authority to contact Tyndall-Manchester, wishing to engage (see statement from the Secretary General of the European Low Fares Airline Association [G]). This kept Tyndall-Manchester’s work at the forefront of the airport expansion debate. The impacts of the Tyndall contribution to this debate and public profile raising finally manifest in the formal withdrawal by BAA of its planning application for a second Stansted runway on 24 May 2010 and in the coalition government abolishing the policy to develop a third runway at Heathrow. This latter retraction followed the ruling by Lord Justice Carnwarth that the planned expansion did not properly take into account the social costs of increased carbon emissions from aviation expansion [I].

#### 4) Local authority emissions accounting

Manchester City Council’s climate change strategy adopted a new method for emissions accounting [J] developed during Tyndall-Manchester’s aviation work accounting for aviation emissions in 2009 [6, above]. Tyndall-Manchester work informed the debate around the expansion of individual regional airports, which in the Northwest have either been overturned or delayed (corroborated by a confidential report from the Association of Greater Manchester Authorities [K]).

#### 5. Sources to corroborate the impact (indicative maximum of 10 references)

- A. Invited to give oral evidence to the Environmental Audit Committee on the Committee on Climate Change’s report on cumulative budgets and the inclusion of all sectors. November 2008 (<http://www.publications.parliament.uk/pa/cm200708/cmselect/cmenvaud/uc1117-iii/uc111702.htm>) and June 2009 (<http://www.parliament.the-stationery-office.co.uk/pa/cm200910/cmselect/cmenvaud/228/228ii.pdf>)
- B. Invited to give oral evidence on the Climate Change (Scotland) Bill, Scottish Parliament Transport, Infrastructure & Climate Change Committee, Feb 2009 ([www.scottish.parliament.uk/S3\\_TransportInfrastructureandClimateChangeCommittee/Reports/trr09-02.pdf](http://www.scottish.parliament.uk/S3_TransportInfrastructureandClimateChangeCommittee/Reports/trr09-02.pdf))
- C. Aviation and Climate Change, House of Commons Research Paper 08/08, January 2008, <http://www.parliament.uk/briefing-papers/RP08-08.pdf>
- D. Statement of corroboration from: David Miliband MP, former Secretary of State for Environment, Food and Rural Affairs (2006–7), author of Climate Change Bill.
- E. Statement of corroboration from: Tim Yeo MP, chair of House of Commons Energy and Climate Change Select Committee.
- F. Statement of corroboration from: Neil Golborne (May 2013), team leader of the transport and agriculture team at the Committee on Climate Change (CCC).
- G. Statement of corroboration from: Secretary General, European Low Fares Airline Association
- H. Hansard record of the discussion of including aviation in the EU ETS, 8 Mar 2007: Column 421, <http://www.publications.parliament.uk/pa/ld200607/ldhansrd/text/70308-0015.htm>
- I. Hayden, Anders (2011). *The UK’s Decision to Stop Heathrow Airport Expansion: Sufficiency, Ecology Modernization and Core Political Imperatives*, <http://www.cpsa-acsp.ca/papers-2011/Hayden.pdf>.
- J. Manchester City Council climate change action plan (2009) ‘A Certain Future’, <http://www.manchesterclimate.com/actionplan.pdf>
- K. Confidential report from: Director of Environment for the Association of GM Authorities
- L. Statement of corroboration from: Head of Science, Policy & Research, Friends of the Earth