



# Climate change and a new runway

By Cait Hewitt

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## Abstract

Climate change poses an urgent global threat and all countries have now committed to rapid decarbonisation in order to limit global temperature increases to well below 2 degrees. Aviation is a growing problem in this context: passenger demand is set to increase, but aircraft are likely to remain almost completely dependent on fossil fuels for as far ahead as anyone can see and the gains to be had from technological improvements are becoming ever more marginal. While progress could be made this year on a global measure for offsetting some emissions from international aviation, current plans indicate that this will come nowhere near to meeting the scale of the challenge in a UK context. The Airports Commission has argued that it was not within its remit to set out what climate change policy would be needed alongside a new runway, pushing the challenge back to Government. In fact, there is no realistic way to deliver the requirements of UK climate legislation – or indeed the more demanding climate change commitments to which we agreed in Paris – if a new runway is approved at either Heathrow or Gatwick.

## Climate change and the world

The reality of climate change is now beyond doubt among all serious scientific bodies, among governments in developed and developing countries, and – in the UK – among both the business community and all major political parties. The latest review from the Intergovernmental Panel on Climate Change, which brings together thousands of scientists from around the world to advise governments, says “Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia.”<sup>1</sup> Climate change has had impacts on natural and human systems on all continents, increasing the risk of extreme weather events such as heat waves, droughts, floods, cyclones and wildfires, reduced crop yields in most areas, and an increased burden of disease.

In December 2015 an historic agreement was reached to tackle climate change through concerted global action. The Paris talks brought together the largest gathering of world leaders in history. It marked the first time that virtually every country on Earth, including the US, China, India, and all EU members, pledged to constrain its greenhouse gas emissions in order to keep global warming “well below” the danger threshold of 2°C. Efforts would be pursued, it was agreed, to limit warming to not more than 1.5°C.

## UK policy

The UK has, particularly since the industrial revolution, been responsible for a relatively high per capita emissions level, and in 2008 introduced the world’s first legally binding climate change target. The Climate Change Act had such strong cross-party support that only five MPs voted against it. The Act requires a cut of 80% of the emissions level in 1990, with a system of 4-year carbon budgets keeping the economy on track. An independent body, the Committee on Climate Change (or CCC), was created under the Act to give advice to Government on delivering our carbon budgets. The level of ambition of the UK target matched the goal agreed in 2009 by the G8 that developed countries should collectively cut emissions by “80% or more” compared to 1990 levels,

and represents the lower end of the EU-wide commitment to cut emissions by 80-95% by 2050. It would not be directly affected by any departure from the European Union.

There is a strong argument for increasing the stringency of the Climate Change Act in light of the Paris Agreement. The target underpinning the Act was based on the principle that the UK should play a fair share in limiting the risk of exceeding a 2°C global temperature rise to no more than 50%,<sup>2</sup> but the new global agreement is significantly more ambitious.

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## Aviation and climate change

Aviation presents a particular challenge to efforts to limit emissions growth. While most other sectors are now on a path to decarbonisation through the use of renewable energy, aircraft remain almost completely dependent on fossil fuel.

The first jets were extraordinarily inefficient: the piston engine aircraft of the 1950s were two to three times as fuel-efficient as the early jets that succeeded them.<sup>3</sup> The design of both engines and airframes improved considerably during the decades that followed, but the rate of efficiency gains has since been leveling off, and future improvements are likely to be marginal. The Government and its official climate watchdog, the Committee on Climate Change, estimate annual average efficiency improvements of less than one percent annually going forward. Passenger demand, meanwhile, keeps on growing. While the UK aviation market is relatively mature, the Government nevertheless predicts a doubling of aviation demand between now and 2050<sup>4</sup> and a continued growth of CO<sub>2</sub> emissions.

The climate damage from aircraft, however, is greater than that of CO<sub>2</sub> alone. At high altitude, the net effect of emissions of oxides of nitrogen, contrails, water vapour, sulphur oxides, and soot is to further increase warming. Overall, the climate impact has been estimated to be around twice that of carbon dioxide alone.<sup>5</sup> Each of these gases however varies significantly in how long it persists in the atmosphere, and difficulty in estimating the ratio between CO<sub>2</sub> and non-CO<sub>2</sub> impacts in the future has so far provided the perfect excuse for regulators to effectively ignore aviation's non-CO<sub>2</sub> effects.

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## Aviation and UK climate policy

In its plan for delivery of the Climate Change Act the approach of the Committee on Climate Change, consistently endorsed by the Government, has been to allow 'headroom' of 37.5 Mt for emissions from aviation (equivalent to the level in 2005) in the UK's 2050 total CO<sub>2</sub> allowance of 160 Mt. The proportion of UK emissions from aviation would increase under this assumption from around 5% today to around 25% in 2050, with other sectors bearing an increased responsibility for emissions cut. This, says CCC, is the maximum that can feasibly be allowed for.

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## Is the CCC's approach to aviation tough enough?<sup>6</sup>

Overall, the CCC has made recommendations that appear to be built around delivering the Climate Change Act at minimal cost and in way that is politically feasible. Aviation is tricky in both respects since meaningful emissions reductions are hard to come by, and since many politicians regard the sector with special affection. A target of 37.5 Mt is equivalent to a 120% increase on emissions in 1990 as against the 80% cut on 1990 emissions levels required from the economy overall, and takes no account of aviation's non-CO<sub>2</sub> impacts. Other sectors are expected to reduce emissions by 85% on average in order to deliver an economy-wide 80% emissions cut, and as discussed above, there is a

strong case for this 2050 target to be tightened.

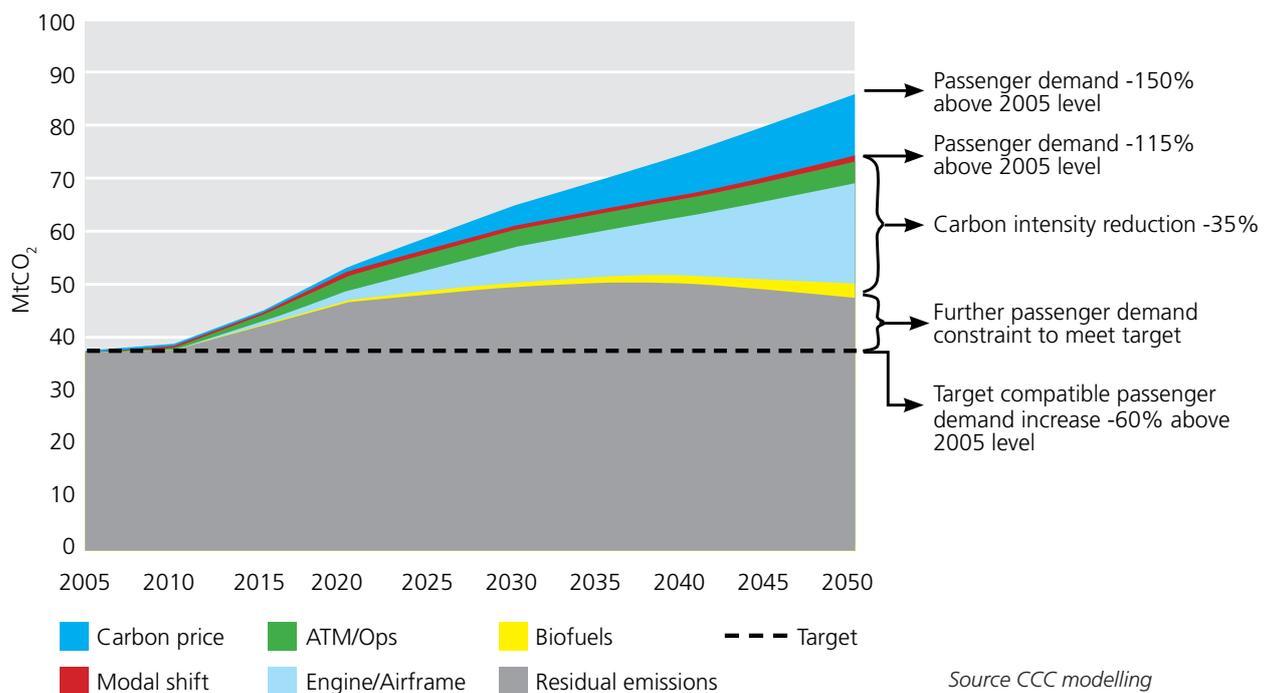
Despite the conclusions of the CCC's 2009 report Meeting the 2050 target (discussed below) that technology improvements and biofuel would be insufficient to manage the climate challenge for aviation, the Committee has remained fiercely silent on what policies should be adopted (including on airport capacity) to deliver the aviation target, arguing that these are for the Government to address. Meanwhile, public and political debate about runways has been taking place without the climate change constraint on growth being widely acknowledged.

## Delivering the Climate Change Act will mean limiting aviation demand

In many ways, then, an aviation target of 37.5 Mt for the UK is a generous one. Even so, delivering it will be a challenge. The Committee on Climate Change, the Department for Transport and the Airports Commission have all predicted that in the absence of new measures (and in some cases even after assuming the introduction of measures such as carbon trading for aviation) it will be exceeded even without adding any extra airport capacity. Yet somehow this unpalatable conclusion has been almost entirely glossed over in all the political rhetoric about shoring up the UK's hub status with 'sustainable' airport expansion that doesn't compromise environmental commitments.

In 2008-9 the Committee on Climate Change reviewed the likely future emissions from the aviation sector, including a detailed analysis of anticipated future technology improvements, airspace efficiencies and biofuel take-up. Under 'likely' assumptions in relation to aviation's future carbon intensity, the Committee found, projected demand for aviation would lead to emissions significantly in excess of the 37.5 Mt cap that the Government had adopted. While some growth in passenger numbers would be possible, this would need to be limited to around a 60% increase compared with 2005 levels.<sup>7</sup>

**Figure ES.6 Likely scenario (planned capacity)**



CCC analysis in 2009 found that passenger demand growth would need to be constrained if the target of limiting aviation emissions to the 2005 levels was to be achieved (from 'Meeting the UK Aviation target – options for reducing emissions to 2050')

The finding should not have come as a surprise. The Government itself periodically publishes its own aviation demand and CO<sub>2</sub> forecasts, which similarly require assessment of future fuel efficiency improvements, fleet mix and air possible traffic management efficiencies. Like the CCC's projections, the Department for Transport's modelling consistently predicts future aviation emissions well above 37.5 Mt.

The latest forecasts were published in 2013.<sup>8</sup> Reflecting the Government policy at the time, they assume: no new runways in the South East, a continuation of Air Passenger Duty (which has a small dampening effect on aviation passenger demand), the introduction of a global carbon trading system for aviation (which would further suppress demand somewhat as a result of the introduction of a carbon price) and the use of some aviation biofuel. Even so, the DfT's central forecast for aviation emissions in 2050 was put at 47 Mt CO<sub>2</sub>.

What does the industry have to say about the conclusion that keeping aviation CO<sub>2</sub> emissions to 37.5 Mt will need limits on passenger growth? In 2008 the Sustainable Aviation coalition of airports, airlines, air navigation service providers and manufacturers had published a carbon roadmap,<sup>9</sup> claiming that the sector's emissions could be stabilised at 37.5 Mt without any constraints on growth. With independent analysis having now concluded that passenger growth will need to be curtailed to meet the CO<sub>2</sub> target, the original Sustainable Aviation roadmap has been 'updated'. The new iteration acknowledges that absolute emissions in 2050 will be in excess of 37.5 Mt, but attempts to reframe the debate, arguing that a net reduction can be achieved through global carbon trading.

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## The runways debate and the work of the Airports Commission<sup>10</sup>

The last Labour Government ended up with a policy of theoretical support for Heathrow expansion, together with proposed environmental conditions that would in fact have ruled out any aircraft actually using the new runway. In the run-up to the 2010 election, both the Liberal Democrats and the Conservatives, in contrast, adopted clear party policy opposing new runways anywhere in the South East and when the Coalition formed in 2010 it adopted policy that no new runways at Heathrow, Gatwick or Stansted would be pursued during its term of government.

A new aviation policy was drawn up on the basis that, as argued by the Transport Secretary Phillip Hammond, "The previous government's 2003 White Paper, The Future of Air Transport, is fundamentally out of date, because it fails to give sufficient weight to the challenge of climate change. In maintaining its support for new runways – in particular at Heathrow – in the face of the local environmental impacts and mounting evidence of aviation's growing contribution towards climate change, the previous government got the balance wrong. It failed to adapt its policies to the fact that climate change has become one of the gravest threats we face."<sup>11</sup>

But the new policy avoided specific mention of runways, and pressure quickly re-emerged for a review of the Government's position. The Government's solution was to set up the Airports Commission, headed by economist Sir Howard Davies, to review the question of whether new airport capacity was required in order to maintain the UK's hub status.

The Commission's brief made no explicit mention of climate change and did not ask whether a new runway would be compatible with climate objectives. And while in theory the Commission could have advised against expansion, in reality the setting of

a two year timetable in which the first year was to address the question of ‘whether’ and the second year the question of ‘where’ left no opportunity to conclude that the answer was no new runways. But to be taken seriously it would need to give the impression of having carefully considered all environmental impacts associated with its final recommendation.

### **The Airports Commission’s approach on climate change was threefold:**

- 1. Minimise the problem.** The Commission conducted its own CO<sub>2</sub> forecasting that reduced the scale of the emissions challenge. An aircraft efficiency improvement of 1.1% per annum was adopted, and passenger growth levels for regional airports were downgraded significantly compared with the latest Government forecast.
- 2. Assume that someone else solves the problem.** The Commission constructed a model under which someone, presumably the Government, was assumed to have devised a policy to actually enforce a carbon cap. It then assessed what theoretical pattern of passenger demand would follow. Because CO<sub>2</sub> is forecast to exceed the level of the carbon cap even in the ‘no new runway’ baseline, the only way to make room for a runway’s worth of emissions would be to restrict growth at other airports. Unsurprisingly, in the Commission’s theoretical ‘carbon capped’ model, building a new runway at either Heathrow or Gatwick meant that demand was lower in every UK region aside from London and the South East compared to a ‘no new runway’ scenario. This information, however, is entirely at odds with the Commission’s narrative about a new runway being good for the whole of the country and was left hidden in the modelling.

How, though, would such a scenario come about? Would the Government introduce retrospective planning controls on all these airports? Would it introduce large price hikes on tickets? For its interim report, the Commission estimated that imposing a carbon price of £600 per tonne in order to deliver a carbon cap would mean adding £43 to short-haul fares and £205 to long-haul fares.<sup>12</sup> But how such a carbon price or tax would be introduced, the Commission argued, was for the Government to decide. While the Airports Commission set out some theoretical options in a technical paper ‘Carbon Policy Sensitivity Test’ (raising the carbon price, increasing biofuel use, and introducing various operational measures such as slower aircraft cruise) these proposals were unconvincing,<sup>13</sup> and none of them made it into the report’s final recommendations.

- 3. Suggest that the problem doesn’t need solving anyway.** The Commission also presented an alternative model under which aviation’s CO<sub>2</sub> impacts are allowed to overshoot the carbon cap. This was cleverly labelled the ‘carbon traded’ model, giving the impression that it represented an alternative policy approach for managing aviation emissions. But in fact there is little evidence to suggest that carbon trading in isolation – even if it is extended to cover all aviation emissions – will be able to meet the climate challenge, as discussed below.

What the Commission was of course unable to do was to show how a new runway could in reality be compatible with the Climate Change Act. But by using the words carbon and climate change often enough, while also recommending expansion, the impression was created that somehow climate change impacts had been dealt with and accounted for.

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## Why we can't rely on global carbon markets to solve the aviation emissions challenge

The ideal approach for tackling aviation emissions would of course be by way of a global agreement. The UK is far from alone in facing a challenge in tackling aviation emissions and in many countries the sector is growing rapidly. Despite taking a hit from the recession, as much as 6% annual growth in passenger km is anticipated for the Asia-Pacific region between now and 2030, around 5% in the Middle East, and 4% in Europe.

But so far, aviation has been left out of global climate change policy, largely on the basis of disagreement about how to allocate emissions to countries. While it is possible to make a fairly accurate emissions assessment based on the fuel used for departing flights (and this is the basis on which the DfT and the CCC have so far calculated 'UK aviation emissions'), alternative methodologies have sometimes been proposed such as allocation on the basis of the nationality of an aircraft's passengers for example. When the Kyoto Protocol on climate change was agreed in 1997, it sidestepped this challenge, excluding emissions from international aviation and shipping and instead requesting the relevant UN specialised agencies to find solutions.

For aviation, the relevant UN body is the International Civil Aviation Organisation. Historically responsible for agreeing safety standards, attended by transport ministries focussed on the sector's growth, and working on the basis of 'non-discrimination' (agreeing rules that apply equally to all parties), developing measures to deal with CO<sub>2</sub> emissions was a very new kind of challenge. The question of whether all countries should be expected to comply on an equal footing regardless of their status in terms of economic development has proved a particular barrier.

After a decade of inaction from ICAO,<sup>14</sup> in 2008 European states collectively decided to take action into their own hands by including aviation in the pre-existing European Emissions Trading System. But it led to very strong opposition from many non-EU countries, who argued that Europe had no right to try to impose charges for emissions outside its own borders and airspace. Under intense diplomatic pressure, including trade threats, attempted legal action, and widespread talk of non-compliance with the scheme, the EU agreed in November 2012 to 'stop the clock' on its EU ETS legislation for all but intra-EU flights (from one European state to another) to give ICAO one last chance to agree an effective global scheme. Should this not be forthcoming, the aviation EU ETS is due to recommence under its original terms from 1st January 2017.

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## A possible global carbon offsetting scheme

With the threat of the EU ETS still looming, ICAO has finally picked up some momentum towards agreeing a global 'market based measure'. The current plan is for a scheme that will deliver 'carbon neutral growth from 2020' by requiring airlines to purchase carbon offsets for all international emissions above a 2020 baseline. ICAO has not adopted a long-term emissions target, however, and has made no assessment of whether the scheme represents sufficient effort towards stabilising emissions at well below 2 degrees globally, let alone 1.5 degrees. NGOs have argued that the policy must include a 'review and ratchet' mechanism, similar to that included in the Paris Agreement, that allows for greater stringency to be introduced in future, but no backsliding.

For a sector that has so far largely escaped climate change measures, the global MBM would be a step forward. But it will not on its own keep UK aviation emissions to a level consistent with the Climate Change Act or with the Paris Agreement. Complementary measures will clearly be needed. And ruling out airport expansion is a good place to start.

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## The need for an absolute emissions reduction target in the UK

The CCC's recommendation was that the Government should not plan to meet the 37.5 Mt CO<sub>2</sub> limit for aviation in 2050 through carbon trading or offsetting. While CCC endorses the use of carbon markets to achieve emissions reductions efficiently in the medium term, by 2050, it argues, there will be few carbon permits available as all countries and all sectors will be delivering their own emissions targets. A new runway is an investment for the long term and therefore needs a long-term emissions strategy, including appropriate policies on airport capacity, ticket pricing, and technology standards alongside any access to carbon markets.

There are a number of reasons why carbon markets can't be relied upon for reaching long-term emissions objectives:

- At present there is no global trading scheme covering all sectors and able to achieve the objectives agreed in Paris. Instead, there is a patchwork of national and regional measures, some mandatory and some voluntary, with different goals and objectives, and covering only a small percentage of global activities. As a result credits of variable quality in terms of environmental integrity can be bought relatively cheaply, and there is no effective carbon price that would incentivise in-sector reductions in aviation or make alternative fuels cost-effective.
- Only a small proportion of UK aviation emissions are currently covered by a carbon trading system (namely intra-EU flights in the EU ETS). The global carbon offsetting scheme currently under discussion at the UN's ICAO will apply only from 2020, with numerous potential exemptions, and no linkage to the emissions objectives agreed in Paris.
- The Government's aviation CO<sub>2</sub> forecasts discussed above and the Commission's 'carbon traded' model both assume that aviation is exposed to a carbon cost reaching around £200 per tonne of CO<sub>2</sub> by 2050, but that there is nevertheless a significant overshoot of the 37.5 Mt cap. The ICAO scheme has been designed based on modelling predicting a much lower 2050 carbon price of some \$50 (around £32), with even less impact therefore anticipated on ticket prices, passenger demand, and emissions.
- While carbon markets could in theory deliver a robust climate objective, the practical reality is quite different. The design of any carbon market is bound to be influenced by political and commercial interests. The EU's emissions trading system, for example, has generated only a weak carbon price signal and has been scaled back dramatically in its coverage of aviation emissions. While the wording has yet to be agreed, some states have even argued in favour of a 'price ceiling' in the ICAO agreement, to keep carbon costs low and tickets cheap.

Unless the right planning decisions, as well as the right transport and energy policies are adopted alongside measures such as carbon trading or offsetting, it seems inevitable that these 'market based measures' will be watered down or abandoned once they start to bite.

## CLIMATE IMPACT OF A NEW GATWICK RUNWAY

- Gatwick Airport already has the second highest level of emissions of any airport in the UK (after Heathrow).
- The aim of a new runway is to double the number of flights. In 2015 there were 267,767 traffic movements at Gatwick Airport. The purpose of a second runway, according to the Airports Commission, would be to raise this to 560,000 a year.<sup>15</sup>
- Gatwick hopes that with a new runway it would increase the proportion of long haul destinations it serves. As aviation emissions are proportional to distance flown this could dramatically increase the airport's CO<sub>2</sub> output.
- Emissions per passenger for a return journey from Gatwick are around 0.5 tonnes CO<sub>2</sub> - equivalent to the emissions over three months from driving an average car.<sup>16</sup>

## If we refuse to expand for climate reasons won't the flights just go elsewhere?

The climate case against expansion is clear. But if the UK Government refuses a new runway, will the flights – and the emissions – simply move elsewhere? Might emissions actually be higher as more UK passengers connect via a non-UK hub rather than flying direct, and people drive further to be able to reach an airport?

This might be a problem if the UK was taking a unilateral approach to tackling climate change. But as discussed above, every country in the world has now taken on CO<sub>2</sub> commitments with a view to limiting the global temperature increase to well below 2 degrees. UN Secretary General Ban Ki-moon said of the Paris Agreement: "We have entered a new era of global cooperation on one of the most complex issues ever to confront humanity. For the first time, every country in the world has pledged to curb emissions, strengthen resilience and join in common cause to take common climate action. This is a resounding success for multilateralism."<sup>17</sup>

It is probably true that climate impacts are a more prominent part of the airport capacity debate in the UK than elsewhere in the world. But perhaps we should not be surprised that the UK, with its strong aviation history, is facing the limits to its growth sooner than some other countries. The reality of meeting the level of emissions mitigation to which all states are now committed is that aviation growth will inevitably fall increasingly under the spotlight. Domestic climate legislation exists in all those EU countries with major aviation hubs, and the EU's target to cut emissions by at least 20% by 2020 (and by up to 40% by 2030), to which all members are committed, explicitly includes aviation emissions. Beyond Europe the risk of 'carbon leakage' as a result of flights moving location reduces significantly as the extra distance required to be travelled increases.

In the meantime, no one should assume that airport expansion is taking place unchallenged elsewhere in the world. Frankfurt's fourth runway opened in 2011, but hundreds of protesters continue to meet almost weekly calling for its closure, or controls

on its use, on the basis of noise impacts. At Schiphol, the number of aircraft movements permitted annually has been limited to 500,000 – only slightly higher than Heathrow’s cap of 480,000 – unless the airport can demonstrate noise improvements. Public protest has proved a significant setback to proposals to build a third runway in Munich and planned airports in Siena and Viterbo in Italy have been successfully challenged.

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## Conclusion

The Climate Change Act commits the UK to cutting emissions by 80% by 2050. The Government’s official climate watchdog has specified that in order to meet this economy-wide target, emissions from flights departing from the UK can be no higher than 37.5 Mt CO<sub>2</sub> – equivalent to a quarter of UK emissions by 2050. This represents a minimum level of ambition and the target should probably in fact be tightened both to allow for aviation’s non-CO<sub>2</sub> impacts and to meet the ambition of the December 2015 climate agreement in Paris.

But none of the official bodies you might expect to be overseeing delivery of the target – the Committee on Climate Change, the Government or the Airports Commission – has ever set out a plan for doing so, and emissions are currently set to overshoot their maximum level even without airport expansion. The Commission’s argument that a new runway at Heathrow or Gatwick is theoretically compatible with the target conceals the fact that in reality it would be impossible to achieve.

With all countries now committed to CO<sub>2</sub> limitations, aviation emissions are likely to come under increasing scrutiny. But the current plan for a global measure to limit emissions falls a long way short of the action needed to tackle the UK’s significant aviation CO<sub>2</sub> challenge and, even if successful, will need to be complemented by other measures. Saying no to new runways is the obvious first step towards ensuring that the UK avoids locking itself into carbon intensive infrastructure and instead makes investment choices that help to deliver a low carbon economy.



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## The author



### Cait Hewitt

Cait Hewitt is Deputy Director of the Aviation Environment Federation, the principal UK NGO campaigning exclusively on the environmental impacts of aviation. She has given oral evidence on the climate change impacts of airport expansion to the London Assembly, the Airports Commission, and most recently the Environmental Audit Committee, whose report published in December 2015 gave rise, the Government says, to its delay in reaching a conclusion on a new runway pending further environmental analysis. She has appeared on both radio and television on the topic of airport expansion. She has a First Class degree in sociology (and was awarded the Peter Selman Sociology prize) and an M.A. with Distinction in environmental philosophy.

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