

# AEF discussion paper on aviation and air pollution

December 2018

Part of a series of three discussion papers on the key environmental policy challenges to be addressed in the Aviation Strategy Green Paper.

## Summary and recommendations

While aviation's impact on climate change relates largely to aircraft emissions, in terms of air pollution it is vehicles traveling to and from airports that are generally blamed from the problem. Heathrow is the only airport in the UK in an area known to be consistently in breach of air quality law, although there has been no national review of pollution levels at other UK airports since the 2003 White Paper. The World Health Organisation, meanwhile, recommends much more stringent limit values for some key pollutants than those required by law. Growing interest in the health damage from particulate matter in particular suggests that it may be time to look again at the assumption that aircraft emissions at higher altitudes can be disregarded when assessing aviation's air quality impact.

This paper argues that:

- The forthcoming Aviation Strategy should clarify how airport planning decisions will help deliver air quality commitments.
- It should close the current information gaps with respect to air pollution from aviation, by
  - *Setting out the evidence base in relation to aircraft air pollution outside the landing and take-off cycle,*
  - *Providing (a) updated mapping of air pollution levels around UK airports with respect to legal limit values and WHO recommended maximum levels for pollutant concentrations; and (b) an assessment of how any increase in aircraft emissions or airport-related emissions affects NECD limit values, and*
  - *Setting out what approach individuals concerned about air pollution near their airport should take.*
- To ensure the UK supports the setting of effective technology standards, the strategy should set out the Government's view on whether it regards the current international standards to be tough enough.



## Introduction

Air pollution has frequently been the focus of news and public debate in recent years. New evidence has emerged about the breadth and scale of health impacts associated with toxic air while in terms of policy approaches, both historic incentives to buy diesel vehicles and the capacity for car manufacturers to cheat on emissions tests have come under fire.

Airports generate air pollution from a number of sources including on-site power and heating, equipment to service aircraft, on-site vehicles, airport-related traffic on surrounding roads (staff, passengers and freight) and aircraft both on the ground and in the air. Background emissions are also important to consider: airports are often located in or near major urban centres or transport networks that already have air quality problems, which the airport's activities can exacerbate.

Heathrow Airport has come under particular scrutiny with respect to air pollution, with roads around the airport having been in breach of legal limits for nitrogen dioxide for over a decade. While new government plans foresee dramatic reductions in NO<sub>2</sub> in major cities in the coming years as a result of cleaner road vehicles, official forecasts nevertheless indicate that expansion will increase the scale of the challenge in bringing London into compliance. More stringent targets for emissions of small particles, meanwhile, are likely to prove difficult to deliver in the near future, and on-site air pollution, while not monitored for purpose of public protection required by law, is of increasing concern to airport staff and their unions.

## Air pollution impacts and policies

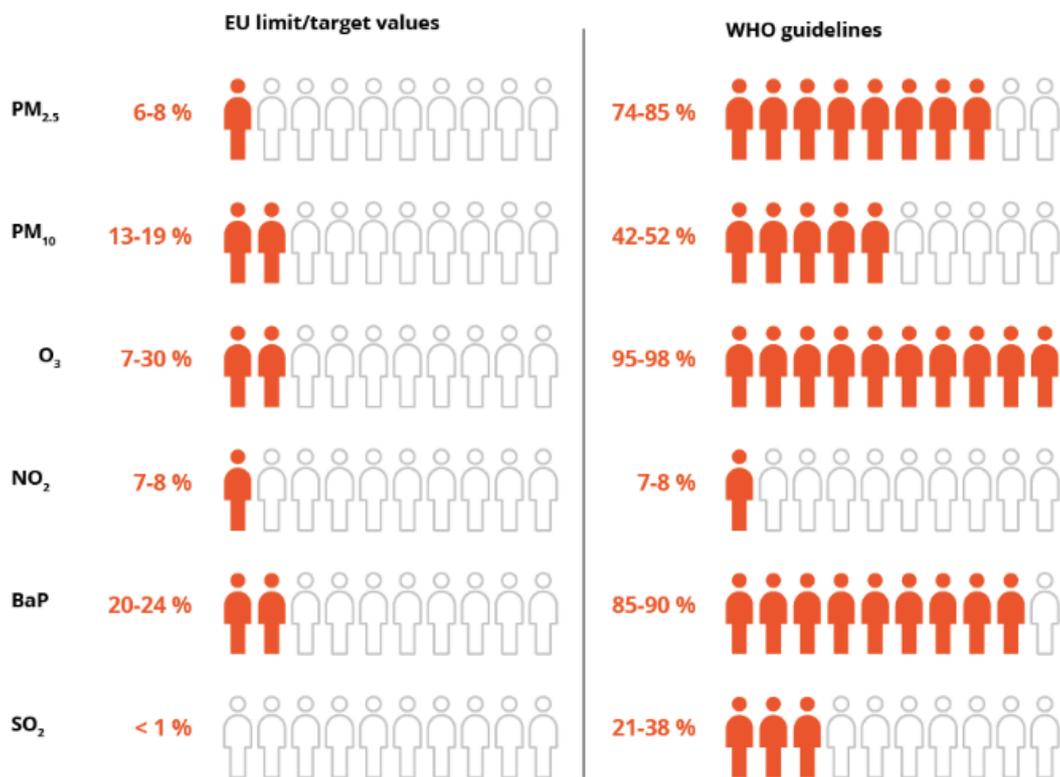
There is longstanding evidence linking air pollution to increased risk of heart attacks, lung disease and strokes. More recently, toxic air has been linked to diabetes, kidney disease, Alzheimer's disease, and risk of low birth weight as a result of prenatal exposure.

The EU's Ambient Air Quality Directive (translated into UK law as the Air Quality Standards Regulations 2010) sets maximum concentration levels for key pollutants, to be achieved by 2010. Persistent breaches of the limits prompted environmental law campaigners ClientEarth, in 2013, to launch a series of successful legal actions against the UK Government, with the result that Defra has been forced by the courts to increase the scale of ambition in its plans for policy action. Under the latest plan, even the most polluted roads in London are due to be compliant with the law by the mid-2020s, though the Government's own analysis found that Heathrow expansion will come with a high risk of causing non-compliance, at least in the early years of operation.

The legal limits, meanwhile, appear increasingly at odds with the latest health advice. The European Court of Auditors, for example, noted in a special report published in September 2018<sup>1</sup> that “The EU’s air quality standards were set almost twenty years ago and some of them are much weaker than WHO guidelines and the level suggested by the latest scientific evidence on human health impacts.” The report recommended an ‘ambitious update’ to the directive.

The European Environment Agency has also highlighted<sup>2</sup> the gap, for many pollutants, between recommendations from the World Health Organisation and maximum concentration levels as legislated in the EU, and set out the proportion of the population in Europe exposed to dangerous pollution as defined by both approaches:

**Figure.1: EU urban population exposed to harmful levels of air pollutant concentrations in 2014-2016**



It can be difficult to attribute atmospheric pollution to a specific source, but there is some evidence to suggest that the impact of aviation on some of the pollutants that stand out as having widespread health impacts could be significant. A 2015 paper published by MIT, for example<sup>3</sup>, attempted to quantify and monetise the

<sup>1</sup> [https://www.eca.europa.eu/Lists/ECADocuments/SR18\\_23/SR\\_AIR\\_QUALITY\\_EN.pdf](https://www.eca.europa.eu/Lists/ECADocuments/SR18_23/SR_AIR_QUALITY_EN.pdf)

<sup>2</sup> “Air pollution still too high across Europe” <https://www.eea.europa.eu/highlights/air-pollution-still-too-high>

<sup>3</sup> 2015, Steve Yim et al, “Global, regional and local health impacts of civil aviation emissions”

[http://iopscience.iop.org/article/10.1088/1748-](http://iopscience.iop.org/article/10.1088/1748-9326/10/3/034001/meta;jsessionid=B7F20429FA9632D9531176B5BDDE0724.c5.iopscience.cld.iop.org)

[9326/10/3/034001/meta;jsessionid=B7F20429FA9632D9531176B5BDDE0724.c5.iopscience.cld.iop.org](http://iopscience.iop.org/article/10.1088/1748-9326/10/3/034001/meta;jsessionid=B7F20429FA9632D9531176B5BDDE0724.c5.iopscience.cld.iop.org)

impact of PM 2.5 (fine particulate matter) and O<sub>3</sub> (ozone) emissions from aviation emissions globally. While the air quality problem in relation to airports is typically characterised in UK policy as attributable primarily to surface access emissions, the MIT study looked specifically at the impact of aircraft emissions. It estimated that aviation emissions cause around 16,000 premature deaths per year globally, with emissions associated with the LTO cycle contributing a quarter of this impact.

Alongside the legislation on pollutant concentrations are regulations controlling the total amount of pollution released. Analysis published in the context of Heathrow expansion indicated that the UK is on course to miss the 2020 limit for PM<sub>2.5</sub> under this National Emissions Ceiling Directive (NECD), and by 2030 to be in breach of the limits for both PM<sub>2.5</sub> and NO<sub>x</sub>, with expansion predicted to exacerbate these breaches slightly.

## Evidence Gaps

Despite the MIT work cited above, the standard advice, from UK academics and from the Government, is that the primary issue with aviation air pollution relates to road vehicles rather than aircraft, and that for aircraft, only emissions released during the landing and take off cycle need be accounted for. The scientific basis for this cut-off appears hazy however, with some confusion in key UK policy documents even about whether the appropriate cut-off is 1000 feet or 1000 metres above ground level<sup>4</sup>. Local communities concerned about the impact of airport operations on their health would welcome clarification with supporting evidence on what happens to pollutants at higher altitudes. Does atmospheric chemistry render these emissions harmless to health? Or do some emissions – particulate matter, for example – simply disperse over a wide area and smudge into the ‘background’ pollution level?

Meanwhile, there has been no national review of airport air pollution, to our knowledge, since the 2003 Airports White Paper when the then government commissioned an analysis of air pollution levels at all the UK’s major airports. While Heathrow has remained in the spotlight for poor air quality, periodic monitoring of pollution at other UK airports would seem prudent, particularly in the context of likely future breaches of the NECD. This should assess both legal limits and WHO recommended maximum levels, not least given the Government’s commitment in its draft Clean Air Strategy to reduce the number of people exposed to PM at levels deemed dangerous by WHO. While the major problems are most likely to be at larger airports, pollution levels should also, we suggest, be monitored at smaller airports especially where they have housing or public amenities very close by. For example, we are aware that many smaller airports, such as Southend, have

---

<sup>4</sup> “References for the assertion in Air Navigation Guidance, 2017 document, page 22: on the effects of aircraft pollution above 1000 feet”

[https://www.whatdotheyknow.com/request/references\\_for\\_the\\_assertion\\_in?nocache=incoming-1255845#incoming-1255845](https://www.whatdotheyknow.com/request/references_for_the_assertion_in?nocache=incoming-1255845#incoming-1255845).

aprons and taxiways close to housing where the running of aircraft engines and APUs can lead to localised exposure.



## Who is responsible?

### Local authorities

The primary, day-to-day responsibility for tackling air pollution rests with local authorities, and the Government's latest draft air quality plan reinforces this. Authorities are limited, however, in terms of both powers and resources. The response<sup>5</sup> of the Local Government Association to the consultation on Defra's draft Clean Air Strategy notes that "Shipping and aviation emissions are difficult for local authorities to control but make significant contributions to localised air quality issues", and that more generally their powers to regulate traffic flows and vehicle usage are limited. While local authorities have significant powers over planning decisions, the extent to which authorities can take account of air pollution impacts is unclear. A 2015 decision by Swale Borough Council to turn down an application for housing was, for example, described as the first time air quality has been considered as a factor in determining a planning decision<sup>6</sup>. It is worth noting that

<sup>5</sup> <https://www.local.gov.uk/sites/default/files/documents/Clean%20Air%20strategy%20response%20final%20cleaned.pdf>

<sup>6</sup> <https://www.airqualitynews.com/2017/11/14/planning-decision-upheld-after-air-quality-ruling/>

the local authorities taking legal action against the decision to expand Heathrow Airport because of its impacts on local air quality have no powers to stop it but will be expected to deal with the local environmental impacts if it goes ahead.

## Airports

Many airports have their own policies in place to try to minimise the air pollution impact of their operations. Heathrow, for example, provides charging points for electric taxis (though the recent decision to impose a cost for usage has proved contentious)<sup>7</sup> and a number of airports have electric charging points for passenger vehicles. Some are investing in on-site vehicles that produce fewer harmful emissions and many provide fixed electrical ground power to help remove the need for on-board generators to be used when aircraft are on the ground.

The effectiveness of airport initiatives is often, however, limited to eye-catching initiatives that won't impose on passengers or lose revenue for the airport. Emissions from surface access for both passengers and staff often represent a significant proportion of the total air pollution associated with an airport, and airports may put in place measures to limit or disincentivise access by car. Evidence suggests, however, that encouraging behavioural change can't rely on the provision of public transport initiatives alone, and that people's choices are still influenced by the availability of car parking facilities. Car parking charges often provide a significant income stream for airports that they are reluctant to lose, and it is notable that self-imposed targets for public transport use are generally set as a percentage of passengers rather than an absolute number, allowing road vehicle trips to increase if passenger numbers rise. While some airports have surface access forums to help co-ordinate transport providers, they have no powers.

## The Government

It is ultimately for the UK Government to ensure that legal obligations on air quality are upheld. Post-Brexit, the UK may no longer face EU sanctions for failing to uphold environmental laws, but the Government has nevertheless committed to developing environmental protections that are at least as ambitious as those currently derived from EU law and is working on a new Environment Act to help deliver this commitment.

Nevertheless it is hard to have confidence that the Government can be relied on to deliver effective action on air pollution given that legal limits that came into force in 2010 have been breached annually since then, and that it is only as a result of repeated legal challenge that more stringent plans have been put in place to get to grips with the problem. In developing its plans for a third runway at Heathrow, the NPS, drafted by the Government, has put responsibility for delivering air

---

<sup>7</sup> [https://www.taxi-point.co.uk/single-post/2018/11/02/%E2%80%9CHeathrow-dont-care-about-lowering-emissions%E2%80%9D-says-cabbie-as-sky-high-charging-price-announced?fbclid=IwAR3YVWr48jiLk3QivyYBI4e\\_I7MS52e7XhoN2z6Wg6\\_b6r\\_6t69X\\_BacqI](https://www.taxi-point.co.uk/single-post/2018/11/02/%E2%80%9CHeathrow-dont-care-about-lowering-emissions%E2%80%9D-says-cabbie-as-sky-high-charging-price-announced?fbclid=IwAR3YVWr48jiLk3QivyYBI4e_I7MS52e7XhoN2z6Wg6_b6r_6t69X_BacqI)

quality improvements in the hands of the airport itself, and has not put in place any enforcement mechanisms for ensuring that expansion does not proceed if it will either cause or worsen a breach of air quality limits, despite modelling showing a high risk of this occurring in the years after opening.

In terms of standards for the manufacture of aircraft and aircraft engines, the Government will, after Brexit, have responsibility for ensuring adherence to ICAO recommended standards and practices covering NOx and smoke. ICAO is currently developing a PM standard.

## The CAA

Under the Civil Aviation Act 2012, the CAA has a legal duty to publish information “as it considers appropriate” about the environmental effects of civil aviation, including how human health and safety is, or may be, affected by such effects. So far, the CAA seems only have to dispatched this duty insofar as it relates to air pollution by way of a few short paragraphs of text on its website<sup>8</sup>.

## Recommendations

The Aviation Strategy should put in place policies to ensure that the aviation sector helps to support wider actions both to bring the UK into compliance with existing legal limits on air pollution, and to better protect public health by delivering WHO recommended limit values going forward. Information gaps should be addressed, both to ensure a sound evidence base for policy, and to better equip the public to engage in debate and make decisions about their own actions.

### **1. The Government should clarify how airport planning decisions will help deliver air pollution commitments.**

Many airport planning decisions that could result in a worsening of air quality are taken at the local level. Some, including the Heathrow third runway will, in future, require a Development Consent Order.

The Government should clarify how air quality impacts should be taken into account in these decisions. Airport development should, in our view, be disallowed if there is a significant risk of it either causing or exacerbating any breaches of air pollution legal limits, (as a minimum level of ambition) either now or in the future when operating at maximum capacity. This risk should be assessed with respect to the Air Quality Directive, the National Emissions Ceiling Directive, or any future relevant legislation. If development is permitted in such

---

<sup>8</sup> <https://www.caa.co.uk/Consumers/Environment/Information-on-the-environmental-impact-of-aviation/>

circumstances, conditions should be put in place that the development will be halted if such breaches occur. A regulator – either the Environment Agency or the CAA – should be tasked with monitoring any such breaches and taking enforcement action where necessary.

Since current legal limits are out of step with WHO advice on air pollution targets, appropriate advice should be developed to guide planning decisions that are likely to cause or exacerbate air pollution above the levels recommended for health.

## **2. The Government should close the current information gaps with respect to air pollution from aviation.**

- (i) *The strategy should set out the evidence base in relation to aircraft air pollution outside the landing and take-off cycle.* DfT recently indicated, in response to an FOI request (see footnote 4), that they hold no information on the appropriate cut-off, in terms of altitude, for air pollution associated with aircraft, but that “emissions from aircraft above 1,000 feet are unlikely to have a significant impact on local air quality”. Meanwhile the document cited in support of this view, the International Civil Aviation Organisation's (ICAO) Airport Air Quality Manual, cites 1000 metres, or around 3000 feet, as the appropriate cut off for considering the impact of aircraft air pollution. In clarifying which altitude is correct, the Government should assess the robustness of the evidence base in terms of how to account for air pollution above the LTO height, particularly considering the potential significance of ultrafine particle emissions at higher altitudes.
- (ii) *The strategy should provide (a) updated mapping of air pollution levels around UK airports with respect to legal limit values and WHO recommended maximum levels for pollutant concentrations, and (b) an assessment of how any increase in aircraft emissions or airport-related emissions affects NECD limit values.* Mapping should extend to small airports in cases where they have residential properties, playgrounds, schools or hospitals nearby, and should include consideration of on-site air quality (of relevance to staff). A process for ongoing monitoring should be put in place.
- (iii) *The strategy should set out what approach individuals concerned about air pollution near their airport should take, and should direct the CAA to make this information clear under their information duties.* Members of the public who are concerned about the air pollution associated with their local airport need clarity about who to approach for information and advice on this issue, and guidance on how they can be confident that the information provided is accurate.

### **3. The Government should support the setting of appropriate performance standards for aircraft.**

The strategy should set out the Government's view on whether international standards for limiting air pollution from aircraft are sufficiently stringent. CAEP (the Committee on Aviation Environmental Protection at the UN International Civil Aviation Organisation) has asked a panel of independent scientific experts to review whether ICAO's standards respond to the latest evidence on environmental impacts, and what technologies may exist to address these issues in the future. The UK Aviation Strategy should set out how the Government will assess the output from CAEP's independent expert panel, to ensure that the industry contributes to achieving improvements in air quality levels in line with health-based advice.