**Position Paper 2**

# Expansion of Leeds Bradford Airport and Incorporating Aviation into the Leeds Carbon Roadmap

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The Leeds Climate Commission has produced this position paper as a constructive contribution to inform decision making in the city.

The Leeds Climate Commission was established in 2017 to help Leeds to make positive choices on issues relating to energy, carbon, weather and climate. It brings together key organisations and actors from across the city and from the public, private and third sectors.

Leeds Climate Commission members have contributed to this paper, but the views expressed in this position paper cannot be attributed to any single member of the Commission and the Leeds Climate Commission takes responsibility for all views expressed.

Leeds Climate Commission has committed to be guided in its activities by the results of the Leeds Climate Change Citizens' Jury. This position paper forms part of the Commission's response to the Jury's recommendations by providing evidence on the significance of aviation emissions for the carbon footprint of the city.

Leeds Climate Commission is part of the ESRC Place-Based Climate Action Network, an initiative designed to support the development of climate commissions and climate action plans in UK local authorities.

## 1. Introduction

Aviation has become an increasingly prominent aspect of social and economic life in recent decades, but there are pressing questions relating to its environmental impacts. These impacts have become more prominent in the context of a climate emergency that stresses the need to a) limit global warming to 1.5 rather than 2 degrees centigrade, and b) to accelerate the process of decarbonisation in order to avoid dangerous climate change[i]. This has led to countries such as the UK upgrading their carbon reduction commitments from 80% to net zero emissions by 2050[ii], and to cities such as Leeds declaring a climate emergency and an ambition to work towards net zero emissions by 2030[iii]. The adoption of these more ambitious carbon reduction targets has meant that on-going emissions from sectors such as aviation that may face challenges in fully decarbonising have come into sharper focus. Whilst a net zero target may allow some on-going emissions, it does stress the need for them to be minimised and for any residual emissions to be off-set.

Globally, aviation currently accounts for c2%[iv] of total GHG emissions and c10%[v] of transport related GHG emissions. In the UK, aviation accounts for c7%[vi] of total GHG emissions, with aviation emissions equating to c1/3[vii] of the emissions from road transport or industry. However, aviation emissions are increasing rapidly, and as other sectors decarbonise and we get closer to net zero emissions the relative importance of aviation emissions increases. This is reflected in the fact that UK aviation emissions have doubled since 1990, whilst emissions from the economy as a whole have fallen by 40%[viii].

Looking forward, the climate impacts of aviation are shaped by the extent to which any efficiency gains relating to emissions per passenger km travelled can compensate for the impacts of increasing levels of supply/demand. As is discussed below, in the UK in the next decade it seems that rates of improvement in the efficiency of planes will be outstripped by more significant rates of increase in supply/demand. In the medium to long term, there is some scope for technological change – for example through the advent of electric, hydrogen or next generation bio-fuel powered planes. However, the prospects for such innovations becoming widely adopted across the aviation sector in the short to medium term currently seem low - even if planes with new technologies became viable in the next decade, it would take many years for existing fleets to transition towards the new technologies. Given the nature of the climate emergency and the need to deliver deep reductions in emissions in the next decade, the growth of emissions from aviation therefore represents a major challenge.

Whilst recognising that many of the policy levers that could be pulled to address the climate impacts of aviation exist at the national or international scales, this position paper considers the relevance of aviation to the Leeds Carbon Roadmap[ix] and to efforts across the city to work towards net zero emissions by 2030. The paper presents evidence on the current and future significance of emissions from both Leeds residents and from Leeds Bradford Airport (LBA), and it considers the extent to which they may be minimised and/or offset through a number of indicative interventions.

## 2. Context

### - *The growth of aviation*

As shown in Table 1, there has been rapid growth in aviation passenger numbers at the global, UK and regional/local levels since 2000. Recent media reports have suggested that all airports in the UK also have ambitious growth plans. This restricts the potential for one airport to grow by attracting passengers from another.

**Table 1: Growth of flying at the global, UK and LBA scales.**

**Global**

- 2000-2018 – 157% growth from 1.67 billion to 4.3 billion passengers a year[x].
- 2020-2050 – forecast to grow to 16 billion passengers a year[xi].

**UK**

- 2000-2018 - 62% growth from 180 million to 292 million passengers a year[xii].
- 2018-2050 – forecast to grow by a further 29% to reach 410 million by 2050, without expansion of Heathrow airport[xiii].

**Leeds Residents**

- 2000-2018 – in line with national growth rates, we estimate that flights taken by Leeds residents grew from 1.05 million flights a year in 2000 to 2.75m a year in 2018, or from an average of 1.4 to 3.5 flights per person per year.
- 2018-2050 – again in line with national growth rates, without expansion of Heathrow, we estimate that flights taken by Leeds residents would grow to 3.55m a year by 2050.

**LBA**

- 2000-2018 – 169% growth since 2000, from 1.5 million to 4.04 million passengers a year.[xiv]
- Currently, LBA is the 15th largest airport in the UK, accounting for c1.4% of all UK passengers.[xv]
- 2020-2030 - LBA proposes to expand its passenger numbers to 7m per year in 2030[xvi], and the UK Department for Transport has suggested that it may grow to 9m per year in 2050[xvii].

**Other Reported[xviii] UK Airport Growth Plans**

- Birmingham - 12m to 18m by 2033
- Doncaster-Sheffield - 1.2m to 7.2m by 2037
- E Midlands – 4.9m to 10m by 2040
- Gatwick – 49m to 70m by 2033
- Heathrow - 80m to 130m by 2028
- Liverpool - 5m to 11m by 2050
- Luton – 16.7m to 32m (undated)
- Manchester - 28m to 50m by 2030
- Newcastle - 5.3m to 9.4m by 2035
- Stanstead – 28m to 43mm (undated).

### - *The economic significance of aviation*

As aviation has grown, so has the economic significance of the aviation sector, both at the national and regional scales. These are summarised in Table 2.

**Table 2: The economic significance of aviation**

**UK**

According to the UK Department for Transport[xix]:

- the UK has the largest aviation network in Europe and the third largest in the world;
- UK aviation directly contributes at least £22 billion to the economy (i.e. c1% of GDP) and supports around half a million jobs (i.e. 1.5% of all employment);
- aviation supports regional growth and connectivity, with airports being economic hubs that provide connectivity and employment.

**LBA**

According to Cushman and Wakefield[xx]:

- LBA provides £100m of direct GVA to the Leeds City Region each year (i.e. 0.15% of GVA), with overall (i.e. including wider) impacts estimated to be £336m per year (i.e. 0.5% of GVA).
- LBA provides over 2,350 direct jobs (i.e. 0.17% of Leeds City Region employment), with considerably more relying indirectly on the airport.
- By 2030, with forecast passenger growth at the airport, it is estimated that this will grow to £290m of direct GVA and around 8,000 jobs by 2030.

**UK Tourism**

- Nationally, the UK spent £43.8 billion on visits overseas in 2016, whilst overseas residents spent £22.5 billion visiting the UK. There is therefore a net outflow of tourism expenditure, with the UK spending 48% more on visits abroad then it receives on visits to the UK[xxi].

### - *The significance of aviation emissions*

As stated above, aviation currently accounts for c7% of total UK GHG emissions. The UK Committee on Climate Change estimates that the fuel efficiency of planes can be improved at a rate of 0.8% per passenger km travelled per year, and broader changes in aviation operations (e.g. in air traffic management) might increase this to 1.5% a year[xxii], which would lead to a 37% decrease in emissions per passenger km travelled between 2020 and 2050. However, the UK Government forecasts that passenger numbers will grow by 1.1% a year, leading to a 39% increase in numbers over the same period. Assuming that the average distance of each flight stays the same, we can therefore expect overall levels of emissions from UK aviation to increase slightly over the period.

**Table 3: Levels of aviation emissions at the global, UK and regional scales**

**Global**
Global aviation CO2 emissions grew by 75% between 1990 and 2012[xxiii]. GHG emissions from aviation now account for c2% of the global total[xxiv], with forecasts suggesting that current emissions could increase by 300-700% by 2050[xxv].

**UK**
GHG emissions from UK aviation now constitute c7% of the UK total[xxvi], and are forecast to grow to 25% by 2050[xxvii], partly because emissions from other sectors are forecast to fall. In 2012, emissions from aviation were c1/3 of the emissions from road transport or industry[xxviii].

**Leeds Residents**
We estimate that adding the GHG emissions from flights taken by Leeds residents to the scope 1 and 2 emissions baseline of the city would lead to an increase of c19% to the total scope 1 and 2 emissions from the city (see Figure 2 below).

**LBA**
We estimate that adding the GHG emissions from flights in/out of LBA to the scope 1 and 2 emissions baseline of Yorkshire and Humberside would lead to an increase of c3% to the total scope 1 and 2 emissions from the region.

NB All figures take into account emissions relating to freight and cargo.

### - *Accounting for aviation emissions socially*

Currently, the UK average number of flights per person per year is 3.4 (single) flights per year[xxix], but as is shown in Table 4, this is unevenly distributed with a relatively small number of frequent flyers and with people with higher incomes being much more likely to fly.

**Table 4: The social distribution of flying**

**Frequent Flyers**
Of English residents:

- 1% of people take 20% of all flights in a year
- 10% of people take 45% of all flights in a year
- 20% of people take 70% of all flights in a year
- 52% of people take all flights in a year
- 48% of people not flying in any one year[xxx]

**Propensity to Fly by Income**
By income, across the UK in 2008:

- the top 20% of the population took 40% of all flights
- the top 40% of the population took 61% of all flights
- the top 60% of the population took 77% of all flights
- the bottom 40% of the population took 24% of all flights
- the bottom 20% of the population took 11% of all flights[xxxi].

### - *Accounting for aviation emissions geographically*

Although the CCC has called for national carbon accounts and targets to include emissions from aviation and shipping[xxxii], aviation emissions are not currently included in carbon accounts at the national or sub-national levels. If they were, they could either be allocated territorially (e.g. to the areas where airports are located), or under a consumption-based approach responsibility for emissions could be allocated to end consumers.

In the case of LBA, although the airport is located within the boundaries of Leeds, 90% of all flights taken from the airport are taken by residents of the Yorkshire and Humber region[xxxiii], with an estimated 18% of flights being taken by residents of Leeds. A consumption-based approach would therefore allocate responsibility for 18% of flight-based emissions from LBA to the territorial area of Leeds and 71.8% to other areas in the Yorkshire and Humber region.

However, other data shows that only c.1/3[xxxiv] of all flights taken by residents of Yorkshire and Humber are taken through LBA. Indeed, residents of Yorkshire and Humber take more flights through Manchester airport than through LBA. Assuming Leeds residents also only take 1/3 of their flights through LBA, under a consumption-based approach responsibility for the emissions from the other 2/3 of flights taken from other airports would also be added to the Leeds' territorial emissions. This figure also has to be adjusted as most flights from LBA are short-to-medium haul, with long haul flights occurring though other airports.

**Table 5: The distribution of passengers at LBA, and of passengers from Leeds.**

**LBA**
90% of all flights taken from LBA are taken by residents of the Yorkshire and Humber region[xxxv], with an estimated 18.2% of flights being taken by residents of Leeds[xxxvi].

**Yorkshire and Humber Residents**
Only 33% of the flights taken by residents of Yorkshire and Humber are taken through LBA, with 44% taken through Manchester, 11% through London airports, 6% through East Midlands, 2% through Liverpool, 1.6% through Newcastle and 1.4% through Birmingham[xxxvii].

## *3.* Aviation emissions and the Leeds Carbon Roadmap

### *- Methodology and Assumptions*

In the analysis below, we present analysis on the emissions associated with a) flights taken by Leeds residents and b) flights to/from LBA. We calculate total emissions and emissions per passenger using the Climate Care web-tool, itself based on UK government guidance on GHG reporting, taking into account both direct carbon emissions and the non-CO2 related impacts of radiative forcing[xxxviii].

Given the growth plans of other airports (see Table 1 above), we assume that all airports retain their current share of passengers and that growth in passenger numbers from one airport are not achieved through reductions in passenger numbers at another. We also assume that any national policies relating to aviation impact on all UK airports equally, and that approaches in one area do not lead to changes in passenger numbers at another airport. We also do not consider the impacts of surface travel to/from different airports and to/from destinations reached by increased surface travel as a result of changes in air travel.[1]

The analysis focuses on existing aviation technologies and factors in on-going efficiency improvements in airplanes and in air traffic management etc at the top of the range predicted by the CCC (i.e. 1.5% per year). Clearly, if alternative technologies for aviation become viable, more rapid reductions in emissions might be possible.

To estimate the total impact of all flights taken by Leeds residents, whether from LBA or any other airport, we assume that Leeds residents – who have broadly the same income levels and distribution as the UK average - take the same number of flights as the UK average (i.e. 3.4 single (not return) flights per person per year). To take account of the fact that flights taken from other airports are more likely to be long haul than those taken from LBA, we assume that flights from other airports have average emissions of 0.36 tonnes per passenger (i.e. an average flight – whether short, medium or long haul), whilst from LBA they are 0.34 tonnes per passenger (i.e. an average short to medium haul flight).

To estimate the impact of flights to/from LBA, we compare an expansion scenario for LBA (4m to 7m by 2030 and 9m by 2050) to a scenario where passenger numbers from LBA grow at the national growth rate (4m to 4.7m by 2030 and 5.7m by 2050) and a scenario where passenger numbers remain constant at 2018 levels.

[1] To factor these aspects in would require a more dynamic market model covering supply, demand and travel to/from all airports in the UK.

- ***Results***

Figure 1 below presents the results of the analysis.

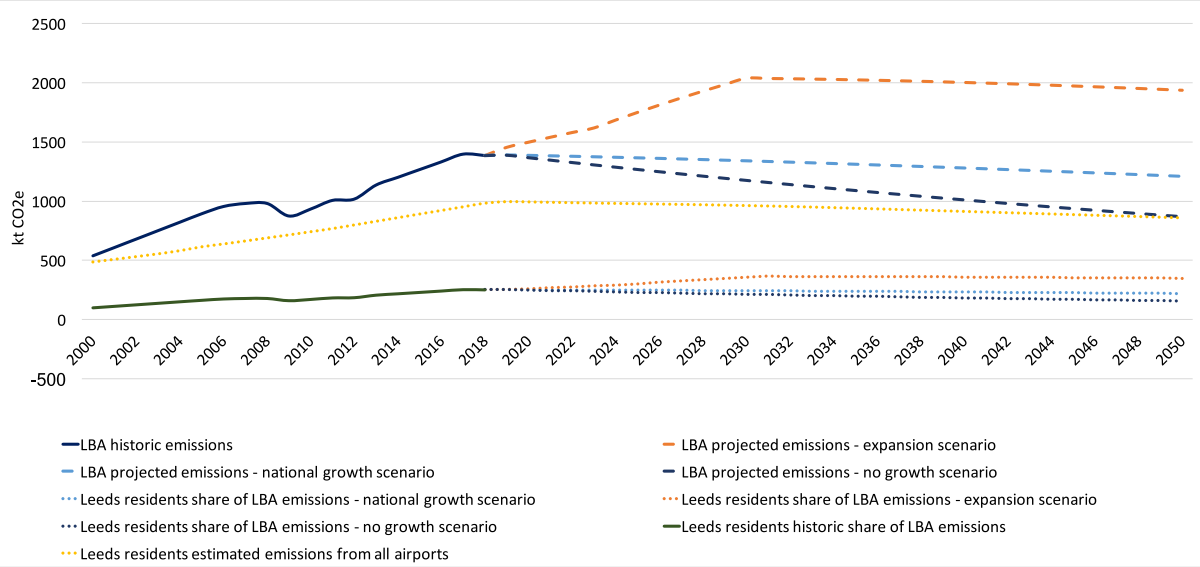


**Figure 1: Projected/estimated emissions from Leeds residents flights and LBA, 2000-2050**

In the figure, the dotted yellow line shows that the emissions associated with Leeds residents' flights to/from all airports (including LBA) grew by 102% between 2000 and 2018. If they continue to grow at the national growth rate, they will fall by 16% by 2030 and 21% between 2030 and 2050 as the impacts of growth in passenger numbers are more than offset by on-going efficiency improvements. The dark green line shows the share of LBA emissions that can be attributed to Leeds residents.

The dark blue line shows LBA's flight-related emissions from 2000 to 2018. This indicates that GHG emissions from flights to/from LBA have grown by 157% since 2000. Under an expansion scenario (i.e. the dotted orange line), we predict emissions will grow by a further 47% by 2030, before declining by 5% between 2030 and 2050 as the impacts of efficiency improvements cancel out passenger growth. Under the national growth scenario (the dotted light blue line), emissions fall by 13% between 2020 and 2050, whilst under the constant passenger scenario (the dotted dark blue line), emissions fall by 37% between 2020 and 2050.

We put these emissions from flights taken by Leeds residents and from LBA into the broader context of Leeds Carbon Roadmap in Figure 2 below. This shows Leeds' baseline scope 1 and 2 emissions from 2000 to 2018 (the solid grey line), business-as-usual projections for these emissions into the future (the upper dotted grey line) and the projected trajectory if the city delivered on its science-based targets (the lower dotted grey line). If we add emissions associated with flights taken by Leeds residents on to the baseline and the business as usual projections (the solid and dotted green lines), it adds 21% on to current scope 1 and 2 emissions, with this figure growing to 24% as baseline scope 1 and 2 emissions fall through to 2050.

The graph also allows us to compare scope 1 and 2 emissions from Leeds as a whole with flight-related emissions from LBA. In 2000, it suggests that LBA's flight based emissions were equivalent to 8% of Leeds' scope 1 and 2 emissions but they had grown to become equivalent to 30% of this figure by 2018. If Leeds' scope 1 and 2 emissions follow a business as usual trend, in 2050 emissions from the airport would be equivalent to 55% of Leeds scope 1 and 2 emissions under the expansion scenario, 35% under the national growth scenario and 25% under the constant passengers scenario. However, if Leeds is able to reduce its emissions in line with science-based targets, then emissions from LBA would be at the same level as Leeds' scope 1 and 2 emissions in 2026 under the expansion scenario, 2029 under the national growth scenario and 2031 under the constant passengers scenario.

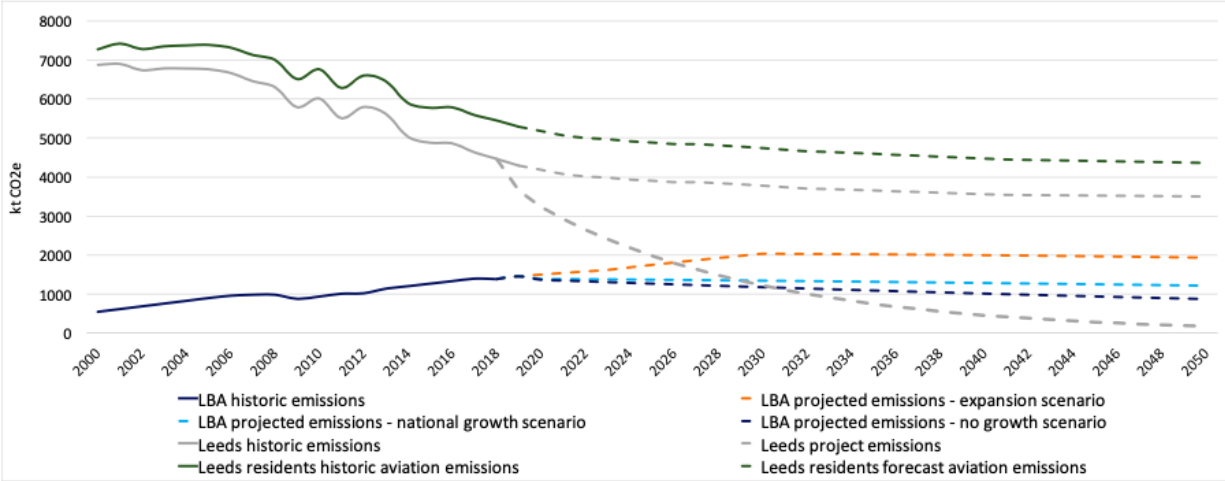


**Figure 2: Adding aviation emissions to the Leeds Carbon Roadmap**

### *4. What could be done to influence aviation emissions, and by whom?*

Given the apparent plans of all UK airports to expand in the coming years (see Table 1 above), there is a pressing need for a revised national aviation strategy that is consistent with a net zero plan that includes aviation emissions. While local government may have some influence over airport expansion (e.g. over buildings expansion, air or noise quality or local surface transport connections), the main policy levers that could be used to address aviation emissions (e.g. regulatory standards, fiscal incentives, longer distance surface connections) are only available at the national level, and the willingness to adopt them may depend on international agreement/coordination. Beyond government, organisations and individuals also have choices to make on whether/how frequently they fly, and voluntary schemes to reduce levels of flying are proving to be influential in some contexts.

For indicative purposes, we estimate that restricting flights to destinations that could be reached by train might reduce levels of emissions of flights to/from LBA in 2030 by 6%. Voluntary commitments to reduce business travel by 30% would reduce emissions by only 1%, not least because over 90% of flights from LBA are for leisure rather than business. However, if 30% of leisure passengers voluntarily committed to taking one flight every other year rather than annually this would reduce 2030 emissions by 12%.

If a national frequent flyer tax of as low as £8.50 per flight was applied, this would reduce demand and cut emissions by 3%, with impacts focused on the small proportion of people and the higher income groups that do a disproportionate amount of flying. If the revenues from a national frequent flyer tax were hypothecated and devolved, between 2020 and 2030 this would make £135 million available for low carbon investment within the Leeds City Region. This could provide enough funds to support the retrofit of domestic and public/commercial buildings in Leeds, leading to carbon reductions equivalent to 19% of LBA's flight related emissions in 2030. If invested in regional tree-planting, additional revenues from the frequent flyer tax could then completely off-set all flight-based emissions from LBA, but this would require the planting of 360 million trees, which even with the densest managed planting would require a land area of 810 square kilometres, equivalent to c1.5 times the area of Leeds.

On the viability of these indicative measures, it is important to stress that some would require legal interventions and new taxes and fiscal arrangements that are not under consideration and/or have been opposed by HM Treasury in the recent past (e.g. frequent flyer taxes and/or hypothecation and devolution of tax revenues). Others would require widespread social change and the rapid spread of no-fly or limited-fly commitments covering a significant proportion of leisure and business travel. Others would require the delivery of off-setting schemes such as tree planting at an unprecedented rate and scale.

### 5. Actions

Based on the analysis above, as a Commission:

- We acknowledge the increasing significance of aviation emissions, and the extent to which they make delivering on the extremely challenging targets adopted in the climate emergency declaration more challenging still.
- We recognise that local and regional plans such as the local plan and the inclusive growth strategy provide the context for, and that local policy and planning can have some influence over, airport expansion (e.g. on travel to and from the airport, on the expansion and performance of the airport buildings, on noise and air quality).

- We also recognise that other local initiatives such as the promotion of voluntary pledge-based approaches to deliver reductions in business and leisure air travel could make an important contribution to reducing aviation emissions.
- However, we emphasise the need for national strategies that impact on all areas and airports equally. We therefore call for the adoption of an ambitious national aviation strategy that integrates aviation into the national carbon roadmap, and that supports the delivery of measures designed first to limit and then to off-set the impacts of aviation emissions.

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