

**From:** [REDACTED]  
**To:** [Manston Airport](#)  
**Subject:** For the attention of the Manston Airport Team  
**Date:** 09 July 2021 09:46:39  
**Attachments:** [Representation to Secretary of State for Transport from David Stevens.pdf](#)

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Please find attached my representation, in support of the Airport Development, to the Secretary of State for Transport in response to his request in his Statement of Matters.

Kind regards,

David Stevens

## TR020002 – Representation to the Secretary of State for Transport

**Re-determination of the Application by RiverOak Strategic Partners Limited (“the Applicant”) for an Order granting Development Consent for the reopening and development of Manston Airport in Kent.**

### Statement of Matters

In the Department for Transport’s Statement of Matters letter dated 11<sup>th</sup> June 2021 it invited Interested Parties to make further representations on 4 matters.

#### Matter 1

**“the extent to which current national or local policies (including any changes since 9 July 2020 such as, but not limited to, the re-instatement of the ANPS) inform the level of need for the services that the Development would provide and the benefits that would be achieved from the Development”.**

a) The DCO is a Planning matter.

- Planning matters are determined by Policy.
- There have been no changes to National Policy since July 2019.
- It is still government policy to make best use of existing runways<sup>1</sup>.
- Therefore, use Manston.

b) The link between deprivation and health

- Thanet has the highest unemployment rate in Kent.<sup>2</sup>
- Thanet has the highest 18-24 unemployment rate in the South East<sup>3</sup>.
- Thanet has many areas with very high levels of deprivation<sup>4</sup>.
- There is an established link between deprivation and life expectancy with a difference of over 9 years for males and over 7 years for females<sup>5</sup>.
- The Manston development will reduce local unemployment.
- The Manston development will reduce local deprivation.
- The Manston development will improve local life expectancy and local healthy life expectancy.

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<sup>1</sup> Making Best Use of existing runways

<sup>2</sup> District Unemployment Level Kent 2021

<sup>3</sup> District Unemployment Level 2021

<sup>4</sup> Indices of Deprivation headline figures 2020

<sup>5</sup> The Kings Fund

## **Matter 2**

**“whether the quantitative need for the Development has been affected by any changes since 9 July 2019, and if so, a description of any such changes and the impacts on the level of need from those changes (such as, but not limited to, changes in demand for air freight, changes of capacity at other airports, locational requirements for air freight and the effects of Brexit and/or Covid)”.**

The quantitative need for the development has increased because:

- Stansted will not have sufficient Cargo ATMs to meet the need<sup>6</sup>.
- Heathrow’s R3 will not be available to meet the need for many years<sup>7</sup>.
- Huge growth in e-commerce and just-in-time goods requiring dedicated freighters<sup>8</sup>.
- The need to deliver new air cargo facilities that are as carbon neutral as possible<sup>9</sup>.
- New trade deals with countries outside of the EU.

## **Matter 3**

**“the extent to which the Secretary of State should, in his re-determination of the application, have regard to the sixth carbon budget (covering the years between 2033 – 2037) which will include emissions from international aviation”.**

- The Secretary of State must have regard to any relevant Policy.
- Making Best Use of existing runways is Government Policy<sup>10</sup>.
- The Government firmly believe they are on track to meet Net Zero by 2050<sup>11</sup>.
- The Manston Airport development represents a tiny proportion of UK GHG emissions and a small percentage of total UK ATMs<sup>12</sup>.
- The Manston Airport development, through its Carbon Minimisation Action Plan, will be as Carbon Neutral as possible<sup>13</sup>.
- Aeroplane operators will be obliged to offset their GHG emissions through the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)<sup>14</sup>.
- The Manston Airport development is not at odds with the recommendations made in the Sixth Carbon Budget produced by the Climate Change Committee (CCC)<sup>15</sup>.
- With the appropriate mitigation measures the proposed development’s effect on the global climate is not significant<sup>16</sup>.
- There is no reason why the Secretary of State for Transport should not grant the DCO for Manston.

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<sup>6</sup> Reduction in Cargo ATMs at Stansted

<sup>7</sup> Heathrow CAA review of plans

<sup>8</sup> IATA Air Cargo and e-commerce

<sup>9</sup> Logistics UK Call to Action report

<sup>10</sup> Making Best Use of existing runways

<sup>11</sup> Government Press release – sixth carbon budget

<sup>12</sup> CAA ATM data

<sup>13</sup> [REP11 – 008]

<sup>14</sup> CORSIA FAQs

<sup>15</sup> Sixth Carbon Budget - aviation

<sup>16</sup> [APP – 034] – table 16.16

## **Matter 4**

***“any other matters arising since 9 July 2019 which Interested Parties consider are material for the Secretary of State to take into account in his re-determination of the application”.***

- Louise Congdon of York Aviation was called as an “expert witness” by Stone Hill Park during the examination.
- The Examining Authority gave significant weight to her forecasting evidence.
- During the Stansted Airport Public Inquiry, it was significant that the Manchester Airport Group (MAG) used Dan Galpin of ICF to act as their expert witness for Air Traffic Forecasts and Projections<sup>17</sup>.
- During the Stansted Airport Public Inquiry, the Manchester Airport Group (MAG) did use Louise Congdon as their witness but only for socio-economic impacts.
- On 11<sup>th</sup> February 2021 (Day 19 of the Inquiry), Louise Congdon, when cross-examined by Paul Stinchcombe QC, acting for Stop Stansted Expansion (SSE), confirmed she was not qualified to act as an expert witness for forecasting.
- In their closing submissions the appellant, STAL, stated that *“Mr Galpin is the only expert air traffic forecasting witness who has given evidence to the inquiry”*<sup>18</sup>.

**This must cast significant doubt on the Examining Authority’s reliance on the forecasting predictions put forward by Louise Congdon and help to explain why the Secretary of State was inclined to disagree with the conclusions drawn by the Examining Authority.**

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**For all the reasons outlined above, I firmly support the reopening of Manston Airport and urge the Secretary of State for Transport to grant the DCO for the development.**

**David Stevens.**

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<sup>17</sup> Stansted Airport Public Inquiry - programme

<sup>18</sup> Closing submissions by STAL





HM Government

# Beyond the horizon

## The future of UK aviation

Making best use of existing runways



June 2018



HM Government

# Beyond the horizon

## The future of UK aviation

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# 1. Making best use of existing runways

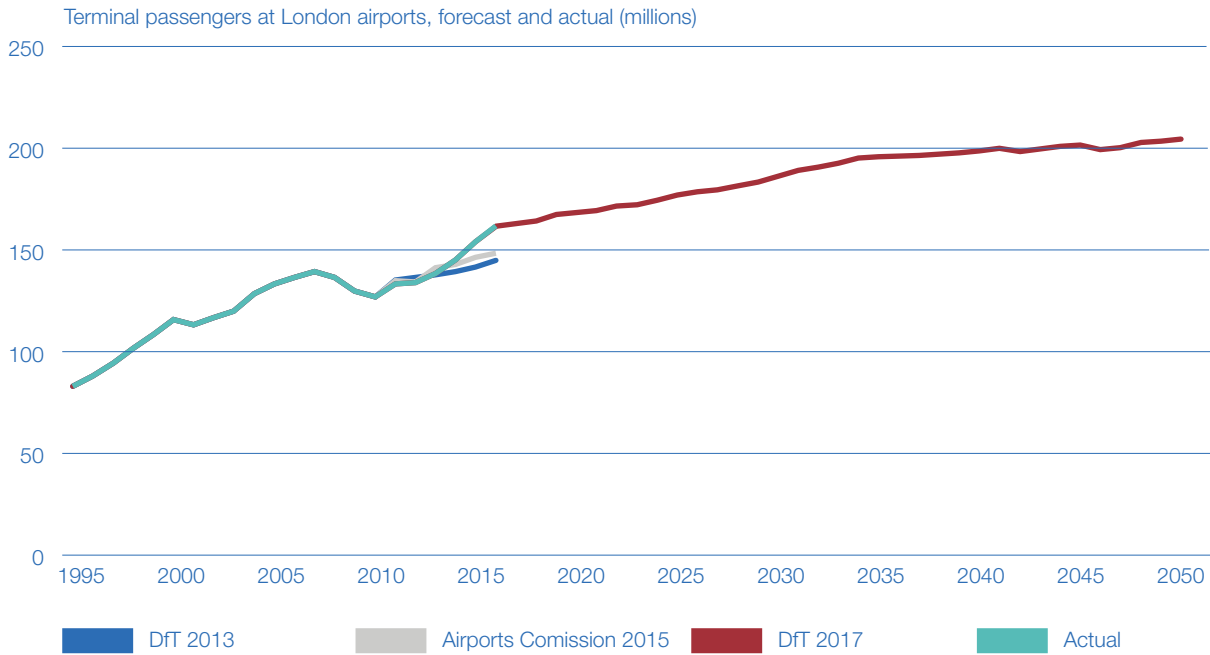
- 1.1 The government's 2013 Aviation Policy Framework provided policy support for airports outside the South East of England to make best use of their existing airport capacity. Airports within the South East were to be considered by the newly established Airports Commission.
- 1.2 The Airports Commission's Final Report recognised the need for an additional runway in the South East by 2030 but also noted that there would be a need for other airports to make more intensive use of their existing infrastructure.
- 1.3 The government has since set out its preferred option for a new Northwest runway at Heathrow by 2030 through drafts of the Airports National Policy Statement (NPS), but has not yet responded on the recommendation for other airports to make more intensive utilisation of their existing infrastructure.
- 1.4 On 24th October 2017 the Department for Transport (DfT) released its latest aviation forecasts. These are the first DfT forecasts since 2013<sup>1</sup>. The updated forecasts reflect the accelerated growth experienced in recent years and that demand was 9% higher in London<sup>2</sup> in 2016 than the Airports Commission forecast<sup>3</sup>. This has put pressure on existing infrastructure, despite significant financial investments by airports over the past decade, and highlights that government has a clear issue to address.
- 1.5 The Aviation Strategy call for evidence set out that government agrees with the Airports Commission's recommendation and was minded to be supportive of all airports who wish to make best use of their existing runways, including those in the South East, subject to environmental issues being addressed. The position is different for Heathrow, where the government's proposed policy on expansion is set out in the proposed Airports NPS.

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1 Additional aviation forecasts were published by the Airports Commission in 2015 to support their recommendations for an additional runway in the south east.

2 Heathrow, Gatwick, Stansted, Luton and London City

3 The difference is explained largely by the fact that oil prices were lower than expected



### Call for evidence response summary

- 1.6 The Aviation Strategy call for evidence document asked specifically for views on the government's proposal to support airports throughout the UK making best use of their existing runways, subject to environmental issues being addressed.
- 1.7 We received 346 consultation responses. Excluding those who either did not respond or responded on a different topic, 60% were in favour, 17% against and 23% supportive provided certain issues were addressed.
- 1.8 The main issues raised included the need for environmental issues such as noise, air quality, and carbon to be fully addressed as part of any airport proposal; the need for improved surface access and airspace modernisation to handle the increased road / rail and air traffic; and clarification on the planning process through which airport expansion decisions will be made.

### Role of local planning

- 1.9 Most of the concerns raised can be addressed through our existing policies as set out in the 2013 Aviation Policy Framework, or through more recent policy updates such as the new UK Airspace Policy or National Air Quality Plan. For the majority of environmental concerns, the government expects these to be taken into account as part of existing local planning application processes. It is right that decisions on the elements which impact local individuals such as noise and air quality should be considered through the appropriate planning process and CAA airspace change process.
- 1.10 Further, local authorities have a duty to consult before granting any permission, approval, or consent. This ensures that local stakeholders are given appropriate opportunity to input into potential changes which affect their local environment and have their say on airport applications.

## Role of national policy

- 1.11 There are, however, some important environmental elements which should be considered at a national level. The government recognises that airports making the best use of their existing runways could lead to increased air traffic which could increase carbon emissions.
- 1.12 We shall be using the Aviation Strategy to progress our wider policy towards tackling aviation carbon. However, to ensure that our policy is compatible with the UK's climate change commitments we have used the DfT aviation model<sup>4</sup> to look at the impact of allowing all airports to make best use of their existing runway capacity<sup>5</sup>. We have tested this scenario against our published no expansion scenario and the Heathrow Airport North West Runway scheme (LHR NWR) option, under the central demand case.
- 1.13 The forecasts are performed using the DfT UK aviation model which has been extensively quality assured and peer reviewed and is considered fit for purpose and robust for producing forecasts of this nature. Tables 1-3 show the expected figures in passenger numbers, air traffic movements, and carbon at a national level for 2016, 2030, 2040, and 2050.

	Baseline	Baseline + best use	LHR NWR base	LHR NWR + best use
2016	266.6	266.6	266.6	266.6
2030	313.4	314.8	342.5	341.9
2040	359.8	365.9	387.4	388.8
2050	409.5	421.3	435.3	444.2

Table 1: Terminal Passengers at UK airports, million passengers per annum

	Baseline	Baseline + best use	LHR NWR base	LHR NWR + best use
2016	2,119	2,119	2,119	2,119
2030	2,330	2,358	2,459	2,460
2040	2,584	2,602	2,697	2,700
2050	2,901	2,958	3,013	3,043

Table 2: Air Transport Movements (ATMs) at UK airports, 000s

	Baseline	Baseline best use	LHR NWR base	LHR NWR best use
2016	37.3	37.3	37.3	37.3
2030	38.6	38.8	43.5	43.4
2040	38.1	38.7	42.3	42.4
2050	37.0	37.9	39.9	40.8

Table 3: CO<sub>2</sub> from flights departing UK airports, million tonnes

4 [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/674749/uk-aviation-forecasts-2017.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/674749/uk-aviation-forecasts-2017.pdf)

5 Modelled the impact of airports increasing their planning cap whenever they have become 95% full.

## Implications for the UK's carbon commitments

1.14 As explained in Chapter 6 of the Aviation Strategy Next Steps document<sup>6</sup>, we have made significant steps in developing international measures for addressing aviation carbon dioxide (CO<sub>2</sub>) emissions, including reaching agreement at the International Civil Aviation Organisation (ICAO) in October 2016 on a global offsetting scheme for international aviation, known as the Carbon Offsetting and Reduction Scheme for International Aviation, or CORSIA. However, there remains uncertainty over future climate change policy and international arrangements to reduce CO<sub>2</sub> and other greenhouse gases. The Airports Commission devised two scenarios which continue to be appropriate to reflect this uncertainty: carbon traded and carbon capped<sup>7</sup>. In this assessment the DfT has followed the same approach.

## Carbon traded scenario

1.15 Under the carbon-traded scenario, UK aviation emissions could continue to grow provided that compensatory reductions are made elsewhere in the global economy. This could be facilitated by a carbon trading mechanism in which aviation emissions could be traded with other sectors. In this case, provided a global trading scheme is place, higher UK aviation activity would have no impact on global emissions as any increase in emissions would be offset elsewhere and therefore there is nothing to indicate that this policy would prevent the UK meeting its carbon obligations.

## Carbon capped scenario

1.16 The carbon-capped scenario was developed to explore the case for expansion even in a future where aviation emissions were limited to the Committee on Climate Change's (CCC) planning assumption of 37.5Mt of CO<sub>2</sub> in 2050. Under DfT's carbon-capped scenario the cap is met using a combination of carbon pricing and specific measures. For the central demand case we determined that the most appropriate specific measures to use, based on cost effectiveness and practicality of implementation, were more efficient aircraft ground movements (using single engine taxiing) and higher uptake of renewable fuels<sup>8</sup>.

6 <https://www.gov.uk/government/consultations/a-new-aviation-strategy-for-the-uk-call-for-evidence>

7 For background to the Carbon Policy scenarios used by DfT both in this document and in its airport expansion analysis see pages 9 and 33-38 of: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/653879/updated-appraisal-report-airport-capacity-in-the-south-east.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/653879/updated-appraisal-report-airport-capacity-in-the-south-east.pdf)

8 These would be implemented alongside the carbon price.

- 1.17 The more efficient ground movement policy involves government action to incentivise the use of single-engine taxiing at UK airports. It is assumed that the policy would lead to a 95% take-up rate by 2030 and beyond and it is estimated that this measure would reduce fuel consumption by around 1% per flight on average<sup>9</sup>.
- 1.18 The renewable fuels policy involves government regulations to mandate specific renewable fuel percentages in aviation fuel supply. Any measures deployed would be designed to ensure that the renewable feedstock is sustainable and delivers substantial lifecycle CO<sub>2</sub> savings, such as municipal waste, which on this basis could deliver savings of over 70%. Such a scheme would be consistent with the future aims of the Renewable Transport Fuel Obligation to include aviation and focus on advanced fuels, as set out in the government’s response to its recent consultation<sup>10</sup>. The levels of carbon reduction delivered by the policy measures are presented in Table 4.

	No expansion base	No expansion + best use	LHR NWR base	LHR NWR + best use
Carbon reduction required, MtCO <sub>2</sub>	-0.5	0.4	2.4	3.3
Abatement from single engine taxiing, MtCO <sub>2</sub> *	0	0.3	0.3	0.3
Renewable fuel uptake required	0	0**	12%	16%

\*Figure does not vary due to rounding  
 \*\*Zero due to rounding

Table 4: Policies to meet CCC cap (37.5 MtCO<sub>2</sub>), levels in 2050

- 1.19 The level of renewable fuels required is higher under the making best use sensitivity but these are still at the conservative end of the range of forecast future biofuel supply<sup>11</sup>.
- 1.20 There is significant uncertainty over the likely future cost of these measures and their impact on carbon so this policy mix is presented to illustrate the type of abatement action that could be taken. It should not be interpreted as a statement of future carbon policy which will be considered through the development of the Aviation Strategy. Other measures are likely to be available and may turn out to be more cost effective or have greater abatement potential.
- 1.21 On balance, therefore, it is likely that these or other measures would be available to meet the planning assumption under this policy.

9 Ricardo Energy & Environment, 2017. *Carbon Abatement in UK Aviation* [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/653776/carbon-abatement-in-uk-aviation.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/653776/carbon-abatement-in-uk-aviation.pdf)

10 DfT, 2017. *Renewable transport fuel obligations order: government response*. <https://www.gov.uk/government/publications/renewable-transport-fuel-obligations-order-government-response>

11 See Increased use of biofuels chapter in Carbon Abatement in UK Aviation Report prepared by Ricardo Energy & Environment for discussion [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/653776/carbon-abatement-in-uk-aviation.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/653776/carbon-abatement-in-uk-aviation.pdf)



## Local environmental impacts

- 1.22 The government recognises the impact on communities living near airports and understands their concerns over local environmental issues, particularly noise, air quality and surface access. As airports look to make the best use of their existing runways, it is important that communities surrounding those airports share in the economic benefits of this, and that adverse impacts such as noise are mitigated where possible.
- 1.23 For the majority of local environmental concerns, the government expects these to be taken into account as part of existing local planning application processes.
- 1.24 As part their planning applications airports will need to demonstrate how they will mitigate local environmental issues, which can then be presented to, and considered by, communities as part of the planning consultation process. This ensures that local stakeholders are given appropriate opportunity to input into potential changes which affect their environment and have their say on airport applications.

## Policy statement

- 1.25 As a result of the consultation and further analysis to ensure future carbon emissions can be managed, government believes there is a case for airports making best of their existing runways across the whole of the UK. The position is different for Heathrow Airport where the government's policy on increasing capacity is set out in the proposed Airports NPS.
- 1.26 Airports that wish to increase either the passenger or air traffic movement caps to allow them to make best use of their existing runways will need to submit applications to the relevant planning authority. We expect that applications to increase existing planning caps by fewer than 10 million passengers per annum (mppa) can be taken forward through local planning authorities under the Town and Country Planning Act 1990. As part of any planning application airports will need to demonstrate how they will mitigate against local environmental issues, taking account of relevant national policies, including any new environmental policies emerging from the Aviation Strategy. This policy statement does not prejudge the decision of those authorities who will be required to give proper consideration to such applications. It instead leaves it up to local, rather than national government, to consider each case on its merits.
- 1.27 Applications to increase caps by 10mppa or more or deemed nationally significant would be considered as Nationally Significant Infrastructure Projects (NSIPs) under the Planning Act 2008 and as such would be considered on a case by case basis by the Secretary of State.

- 1.28 Given the likely increase in ATMs that could be achieved through making best use of existing runways is relatively small (2% increase in ATMs “without Heathrow expansion” scenario; 1% “with Heathrow”), we do not expect that the policy will have significant implications for our overall airspace capacity. However it is important to note that any flightpath changes required as a result of a development at an airport will need to follow the CAA’s airspace change process. This includes full assessment of the likely environmental impacts, consideration of options to mitigate these impacts, and the need to consult with stakeholders who may be affected. Approval for the proposed airspace change will only be granted once the CAA has been satisfied that all aspects, including safety, have been addressed. In addition, government has committed to establish an Independent Commission on Civil Aviation Noise (ICCAN) to help ensure that the noise impacts of airspace changes are properly considered and give communities a greater stake in noise management.
- 1.29 **Therefore the government is supportive of airports beyond Heathrow making best use of their existing runways. However, we recognise that the development of airports can have negative as well as positive local impacts, including on noise levels. We therefore consider that any proposals should be judged by the relevant planning authority, taking careful account of all relevant considerations, particularly economic and environmental impacts and proposed mitigations. This policy statement does not prejudge the decision of those authorities who will be required to give proper consideration to such applications. It instead leaves it up to local, rather than national government, to consider each case on its merits.**



**COVID-19 continues to have a significant impact on the number of claimants of unemployment benefits.**

**The claimant rate in Kent is currently 5.6%, below the national average rate of 6.0%. Unemployment in Kent fell by 5.1% over the previous month, whereas nationally it increased by 3%.**

**Youth unemployment (18-24) in Kent is slightly higher than the national average: 8.7% in Kent, 8.2% UK, however Kent saw a reduction (-5.8%) while nationally youth unemployment increased (+1.5%).**

**Unemployment has fallen for both males and females over last month: -4.9% for males in Kent compared to -5.4% for females.**

**The latest data for May 2021 was released on the 15th June 2021 and is presented below.**

This workbook looks at the number of people claiming either Jobseekers Allowance or Universal Credit principally for the reason of being unemployed. It also looks at the age and sex of claimants, in particular at youth unemployment which is defined as those aged 18 to 24.

This workbook uses information from a dataset called The Claimant Count by Sex and Age. This experimental series counts the number of people claiming Jobseeker's Allowance plus those who claim Universal Credit who are out of work.

Under Universal Credit a broader span of claimants are required to look for work than under Jobseeker's Allowance. As Universal Credit Full Service is rolled out in particular areas, the number of people recorded as being on the Claimant Count is therefore likely to rise.

Unemployment rates are calculated using the Office for National Statistics Mid-year Population Estimates 2001-2019. The resident working age population is defined as all males and females aged 16-64. These denominators will be updated annually with the ONS mid-year population estimates.

## Related Documents

[Welfare Reform Report](#)

[Ward unemployment interactive model](#)

[Unemployment Measures Bulletin](#)

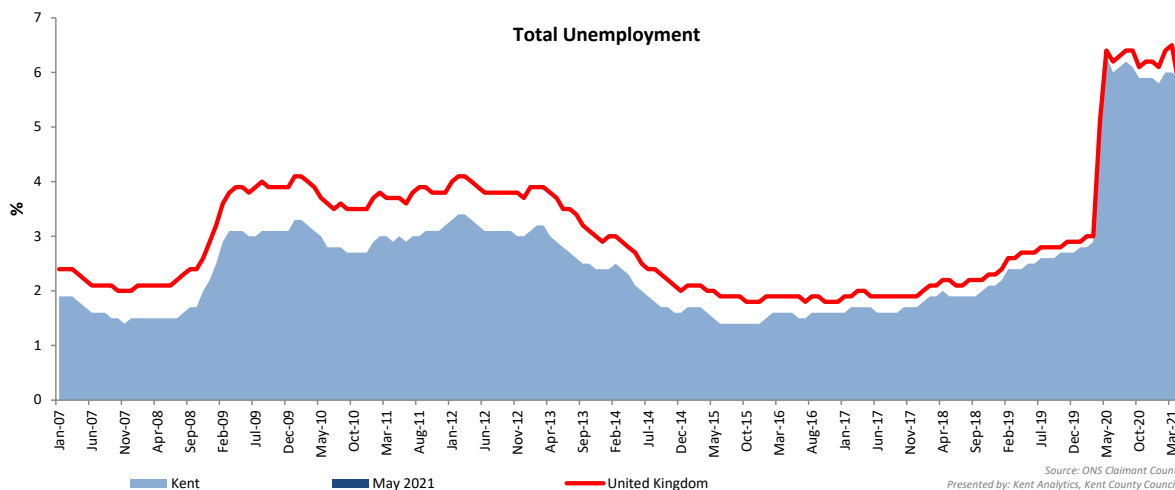
[Universal Credit Claimants](#)

## Further Information

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May 2021	Number	% rate	Number change since April 2021	% change since April 2021	Number change since May 2020	% change since May 2020
<b>Kent</b>	52,985	5.6%	-2,860	-5.1%	-7,060	-11.8%
<b>United Kingdom</b>	2,503,160	6.0%	+73,635	+3.0%	-158,180	-5.9%

### District unemployment

May 2021	Number	% rate	Number change since April 2021	% change since April 2021	Number change since May 2020	% change since May 2020
Ashford	4,250	5.5%	-200	-4.5%	-695	-14.1%
Canterbury	4,815	4.6%	-220	-4.4%	-660	-12.1%
Dartford	3,725	5.2%	-265	-6.6%	-445	-10.7%
Dover	4,150	6.0%	-250	-5.7%	-695	-14.3%
Folkestone & Hythe	4,440	6.7%	-220	-4.7%	-455	-9.3%
Gravesham	4,635	7.1%	-260	-5.3%	-280	-5.7%
Maidstone	5,100	4.9%	-290	-5.4%	-645	-11.2%
Sevenoaks	2,655	3.8%	-250	-8.6%	-370	-12.2%
Swale	5,625	6.2%	-240	-4.1%	-745	-11.7%
Thanet	7,615	9.4%	-220	-2.8%	-1,180	-13.4%
Tonbridge and Malling	3,090	3.9%	-195	-5.9%	-470	-13.2%
Tunbridge Wells	2,875	4.0%	-250	-8.0%	-440	-13.3%
<b>Kent</b>	<b>52,985</b>	<b>5.6%</b>	<b>-2,860</b>	<b>-5.1%</b>	<b>-7,060</b>	<b>-11.8%</b>
Medway	11,590	6.6%	-440	-3.7%	-735	-6.0%

### Kent unemployment headlines May 2021

The unemployment rate in Kent is 5.6%. This is below the rate for United Kingdom (6%).

52,985 people were claiming unemployment benefits in Kent. This has fallen since last month

Thanet has the highest unemployment rate at 9.4%. Sevenoaks has the lowest unemployment rate at 3.8%.

The 18-24 year old unemployment rate in Kent is 8.7%. They account for 19.9% of all unemployed people in the area

Thanet has the highest 18-24 year old unemployment rate in the South East at 14.9%.

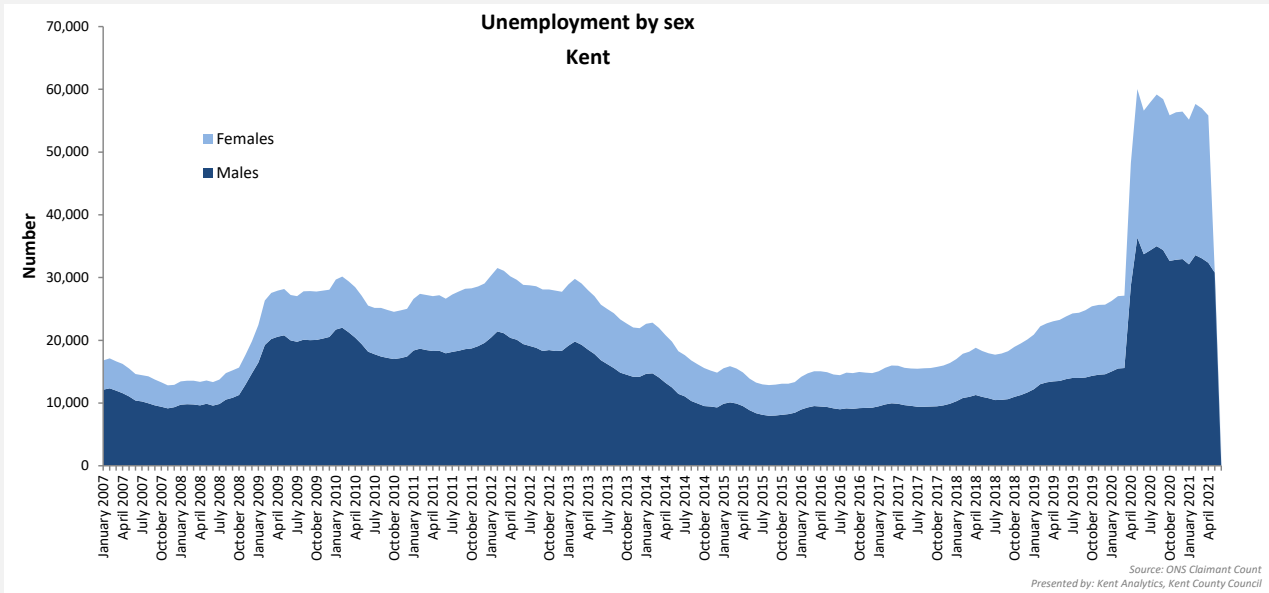
## Unemployment by sex

Kent

May 2021	Number	% rate	Number change since April 2021	% change since April 2021	Number change since May 2020	% change since May 2020
Males	30,765	6.5%	-1,585	-4.9%	-5,600	-15.4%
Females	22,220	4.6%	-1,275	-5.4%	-1,460	-6.2%
<b>Total</b>	<b>52,985</b>	<b>5.6%</b>	<b>-2,860</b>	<b>-5.1%</b>	<b>-7,060</b>	<b>-11.8%</b>

## District unemployment by sex

May 2021	Male claimants	Males claimant rate	Female claimants	Female claimant rate
Ashford	2,415	6.4%	1,835	4.6%
Canterbury	2,865	5.4%	1,950	3.7%
Dartford	2,065	5.8%	1,665	4.6%
Dover	2,425	7.0%	1,725	4.9%
Folkestone & Hythe	2,680	8.1%	1,760	5.4%
Gravesham	2,640	8.1%	1,995	6.1%
Maidstone	2,930	5.6%	2,170	4.1%
Sevenoaks	1,485	4.3%	1,170	3.3%
Swale	3,260	7.2%	2,365	5.2%
Thanet	4,605	11.6%	3,010	7.2%
Tonbridge & Malling	1,740	4.4%	1,345	3.3%
Tunbridge Wells	1,655	4.6%	1,220	3.4%
<b>Kent</b>	<b>30,765</b>	<b>6.5%</b>	<b>22,220</b>	<b>4.6%</b>
Medway	6,775	7.7%	4,815	5.5%



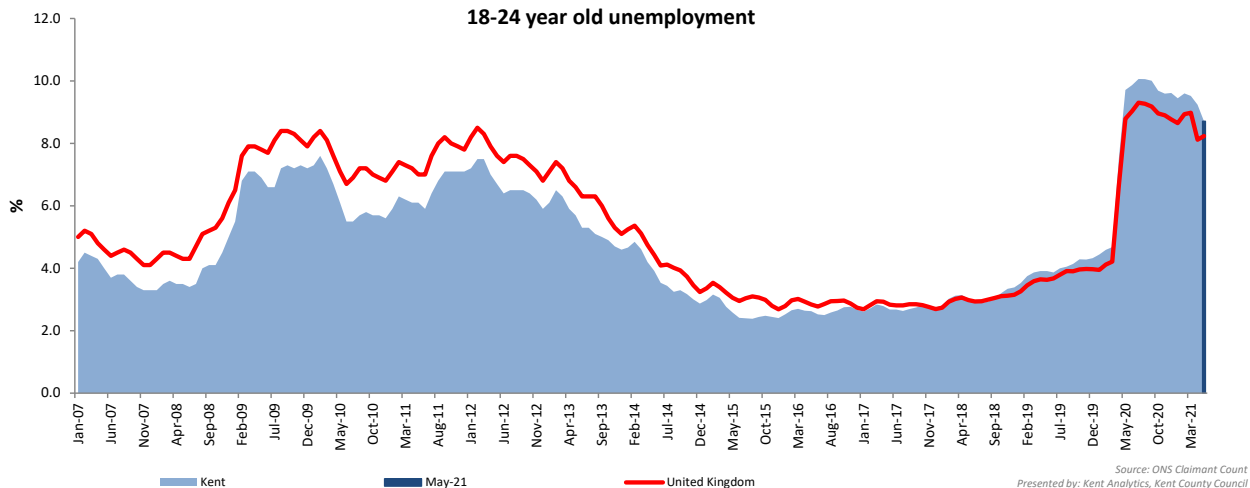
## Unemployment by age group in Kent

May 2021	Number	% rate	Number change since April 2021	% change since April 2021	Number change since May 2020	% change since May 2020
18-24	10,560	8.7%	-645	-5.8%	-1,220	-10.4%
25-49	29,260	6.0%	-1,485	-4.8%	-4,310	-12.8%
50-64	13,080	4.2%	-720	-5.2%	-1,460	-10.0%

## District unemployment by age group

May 2021	18-24 claimants	25-49 claimants	50-64 claimants	18-24 claimant rate	25-49 claimant rate	50-64 claimant rate
Ashford	890	2,290	1,065	10.1%	5.7%	4.1%
Canterbury	1,055	2,605	1,150	4.1%	5.6%	4.0%
Dartford	660	2,280	775	8.7%	5.5%	3.9%
Dover	830	2,215	1,095	10.3%	6.6%	4.2%
Folkestone & Hythe	835	2,340	1,260	11.4%	7.3%	5.2%
Gravesham	945	2,595	1,090	12.4%	7.4%	5.3%
Maidstone	950	2,970	1,175	8.1%	5.4%	3.5%
Sevenoaks	510	1,450	690	7.1%	4.1%	2.8%
Swale	1,250	2,985	1,375	11.0%	6.5%	4.6%
Thanet	1,485	4,215	1,905	14.9%	10.6%	6.7%
Tonbridge and Malling	635	1,680	770	7.1%	4.1%	2.9%
Tunbridge Wells	510	1,630	730	7.2%	4.3%	3.0%
Kent	10,560	29,260	13,080	8.7%	6.0%	4.2%
Medway	2,480	6,595	2,505	11.0%	7.0%	4.8%

## 18-24 year old unemployment

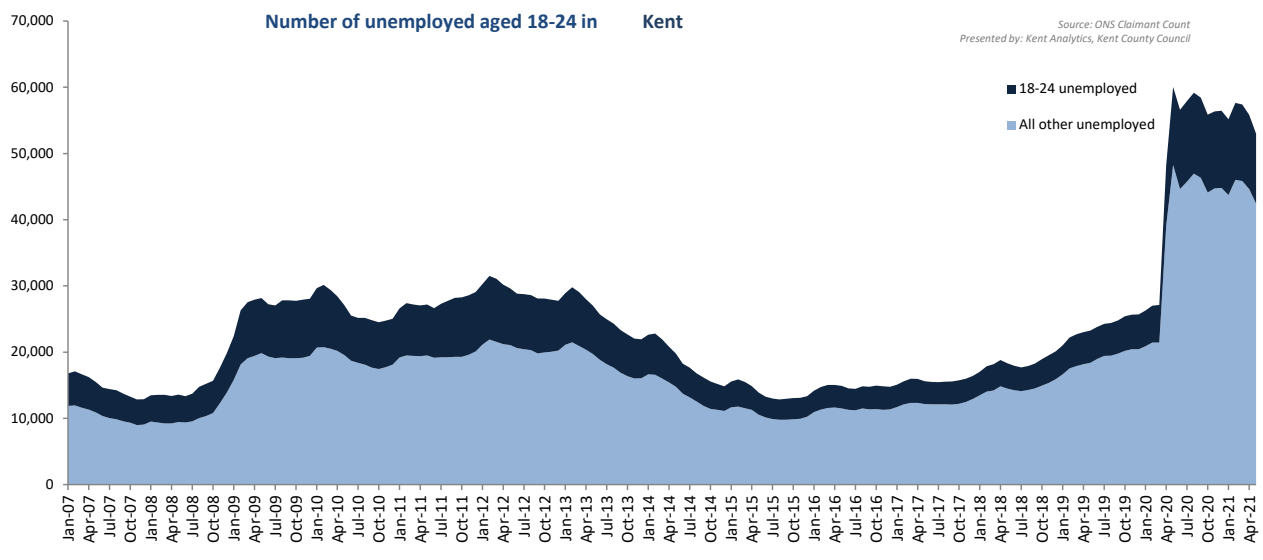
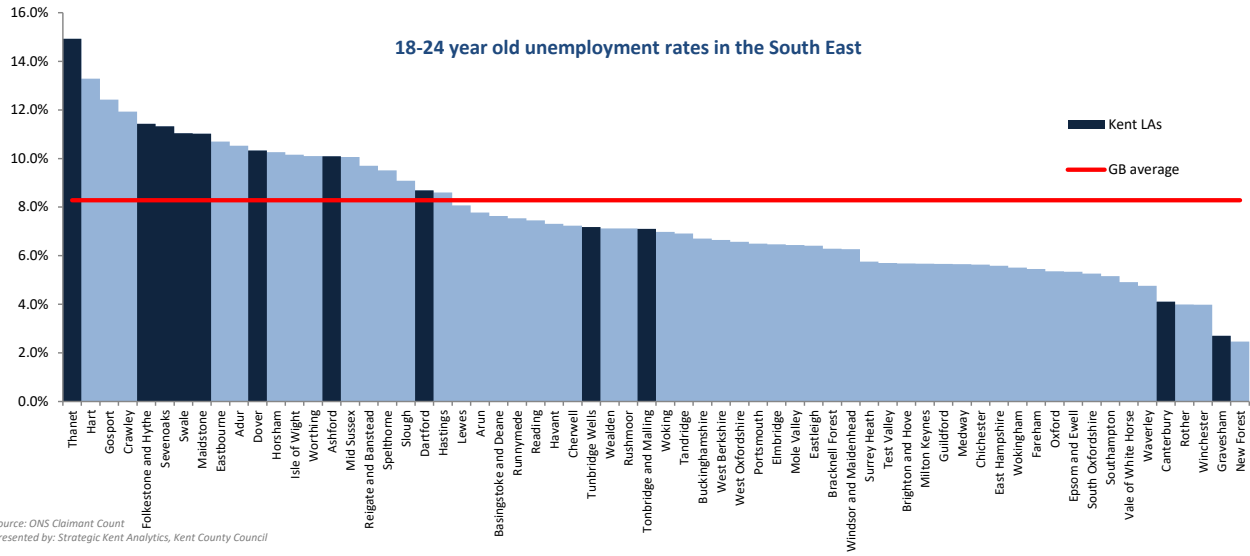


## 18-24 Unemployment

May 2021	Number	% rate	Number change since April 2021	% change since April 2021	Number change since May 2020	% change since May 2020
Kent	10,560	8.7%	-645	-5.8%	-1,220	-10.4%
United Kingdom	465,245	8.2%	+6,660	+1.5%	-30,930	-6.2%

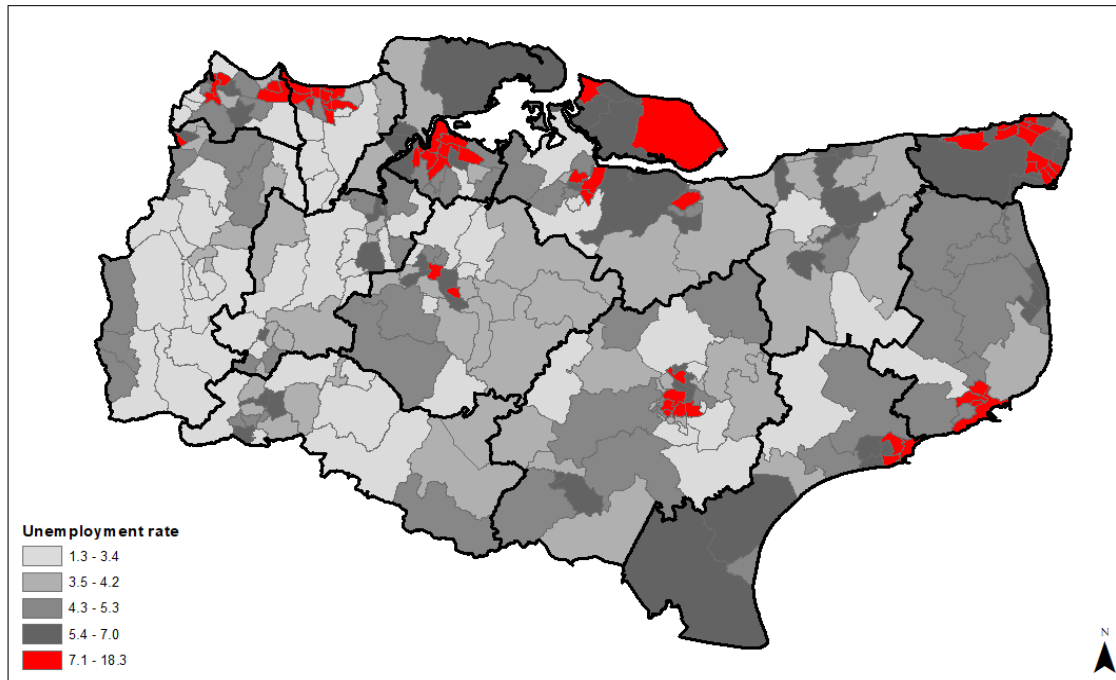
## Unemployment by age group - % of all unemployed

May 2021	Number of claimants in Kent	% of all unemployed in Kent	Number of claimants in United Kingdom	% of all unemployed in United Kingdom
18-24	10,560	19.9%	465,245	18.6%
25-49	29,260	55.2%	1,434,100	57.3%
50-64	13,080	24.7%	598,035	23.9%





Ward Unemployment rates in Kent & Medway  
May 2021



Source: NOMIS  
Map produced by Kent Analytics, Kent County Council  
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This workbook looks at the total number of people claiming either Jobseekers Allowance or Universal Credit principally for the reason of being unemployed. It also looks at the age profile of claimants, in particular at youth unemployment which is defined as those aged 18 to 24.

**This workbook uses information from a dataset called The Claimant Count by Sex and Age. This experimental series counts the number of people claiming Jobseeker's Allowance plus those who claim Universal Credit who are out of work. The dataset currently includes some out of work claimants of Universal Credit who are not required to look for work; for example, due to illness or disability. Therefore this dataset is considered experimental and the results should be interpreted with caution.**

Unemployment rates are calculated using the Office for National Statistics Mid-year Population Estimates 2001-2018. The resident working age population is defined as all males and females aged 16-64. These denominators will be updated annually with the ONS mid-year population estimates.

#### Introduction of Universal Credit

Since 2013 the roll out of Universal Credit has progressed across the UK. Universal Credit will replace a number of means-tested benefits including the means-tested element of Jobseeker's Allowance (JSA).

The Universal Credit Live Service roll out in Kent & Medway began in April 2015. This was replaced in 2016 with the Universal Credit Full Service using the DWP bespoke digital system. The full service rollout in Kent was completed in autumn 2018. The table below shows how Universal Credit rolled out within Kent districts.

While initially Universal Credit was only available to single claimants without a partner and without child dependents, the roll out of the full service made Universal Credit available to all new claimant types and to those reporting changes to their personal circumstances.

From July 2019 the government intends to begin a pilot scheme transferring claimants of existing benefits (those that Universal Credit was designed to replace) onto Universal Credit. This managed migration will start initially with 10,000 existing claimants. They won't start moving people over to Universal Credit in great numbers until the pilot scheme has been completed and assessed, however they plan to have completed the full migration process by the end of 2023.

For more information on Universal Credit: <https://www.gov.uk/universal-credit>

Produced by:  
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## The Index of Multiple Deprivation (IMD2019): Headline findings for Kent

### Related Documents

The [Deprivation and Poverty](#) web page contains more information which you may find useful.

- *Children in Poverty*
- *Homelessness*
- *Unemployment and benefits claimants*
- *Rough Sleepers*

**NOTE:** within this bulletin “Kent” refers to the Kent County Council (KCC) area which excludes Medway Unitary Authority

### Contact details

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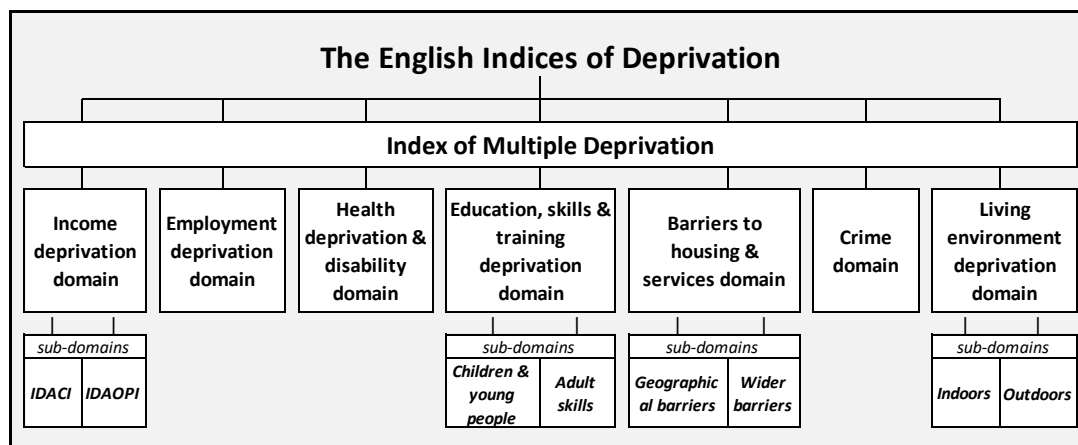
The Index of Multiple Deprivation (IMD2019) is the official measure of relative deprivation in England and is part of a suite of outputs that form the English Indices of Deprivation 2019 (IoD2019). This bulletin presents the findings for Kent.

- There are 901 Lower Super Output Areas (LSOAs) in Kent. A total of 555 remained within the same decile for IMD2019 as they were in IMD2015. This accounts for 62% of all Kent LSOAs.
- The number of Kent LSOAs that are within the 10% most deprived LSOAs in England between the IMD2019 and the previous IMD2015 remains at 51.
- The level of deprivation in nine out of 12 Kent local authority districts has increased since IMD2015 relative to other areas in England.
- Thanet continues to rank as the most deprived local authority in Kent.
- Tunbridge Wells continues to rank as the least deprived local authority in Kent.
- Tonbridge & Malling has experienced the largest increase in deprivation relative to other areas.
- Gravesham has experienced the largest decrease in deprivation relative to other areas.

## Overview of the Indices of Deprivation 2019

The Indices of Deprivation 2019 (IoD2019) is produced by the Ministry of Housing, Communities and Local Government (MHCLG) and provides a set of relative measures of deprivation for neighbourhoods or small areas called Lower-layer Super Output Areas (LSOAs) across England.

The IoD2019 is based on 39 separate indicators, organised across seven distinct domains and 4 sub-domains of deprivation. These are combined and weighted to calculate the overall Index of Multiple Deprivation 2019 (IMD2019). The IMD2019 is the most widely used of these indices.



IDACI - Indices of deprivation affecting children index

IDAOPi - Indices of deprivation affecting older people index

The IMD2019, domain indices and the supplementary indices, together with the higher area summaries, are collectively referred to as the IoD2019.

## Geography and spatial scale

The IoD2019 provides a measure of deprivation experienced by people living in each neighbourhood or LSOA. LSOAs were developed by the Office for National Statistics (ONS) before the 2011 Census. There are 32,844 LSOAs in England with an average of 1,500 residents each and are a standard way of dividing up the country. They do not have descriptive place names like local electoral wards or parishes do but are named in a format beginning with the name of the local authority district followed by a 4-character code e.g. Ashford 001A.

All LSOAs in England are ranked according to their level of deprivation relative to that of other areas. A rank of 1 being the most deprived and a rank of 32,844 being the least deprived.

High ranking LSOAs or neighbourhoods can be referred to as the 'most deprived' or as being 'highly deprived' to aid interpretation. However, there is no definitive threshold above which an area is described as 'deprived'. The

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IoD2019 measure deprivation on a *relative* rather than an *absolute* scale, so an LSOA ranked 100th is more deprived than an LSOA ranked 200th, but this does not mean it is twice as deprived.

It is common to describe how relatively deprived a small area is by saying whether it falls among the most deprived 10 per cent, 20 per cent or 30 per cent of small areas in England (although there is no definitive cut-off at which an area is described as 'deprived').

To help with this, deprivation 'deciles' are published alongside ranks. Deciles are calculated by ranking the 32,844 small areas in England from most deprived to least deprived and dividing them into 10 equal groups. These range from the most deprived 10 per cent of small areas nationally to the least deprived 10 per cent of small areas nationally.

Summary measures have been produced for the following higher-level geographies:

- lower tier local authority districts – Local Authority
- upper-tier local authorities – Counties, Metropolitan counties, & Unitary Authorities
- local enterprise partnerships
- clinical commissioning groups.

### **The Data**

As far as is possible, each indicator is based on data from the most recent time point available. Using the latest available data in this way means that there is not a single consistent time point for all indicators. However, in practice most indicators in the IoD2019 relate to a 2015/16 timepoint. As a result, the indicators do not take into consideration any changes to policy since the time point of the data used. For example, the 2015/16 benefits data used do not include the impact of the roll out of Universal Credit, which only began to replace certain income and health related benefits from April 2016.

### **Uses of the IMD and IoD**

Since their original publication in 2000 the Indices have been used widely for a variety of purposes, including the following:

- Targeting resources, services and interventions
- Policy and strategy
- As an analytical resource to support commissioning by local authorities and health services, and in exploring inequalities.
- Funding bids

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This bulletin presents the IMD2019 in comparison with IMD2015 at LSOA level in Kent and Medway. Summary measures for IMD2015 and IMD2019 at local authority and county level are also presented.

Due to the large number of LSOAs in Kent (902) the tables in this bulletin show only the most deprived 10% LSOAs in Kent. Full lists of all LSOAs in Kent & Medway with scores and ranks for all the domains are available in Excel format on request from Strategic Commissioning – Analytics.

e:-mail [research@kent.gov.uk](mailto:research@kent.gov.uk) or telephone 03000 417444

The 2019IMD has not been made available at ward level. However following guidance from MHCLG we have produced a separate ward level IMD2019 summary that is available in a separate document.

### **Further information**

Further information about the Indices of Deprivation 2019 is available from The Ministry of Housing, Communities and Local Government via their [website](#).

[www.gov.uk/government/statistics/english-indices-of-deprivation-2019](http://www.gov.uk/government/statistics/english-indices-of-deprivation-2019)

## Deprivation at small area level in Kent's Lower Super Output Areas

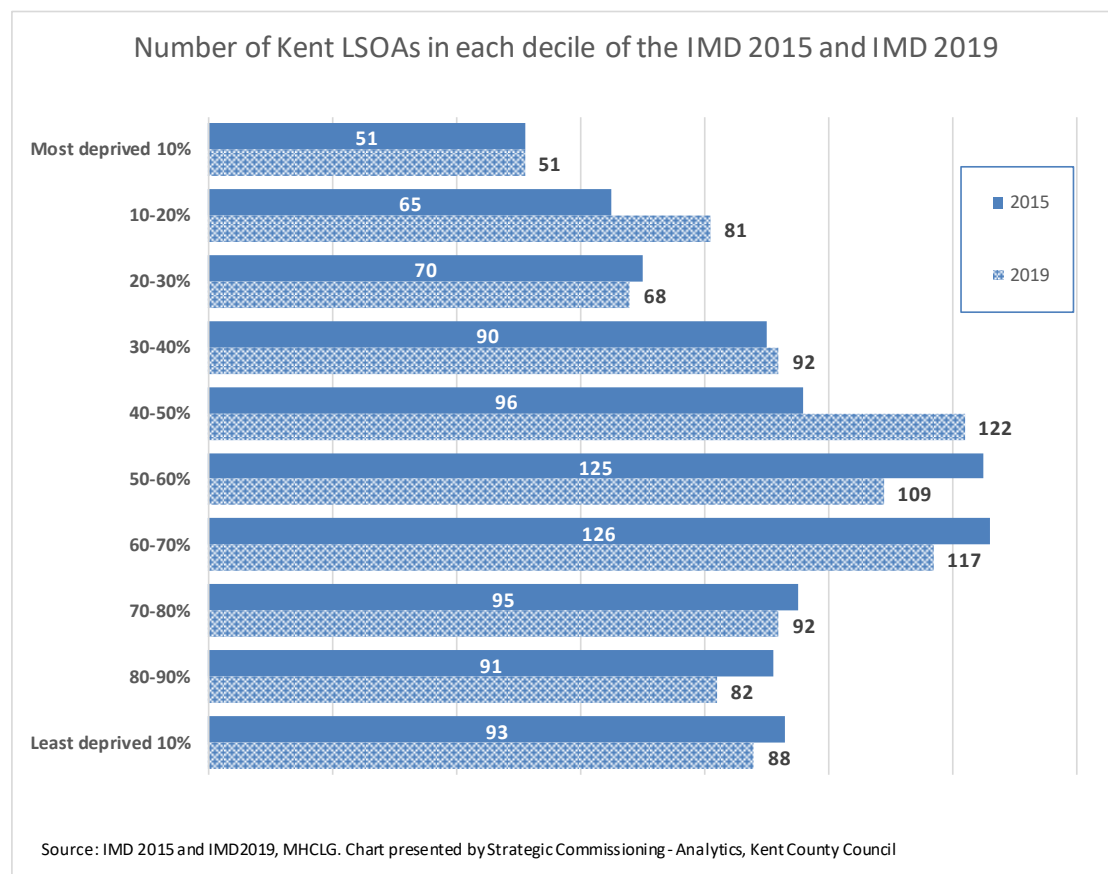
The number of Kent LSOAs that are within the 10% most deprived LSOAs in England between the IMD2015 and the IMD2019 remains at 51. Although there has been no direct increase in the number of the most deprived areas within Kent there have been changes within the lesser deprived areas

The number of Kent LSOAs within the 10 to 20% most deprived LSOAs in England has increased from 65 in 2015 to 81 in 2019. The number within the 40-50% most deprived have also increased from 96 to 122.

At the other end of the spectrum, the numbers of LSOAs within the 10% least deprived LSOAs in England has decreased from 93 in 2015 to 88 in 2019.

Chart 1 shows the changes in of Kent LSOAs within all of the deciles of the IMD2015 and IMD2019.

**Chart 1: Number of Kent LSOAs in each decile of the IMD2015 and IMD2019**



Thanet has the most LSOAs within the most deprived decile with 18. This figure has also remained the same since the IMD2015.

The number of Folkestone & Hythe LSOAs within the 10% most deprived has also remained the same between the IMD2015 and IMD2019.

Four local authorities have experienced an increase in the number of LSOAs within the most deprived decile. These are Swale (+2), Ashford and Dover (both with +1) and Canterbury which now has 2 LSOAs within the 10% most deprived LSOAs for IMD2019 when there were none in the IMD2015.

There has been a reduction in the number of LSOAs within the 10% most deprived within Dartford (-2) and Gravesham (-4). Sevenoaks, Tonbridge & Malling and Tunbridge Wells do not have any LSOAs within the 10% most deprived

Medway Unitary authority has also seen an increase in the number of LSOAs in the 10% most deprived LSOAs between IMD2015 and IMD2019.

**Table 1: IMD2019 and IMD2015: Kent & Medway LSOAs within the top 10% most deprived in England**

Authority	Total LSOAs in each Local Authority	Within the top 10% most deprived: IMD 2015		Within the top 10% most deprived: IMD 2019		2015 - 2019 Change Number of LSOAs
		Number	%	Number	%	
Kent	902	51	6%	51	6%	0
Thanet	84	18	35%	18	35%	0
Swale	85	14	27%	16	31%	2
Dover	67	4	8%	5	10%	1
Folkestone & Hythe	67	4	8%	4	8%	0
Canterbury	90	0	0%	2	4%	2
Gravesham	64	6	12%	2	4%	-4
Maidstone	95	2	4%	2	4%	0
Ashford	78	0	0%	1	2%	1
Dartford	58	3	6%	1	2%	-2
Sevenoaks	74	0	0%	0	0%	0
Tonbridge & Malling	72	0	0%	0	0%	0
Tunbridge Wells	68	0	0%	0	0%	0
Medway U.A.	163	12	24%	14	27%	2

Table ranked by highest number of LSOAs in top 10% most deprived by IMD2019 Score

\* A minus change illustrates a reduction in the number of LSOAs within the 10% most deprived areas in England.

\* A positive change illustrates an increase in the number of LSOAs within the 10% most deprived areas in England.

Source: The English Indices of Deprivation 2015 and 2019, Ministry of Housing, Communities and Local Government

Table presented by Strategic Commissioning - Analytics, Kent county Council

The change in numbers of LSOAs within each of the deciles does not identify which areas have improved or declined. Chart 2 presents the proportion of LSOAs that have remained within the same decile in IMD2019 as IMD2015.

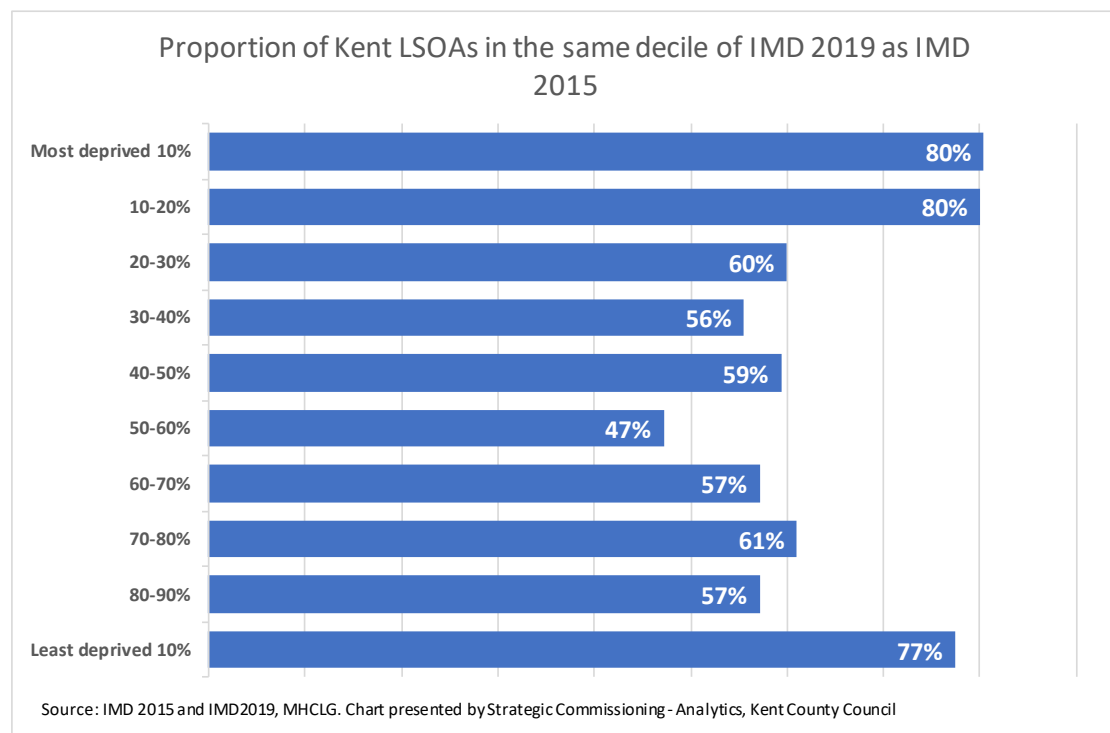
There are 901 LSOAs in Kent. A total of 555 LSOAs remained within the same decile for IMD2019 as they were in IMD2015. This accounts for 62% of all Kent LSOAs.

Of the 51 Kent LSOAs that were within the 10% most deprived LSOAs in England in 2019, 80% or 41 LSOAs remained in the 10% most deprived LSOAs for 2015. The same proportion of LSOAs were in the 10-20% most deprived in IMD2019 and IMD2015.

In contrast, only 77% of LSOAs within the least deprived 10% of LSOAs in 2019 were in the least deprived decile in 2015. This accounts for 72 LSOAs.

Only 57% of LSOAs within the 80-90% least deprived were in this decile for IMD2019 and IMD2015.

**Chart 2: Proportion of Kent LSOAs in the same decile of the IMD 2019 and IMD2015**



Maidstone has the highest number of LSOAs to remain in the same decile in IMD2019 as in IMD2015 with 62. This accounts for 65% of all LSOAs in Maidstone and is a higher percentage than for Kent as a whole.

Dartford has the lowest number and percentage of LSOAs to remain in the same decile in IMD2019 as in IMD2015 with 29. This accounts for 50% of all LSOAs in Dartford. Gravesham has the highest percentage of LSOAs to remain in the same decile in IMD2019 as in IMD2015 at 75%. This accounts for 48 LSOAs in Gravesham.



**Table 2: LSOAs within the same deciles for IMD2015 as IMD2019**

Authority	Total LSOAs in each Local Authority	LSOAs within the same decile in 2015 and 2019	
		Number	%
Kent	902	555	62%
Ashford	78	51	65%
Canterbury	90	51	57%
Dartford	58	29	50%
Dover	67	42	63%
Folkestone & Hythe	67	37	55%
Gravesham	64	48	75%
Maidstone	95	62	65%
Sevenoaks	74	48	65%
Swale	85	50	59%
Thanet	84	53	63%
Tonbridge & Malling	72	39	54%
Tunbridge Wells	68	45	66%
Medway U.A.	163	108	66%

Source: IMD2015 and IMD2019, MHCLG

Table presented by Strategic Commissioning - Analytics, Kent county Council

Of the 41 Kent LSOAs that remained in the 10% most deprived LSOAs for the IMD2015 and the IMD2019 the majority are in Thanet and Swale.

Thanet has the highest number of LSOAs to remain within the 10% most deprived decile in the IMD2015 and the IMD2019 with 16. This accounts for 19% of all LSOAs in Thanet.

Swale has the second highest number of LSOAs to remain within the 10% most deprived LSOAs for the IMD2015 and the IMD2019 with 14. This accounts for 16% of all LSOAs in Swale.

Ashford and Canterbury are the only local authorities to have LSOAs within the 10% most deprived decile of the IMD2019 when they had none in the IMD2015.

Sevenoaks, Tonbridge & Malling and Tunbridge Wells have no LSOAs within the 10% most deprived deciles of either the IMD2015 or the IMD2019.

**Table 3: LSOAs within 10% most deprived deciles for IMD2015 and IMD2019**

Authority	Total LSOAs in each Local Authority	LSOAs within 10% most deprived decile: IMD2015		LSOAs within 10% most deprived decile: IMD2019		LSOAs within 10% most deprived decile for both 2015 and 2019	
		Number	%	Number	%	Number	%
Kent	902	51	6%	51	6%	41	5%
Thanet	84	18	21%	18	21%	16	19%
Swale	85	14	16%	16	19%	14	16%
Dover	67	4	6%	5	7%	4	6%
Folkestone & Hythe	67	4	6%	4	6%	3	4%
Canterbury	90	0	0%	2	2%	0	0%
Gravesham	64	6	9%	2	3%	2	3%
Maidstone	95	2	2%	2	2%	1	1%
Ashford	78	0	0%	1	1%	0	0%
Dartford	58	3	5%	1	2%	1	2%
Sevenoaks	74	0	0%	0	0%	0	0%
Tonbridge & Malling	72	0	0%	0	0%	0	0%
Tunbridge Wells	68	0	0%	0	0%	0	0%
Medway U.A.	163	12	7%	14	9%	12	7%

Source: IMD2015 and IMD2019, MHCLG

Table presented by Strategic Commissioning - Analytics, Kent county Council

The 2019IMD has not been made available at ward level. However following guidance from MHCLG we have produced a separate ward level IMD2019 summary that is available in a separate document.

Table 4 and 4a indicates the wards in which the top 10% most deprived LSOAs in Kent are situated. This table also shows the national rank and Kent rank.

**Table 4: The 10% most deprived LSOAs by IMD2019 in Kent: (Rank 1 to 45 out of 90)**

2011 LSOA Name	2019 Ward Name	National rank			Kent Rank	
		position out of 32,844 LSOAs	Within top 10% most deprived 2019	Within top 10% most deprived 2015	Position out of 902 LSOAs	Within top 10% most deprived
Swale 001A	Sheerness	48	Yes	Yes	1	Yes
Thanet 003A	Margate Central	67	Yes	Yes	2	Yes
Thanet 001A	Cliftonville West	117	Yes	Yes	3	Yes
Thanet 001E	Margate Central	139	Yes	Yes	4	Yes
Thanet 013B	Newington	284	Yes	Yes	5	Yes
Swale 006A	Sheppey East	322	Yes	Yes	6	Yes
Swale 010C	Murston	337	Yes	Yes	7	Yes
Thanet 006D	Dane Valley	423	Yes	Yes	8	Yes
Swale 002C	Sheerness	457	Yes	Yes	9	Yes
Swale 006D	Sheppey East	591	Yes	Yes	10	Yes
Shepway 014A	Folkestone Harbour	614	Yes	Yes	11	Yes
Swale 002A	Sheerness	708	Yes	Yes	12	Yes
Swale 002B	Sheerness	771	Yes	Yes	13	Yes
Thanet 006E	Dane Valley	932	Yes	Yes	14	Yes
Thanet 013E	Northwood	933	Yes	Yes	15	Yes
Dover 011F	St Radigunds	994	Yes	Yes	16	Yes
Thanet 001B	Cliftonville West	1,033	Yes	Yes	17	Yes
Thanet 016D	Eastcliff	1,038	Yes	Yes	18	Yes
Swale 005C	Queenborough & Halfway	1,159	Yes	Yes	19	Yes
Swale 001B	Sheerness	1,205	Yes	Yes	20	Yes
Swale 004E	Sheppey Central	1,309	Yes	Yes	21	Yes
Thanet 001D	Cliftonville West	1,326	Yes	Yes	22	Yes
Shepway 003C	East Folkestone	1,356	Yes	Yes	23	Yes
Thanet 003E	Westbrook	1,563	Yes	Yes	24	Yes
Thanet 016E	Eastcliff	1,597	Yes	Yes	25	Yes
Swale 015D	Priory	1,639	Yes	Yes	26	Yes
Shepway 014B	Folkestone Central	1,761	Yes	Yes	27	Yes
Swale 001C	Sheerness	1,878	Yes	Yes	28	Yes
Dover 013B	Town & Castle	2,105	Yes	Yes	29	Yes
Dartford 001A	Temple Hill	2,133	Yes	Yes	30	Yes
Thanet 013A	Newington	2,242	Yes	Yes	31	Yes
Gravesham 001C	Northfleet North	2,278	Yes	Yes	32	Yes
Thanet 003D	Salvestone	2,342	Yes	Yes	33	Yes
Swale 002D	Sheerness	2,383	Yes	No	34	Yes
Swale 001D	Sheerness	2,411	Yes	Yes	35	Yes
Dover 011A	Buckland	2,450	Yes	No	36	Yes
Dover 012F	Town & Castle	2,473	Yes	Yes	37	Yes
Ashford 008C	Stanhope	2,474	Yes	No	38	Yes
Dover 011D	Whitfield	2,545	Yes	Yes	39	Yes
Thanet 005A	Garlinge	2,616	Yes	No	40	Yes
Thanet 004A	Cliftonville West	2,620	Yes	Yes	41	Yes
Gravesham 007A	Westcourt	2,760	Yes	Yes	42	Yes
Canterbury 001C	Heron	2,768	Yes	No	43	Yes
Maidstone 013A	Park Wood	2,915	Yes	Yes	44	Yes
Thanet 016C	Central Harbour	2,976	Yes	Yes	45	Yes

LSOAs were created in 2011 so LSOAs in Folkestone & Hythe Local Authority are still named Shepway  
Source: English Indices of Deprivation 2019, Ministry of Housing, Communities and Local Government

A rank of 1 is the most deprived

Table presented by Strategic Commissioning - Analytics, Kent county Council

**Table 4a: The 10% most deprived LSOAs by IMD2019 in Kent: (Rank 46 to 90 out of 90)**

2011 LSOA Name	2019 Ward Name	National rank			Kent Rank	
		position out of 32,844 LSOAs	Within top 10% most deprived 2019	Within top 10% most deprived 2015	Position out of 902 LSOAs	Within top 10% most deprived
Shepway 003A	East Folkestone	3,047	Yes	No	46	Yes
Swale 010B	Milton Regis	3,069	Yes	No	47	Yes
Maidstone 013D	Shepway South	3,092	Yes	No	48	Yes
Canterbury 014B	Barton	3,152	Yes	No	49	Yes
Swale 006B	Sheppey East	3,175	Yes	Yes	50	Yes
Thanet 006C	Dane Valley	3,259	Yes	No	51	Yes
Thanet 015D	Eastcliff	3,342	No	Yes	52	Yes
Gravesham 002E	Riverside	3,550	No	Yes	53	Yes
Gravesham 011C	Singlewell	3,588	No	Yes	54	Yes
Maidstone 013E	Shepway South	3,643	No	No	55	Yes
Dover 013A	Town & Castle	3,655	No	No	56	Yes
Dartford 009A	Princes	3,657	No	No	57	Yes
Ashford 008B	Stanhope	3,686	No	No	58	Yes
Thanet 012C	Sir Moses Montefiore	3,690	No	No	59	Yes
Ashford 007F	Victoria	3,697	No	No	60	Yes
Thanet 003B	Margate Central	3,729	No	No	61	Yes
Canterbury 007B	Gorrell	3,794	No	No	62	Yes
Thanet 001C	Cliftonville West	3,804	No	Yes	63	Yes
Gravesham 002A	Central	3,918	No	Yes	64	Yes
Canterbury 009D	Seasalter	3,935	No	No	65	Yes
Canterbury 001B	Heron	3,976	No	No	66	Yes
Dartford 004C	Swanscombe	3,996	No	Yes	67	Yes
Canterbury 019A	Wincheap	4,014	No	No	68	Yes
Thanet 004B	Dane Valley	4,057	No	No	69	Yes
Maidstone 009C	High Street	4,066	No	No	70	Yes
Swale 014C	St Ann's	4,072	No	No	71	Yes
Shepway 014D	Folkestone Central	4,097	No	Yes	72	Yes
Shepway 004E	Folkestone Harbour	4,100	No	No	73	Yes
Gravesham 011D	Singlewell	4,102	No	Yes	74	Yes
Thanet 016B	Central Harbour	4,134	No	No	75	Yes
Dartford 001D	Temple Hill	4,208	No	Yes	76	Yes
Tonbridge & Malling 003A	East Malling	4,333	No	No	77	Yes
Maidstone 013B	Park Wood	4,406	No	Yes	78	Yes
Ashford 008A	Beaver	4,412	No	No	79	Yes
Sevenoaks 002A	Swanley St Mary's	4,465	No	No	80	Yes
Gravesham 003D	Riverside	4,535	No	No	81	Yes
Shepway 004B	East Folkestone	4,540	No	No	82	Yes
Swale 011D	Roman	4,579	No	No	83	Yes
Dover 006C	Aylesham, Eythorne & Shepherdsweil	4,622	No	No	84	Yes
Shepway 014C	Folkestone Central	4,635	No	No	85	Yes
Swale 005B	Queenborough & Halfway	4,662	No	No	86	Yes
Dover 013E	Town & Castle	4,692	No	No	87	Yes
Thanet 013D	Northwood	4,709	No	No	88	Yes
Swale 003A	Minster Cliffs	4,759	No	No	89	Yes
Ashford 007B	Beaver	4,761	No	No	90	Yes

LSOAs were created in 2011 so LSOAs in Folkestone & Hythe Local Authority are still named Shepway  
Source: English Indices of Deprivation 2019, Ministry of Housing, Communities and Local Government

A rank of 1 is the most deprived

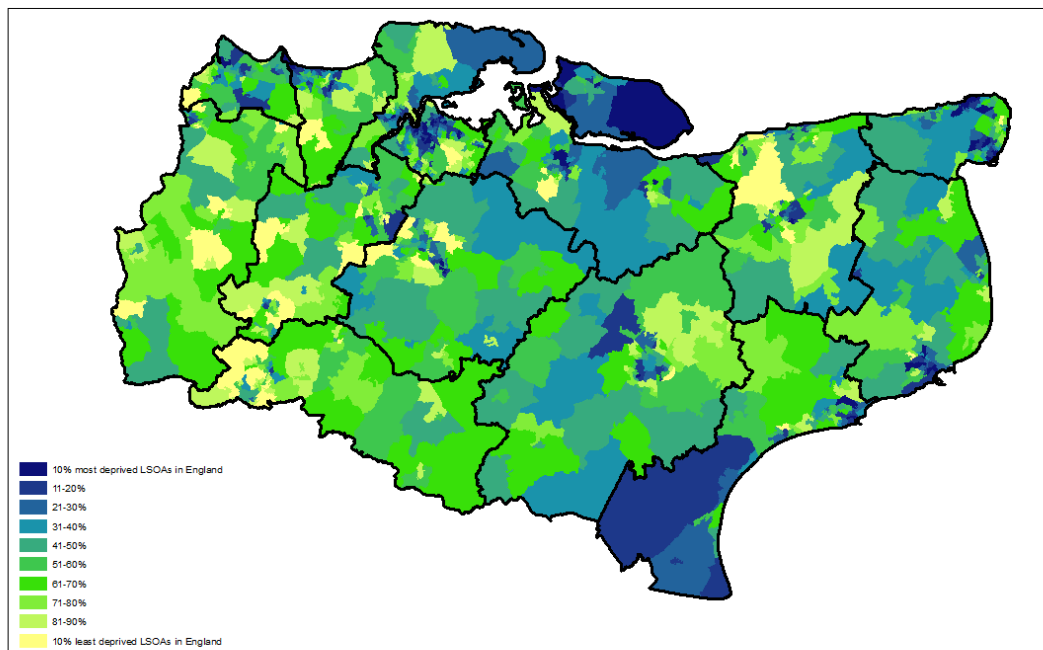
Table presented by Strategic Commissioning - Analytics, Kent county Council

Map 1 illustrates the pattern of deprivation across Kent and Medway at LSOA level. the darker areas are the most deprived areas and lighter ones are the least deprived areas.

The map shows there is an east west divide with the east of the county having higher levels of deprivation than the west.

The highest levels of deprivation can be seen in both coastal regions and urban areas.

Indices of Deprivation 2019 (IoD2019): Overall IMD2019  
National rank of Lower Super Output Areas in Kent & Medway



Source: The English Indices of Deprivation 2019 (IoD2019); The Ministry of Housing, Communities & Local Government (MHCLG)  
Map produced by Strategic Commissioning - Analytics, Kent County Council © Crown Copyright and database right 2019, Ordnance Survey 100019238



## IMD2019 Summary measures for areas larger than LSOAs

The pattern of deprivation across large areas can be complex. In some areas, deprivation is concentrated in pockets of LSOAs, rather than evenly spread throughout. In some other areas the opposite picture is seen, with deprivation spread relatively evenly throughout the area, and with no highly deprived areas.

The set of summary measures have been published to help understand deprivation patterns for local authorities. No single summary measure is the 'best' measure. Each one highlights different aspects of deprivation, and each lead to a different ranking of areas. Comparison of the different measures is needed to give a fuller description of deprivation in a large area. In addition, it is important to remember that the higher-area measures are summaries; the Lower-layer Super Output Area level data provides more detail than is available through the summaries.

- **Average rank:** Population weighted average of the combined ranks for the LSOAs in a local authority. The nature of this measure means that a highly polarised larger area would not tend to score highly, because extremely deprived and less deprived LSOAs will 'average out'. Conversely, a larger area that is more uniformly deprived will tend to score highly on the measure.
- **Average score:** Population weighted average of the combined scores for the LSOAs in a local authority. The main difference from the average rank measure described above is that more deprived LSOAs tend to have more 'extreme' scores than ranks. So highly deprived areas will not tend to average out to the same extent as when using ranks; highly polarised areas will therefore tend to score higher on the average score measure than on the average rank.
- **Proportion of Lower-layer Super Output Areas (LSOAs) in most deprived 10% nationally.** By contrast to the average rank and average score measures, this measure focuses only on the most deprived LSOAs.
- **Extent:** Proportion of a local authority's population living in the most deprived LSOAs in the country. The extent measure is a more sophisticated version of the proportion of LSOAs in the most deprived 10 per cent nationally measure, and is designed to avoid the sharp cut-off seen in that measure, whereby areas ranked only a single place outside the most deprived 10 per cent are not counted at all.

- **Local concentration:** Population weighted average of the ranks of local authority's most deprived LSOAs that contain exactly 10% of the larger area's population. Similar to the proportion of LSOAs in the most deprived 10 per cent nationally and extent measures, the local concentration measure is based on only the most deprived LSOAs in the larger area, rather than on all areas. By contrast to these measures however, the local concentration measure gives additional weight to very highly deprived areas.

### **IMD2019 Summary measures for Kent Local Authorities**

Recent boundary changes in England mean that the number of lower-tier (district, borough and unitary) authorities reduced from 326 in 2015 to 317 in 2019. The MHCLG have released the IMD2015 summary measures for local authorities cast to 2019 boundaries which enables us to provide a comparison with IMD2019 summary measures at local authority level.

Six out of twelve local authorities in Kent saw an improvement in at least one of the summary measures for local authorities in the IMD2019.

There were no improvements in any of the summary measures in Ashford, Dover, Folkestone & Hythe, Maidstone, Swale and Tonbridge & Malling for IMD2019.

Even though Thanet has seen improvements in the national rankings in three of the five summary measures, Thanet remains ranked as the most deprived local authority in Kent in all of the summary measures for local authorities in the IMD2019.

Swale is ranked as the second most deprived local authority in Kent across all summary measures. Sevenoaks and Tunbridge Wells rank as the two least deprived local authorities.

It is important to remember that any change in ranking is relative to changes in all local authorities in England between IMD2015 and IMD 2019.

**Table 5: Kent local authorities by national rank of IMD2019 and IMD2015 summary measures for local authorities**

Local Authorities	IMD - Rank of average rank (National)			IMD - Rank of average score (National)			IMD - Rank of proportion of LSOAs in most deprived 10% nationally			IMD - Rank of extent (National)			IMD - Rank of Local concentration (National)		
	2019	2015	change	2019	2015	change	2019	2015	change	2019	2015	change	2019	2015	change
Thanet	34	35	-1	30	28	2	37	35	2	42	44	-2	15	6	9
Swale	69	87	-18	56	77	-21	45	52	-7	81	91	-10	29	31	-2
Folkestone and Hythe	84	101	-17	90	110	-20	113	125	-12	99	123	-24	99	101	-2
Dover	107	113	-6	113	122	-9	102	125	-23	116	124	-8	109	124	-15
Gravesham	119	120	-1	123	120	3	146	89	57	112	116	-4	121	107	14
Dartford	145	167	-22	154	168	-14	170	131	39	163	168	-5	146	157	-11
Ashford	152	171	-19	158	174	-16	177	200	-23	155	167	-12	149	167	-18
Canterbury	185	182	3	179	181	-2	159	200	-41	158	165	-7	157	165	-8
Maidstone	188	203	-15	185	196	-11	161	168	-7	170	179	-9	166	171	-5
Tonbridge and Malling	236	269	-33	234	266	-32	195	200	-5	212	244	-32	210	244	-34
Sevenoaks	253	264	-11	251	260	-9	195	200	-5	228	222	6	244	234	10
Tunbridge Wells	273	271	2	274	274	0	195	200	-5	257	251	6	263	265	-2
Medway	98	117	-19	93	115	-22	93	109	-16	86	108	-22	86	104	-18

A negative change between 2015 and 2019 shows a rise in the rank therefore an increase in level of deprivation in relation to all other LAs

Kent Local Authorities ranked on 2019 rank of average rank

Source: English Indices of Deprivation 2019, MHCLG, Table presented by Strategic Commissioning - Analytics, Kent County Council

**A rank of 1 is the most deprived**

National rank is out of 317 local authorities



## IMD2019 Summary measures for upper tier local authorities

Recent boundary changes in England mean that the number of upper-tier local authorities (counties and unitary authorities) reduced from 152 in 2015 to 151 in 2019. The MHCLG have not released the IMD2015 summary measures for upper-tier local authorities cast to 2019 boundaries. As a result, we cannot provide a direct comparison of Kent by national rank between IMD2015 and 2019IMD.

However, as with the LSOAs, we can compare the deprivation ‘deciles’ for upper-tier local authorities. Deciles have been calculated by ranking the summary measure scores of the 152 upper tier local authorities in IMD2015 and the 151 upper tier local authorities in IMD2019 areas in England from most deprived to least deprived and dividing them into 10 equal groups. These range from the most deprived 10 per cent of small areas nationally (decile 1) to the least deprived 10 per cent of small areas nationally (decile 10).

**Table 6: Ranks and deciles of summary measures for Kent: IMD2019 and IMD2015**

IMD2019 Summary measure for upper-tier local authority	IMD2019		IMD2015	
	National Rank (out of 151 areas)	National Decile	National Rank (out of 152 areas)	National Decile
Rank of Average rank	95	7	104	7
Rank of Average score	93	7	100	7
Rank of proportion of LSOAs in most deprived 10% nationally	79	6	89	6
Extent	93	5	98	6
Local concentration	74	6	83	6

Source: English Indices of Deprivation 2019 MHCLG

Table presented by Strategic Commissioning - Analytics, Kent county Council

Kent has remained within the same national decile for IMD2019 as for IMD2015 for 4 of the 5 summary measures. Kent has moved up one decile on the extent measure which indicates that Kent is more deprived in this measure in 2019 than it was in 2015.

The number of local authorities within the South East region was not affected by the recent boundary changes therefore we are able to provide a comparison between the IMD2015 and IMD2019 based on the rankings of the 19 upper-tier local authorities within the South East region.

Kent is ranked within the least deprived 50% of upper-tier local authorities in England for 4 out of 5 summary measures of the IMD2019. A rank of 74 for the local concentration measure which puts Kent within the most deprived

50% of local authorities in England for this measure. Kent is ranked within the 50% most deprived areas within the South East on all summary measures.

**Table 7: Kent local authorities by South East rank of IMD2019 and IMD2015 summary measures for upper-tier local authorities**

County / Unitary Authority	IMD - Rank of average rank (South East)			IMD - Rank of average score (South East)			IMD - Rank of proportion of LSOAs in most deprived 10% (South East)			IMD - Rank of extent (South East)			IMD - Rank of Local concentration (South East)		
	2019	2015	change	2019	2015	change	2019	2015	change	2019	2015	change	2019	2015	change
Southampton	1	1	0	27	27	-0	1	1	0	1	1	0	2	2	0
Portsmouth	2	2	0	27	27	-0	2	2	0	2	2	0	1	1	0
Slough	3	3	0	23	23	0	13	13	0	10	10	0	10	5	5
Isle of Wight	4	4	0	23	23	0	9	8	1	5	5	0	8	4	4
<b>Medway</b>	<b>5</b>	<b>6</b>	<b>-1</b>	<b>24</b>	<b>22</b>	<b>2</b>	<b>4</b>	<b>4</b>	<b>0</b>	<b>3</b>	<b>4</b>	<b>-1</b>	<b>4</b>	<b>6</b>	<b>-2</b>
Brighton & Hove	6	5	1	21	23	-3	3	3	0	4	3	1	3	3	0
Reading	7	7	0	20	19	0	8	9	-1	8	9	-1	9	7	2
East Sussex	8	8	0	20	19	1	5	6	-1	6	8	-2	5	8	-3
<b>Kent</b>	<b>9</b>	<b>9</b>	<b>0</b>	<b>20</b>	<b>19</b>	<b>1</b>	<b>6</b>	<b>7</b>	<b>-1</b>	<b>7</b>	<b>7</b>	<b>0</b>	<b>6</b>	<b>9</b>	<b>-3</b>
Milton Keynes	10	10	0	18	18	-0	7	5	2	9	6	3	7	10	-3
West Sussex	11	11	0	14	14	0	10	11	-1	12	11	1	12	11	1
Hampshire	12	12	0	13	12	1	11	10	1	11	12	-1	11	12	-1
Oxfordshire	13	13	0	12	12	0	12	12	0	13	13	0	13	13	0
Bracknell Forest	14	14	0	10	10	-0	14	14	0	17	17	0	16	14	2
Buckinghamshire	15	16	-1	10	10	0	15	16	-1	16	14	2	15	16	-1
West Berkshire	16	15	1	10	10	-0	16	15	1	15	15	0	18	15	3
Surrey	17	17	0	10	9	1	17	17	0	14	16	-2	14	17	-3
Windsor & Maidenhead	18	18	0	8	9	-0	18	18	0	18	18	0	17	18	-1
Wokingham	19	19	0	6	6	0	19	19	0	19	19	0	19	19	0

A negative change between 2015 and 2019 shows a rise in the rank therefore an increase in level of deprivation in relation to all other LAs

Table sorted by rank of average rank

Source: English Indices of Deprivation 2019 MHCLG

Table presented by Strategic Commissioning - Analytics, Kent county Council

A rank of 1 is the most deprived (out of 19 counties and unitary authorities in the South East)

## Conclusion

The IoD2019 have been produced using the same approach, structure and methodology used to create the previous IoD2015 (and the 2010, 2007 and 2004 versions). This allows some comparisons to be made over time between the IoD2019 and previous versions, but only in terms of comparing the **rankings** and **deciles** as determined at the relevant time point by each of the versions.

Just because the overall rank may or may not have changed between the Indices, it does not mean that there have been no changes to the level of deprivation in the area. For example, if the absolute levels of deprivation in all areas were increasing or decreasing at the same rate, the ranks would show no change.

Equally, when comparing the overall IMD, if improvements in one domain are offset by a decline in another domain, the overall IMD position may be about the same even if significant changes have occurred in these two underlying domains.

## Inequalities in life expectancy

Life expectancy is a key measure of a population's health status. Inequality in life expectancy is therefore one of the foremost measures of health inequality.

Life expectancy is closely related to people's socio-economic circumstances. The most common summary measure of these circumstances across a population is deprivation. The index of multiple deprivation is a way of summarising how deprived people are within an area, based on a set of factors that includes their levels of income, employment, education and local levels of crime.

In England, there is a systematic relationship between deprivation and life expectancy, known as the social gradient in health. Males living in the least deprived areas can, at birth, expect to live 9.4 years longer than males in the most deprived areas. For females, this gap is 7.4 years.

Importantly, this social gradient relationship holds true across the whole population – health inequalities are experienced by everyone, not just those at the very bottom and top. Figures 1 and 2 show how life expectancy and disability-free life expectancy, which is discussed in the next section, increase as neighbourhood deprivation falls.

This relationship has become known as 'the Marmot curve' because of its prominence in Sir Michael Marmot's report Fair society, healthy lives. Curves showing the same relationship can also be drawn for other measures of deprivation, such as income or education.

## Inequalities in healthy life expectancy

Another key measure of health inequality is how much time people spend in good health over the course of their lives, given how crucial good health is to wider quality of life and people's ability to do the things that they value.

Two important measures of the amount of time that people spend in good health are 'healthy life expectancy' and 'disability-free life expectancy'. The former estimates time spent in 'good' or 'very good' health, based on how people perceive their general health. The latter estimates, again based on self-reported assessment, time spent without conditions or illnesses that limit people's ability to carry out day-to-day activities.

Inequalities in both healthy life expectancy and disability-free life expectancy are even wider than inequalities in life expectancy (illustrated by the steeper curves for disability-free life expectancy in Figures 1 and 2). People in more deprived areas spend, on average, a far greater part of their already far shorter lives in poor health.

The gap in healthy life expectancy at birth is stark. In 2015–17, people in the least deprived areas could expect to live roughly 19 more years in good health than those in the most deprived areas. People in the most deprived areas spend around a third of their lives in poor health, twice the proportion spent by those in the least deprived areas.

Again, geographical inequalities exist in this measure. Healthy life expectancy at birth for males in North-East England is 59.5 years, compared to 66.1 years for males in the South East, a gap of 6.6 years. For females, the gap is 5.8 years.

## Reduction in air cargo ATMs at Stansted

### **Background**

As a result of the granting of Planning Permission following appeal, passenger throughput has risen to 43mppa and the maximum Cargo ATMs has fallen from 20,500 Cargo ATMs per year to 16,000.

#### **1) Minimum reduction in Cargo ATMs**

Assuming there is no significant growth in passenger ATMs to constrain Cargo ATMs:

20,500 to 16,000 = **22% reduction in Cargo ATMs**

#### **2) Midpoint reduction in Cargo ATMs**

Assuming the Passenger ATMs rise to the level predicted by MAG of 253,000<sup>1</sup> and if MAG can reduce Other ATMs from 15,000 down to 10,000, with a limit of 274,000 total ATMs, that only leaves 11,000 Cargo ATMs:

20,500 to 11,000 = **46% reduction in Cargo ATMs**

#### **3) Maximum reduction in Cargo ATMs**

Assuming the same as scenario 2 but Other ATMs remain at 15,000 then that only leaves 6,000 Cargo ATMs:

20,500 to 6,000 = **71% reduction in Cargo ATMs**

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<sup>1</sup> MAG Stansted Airport Planning Application – Planning Statement paragraph 2.80 on page 18

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# ARCADIS GUIDANCE TO THE CIVIL AVIATION AUTHORITY

## STEP 0 REPORT

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October 2019

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[REDACTED]	[REDACTED]
6.1.1	[REDACTED]
6.1.2	[REDACTED]
6.1.3	[REDACTED]
6.1.4	[REDACTED]
6.1.5	[REDACTED]
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## GLOSSARY

Abbreviation	Description
ADRM	Airport Development Reference Manual
ANPR	Automatic Number Plate Recognition
ANPS	Airports National Policy Statement
ATET	Around the End Taxiways
ATMs	Air Transport Movements
ASD	Airport Supporting Development (essential for safe and efficient operation of the airport)
ATP	Automated Ticket Presentation
BA	British Airways
BAA	British Airports Authority
CAA	Civil Aviation Authority
CAPEX	Capital Expenditure
CBS	Cost Breakdown Structure
CRA	Cost Risk Analysis
CDG	Paris Charles de Gaulle Airport
DCO	Development Consent Order
DDS	Design Day Schedules
DfT	Department for Transport (UK)
EASA	European Aviation Safety Agency
EEA	European Economic Area
EfW	Energy from Waste
GSE	Ground Service Equipment
HAL	Heathrow Airport Limited
HEP	Heathrow Expansion Programme
HSPG	Heathrow Strategic Planning Group
IATA ADRM 10	IATA Airport Development Reference Manual 10 <sup>th</sup> Edition
ICAO	International Civil Aviation Organization
IDT	Integrated Design Team

Abbreviation	Description
IFS	Independent Fund Surveyor
JFK	John F. Kennedy International Airport
LoS	Level of Service
mppa	million passengers per annum
NA	Not Available
NATS	National Air Traffic Service
NWR	North West Runway (The 3 <sup>rd</sup> runway as part of the Preferred Masterplan option)
OLS	Obstacle Limitation Surfaces
Oneworld	Refer Appendix B
OPEX	Operating Expenditure
PHP	Peak Hour Passengers
pph	Passengers per hour per lane
PT	Public Transport
RAG	Red; Amber; Green
RICS	Royal Institution of Chartered Surveyors
RWY	Runway
SkyTeam Alliance	Refer Appendix B
Star Alliance	Refer Appendix B
TAAM	Total Airspace and Airport Modeler
TfL	Transport for London
TN	Technical Note
Totex	Total Expenditure
Tph	Trains Per Hour
TWY	Taxiway
T5N	Terminal 5 North
UK	United Kingdom

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# EXECUTIVE SUMMARY

Arcadis has undertaken a review to assess whether Heathrow Airport Limited (HAL) has put forward a Preferred Masterplan that is operable, deliverable, timely, reasonable and reliably costed and in the interest of consumers.

Our review has concluded that the Preferred Masterplan has been well developed and is technically compliant in meeting the requirements of the ANPS to deliver additional runway capacity at Heathrow by 2030.

At this moment in time, some detailed elements of the plan will not be fully developed but this is not unexpected for a scheme of this size or complexity. It is noted that HAL's approach has been diligent and they have engaged with stakeholders and consumers throughout the development process.

## Arcadis' Key Findings

### Operable:

- HAL has undertaken the appropriate level of detail to assure the proposed infrastructure will meet the operational demands placed on it at **Step 0**;
- The integration of the new infrastructure with the existing airport operation is feasible and is unlikely to conflict with current operations;
- HAL has demonstrated the increase in runway capacity will provide more operational flexibility and resilience; and
- HAL is yet to develop detailed Operational Readiness and Trials workstreams which will be key to ensuring a smooth transition without causing any operational issues.

### Deliverable:

- HAL's delivery of the elements of the scheme are presented in a logical sequence;
- HAL has sought to deliver the most efficient sequencing with the aim of delivering the new runway by 2026 however this has created a programme that has little margin to allow for delays or risk;
- HAL's programme is not unfeasible however this is reliant on the programme timings set out in the plan to be delivered; and
- HAL will be reliant on other organisations to deliver some of the elements of the scheme which they do not control or can mitigate against. Delays could pose a risk to HAL's own delivery programme.

### Timely:

- HAL has developed a programme that has all the necessary steps needed to achieve the ANPS target for 2030 and there is no reason to suggest this date is not achievable;
- The current programme includes risk allowances for each component of the masterplan assessed on the basis of industry norms. There is no apparent programme-wide allowance for schedule risk; and
- With such a complex programme involving a significant range of interdependencies, many of which are out of the control of HAL, the objective to deliver an operational runway by 2026 carries a high level of risk.

### Cost:

- HAL's Cost Estimate for **Step 0** is reasonably and reliably costed;
- HAL has developed a holistic baseline cost estimate and the approach to the structure and methodology of compiling the Cost Estimate reflects industry best practice; and
- The level of quantification and benchmarking has increased leading to an increased level of cost certainty.

### Interest of Consumers:

- HAL continues to engage with consumers to capture insights as part of the masterplanning process to ensure that the interests of consumers are reflected in the Preferred Masterplan.

Arcadis has been appointed as a technical advisor to the Civil Aviation Authority (CAA) to undertake a review of Heathrow's Preferred Masterplan.

Arcadis has been asked to assess the Preferred Masterplan across different timeframes based upon the "Step" process utilised by Heathrow Airport Limited (HAL) throughout the masterplan development process.

These 'Steps' are in alignment to the "Phases" included in the single Preferred Masterplan released as part of the Airport Expansion Consultation on 18<sup>th</sup> June 2019.

**Step 0** is aligned to **Phase 1** that represents infrastructure required on the runway opening day, anticipated to be in 2026.

Arcadis has not been asked to undertake an assessment that is aligned to **Phase 2** for 2030 that is a specified year in the Aviation National Policy Statement (ANPS) for public transport mode share.

**Step 3** is aligned to **Phase 2a** that represents the infrastructure requirement to meet 700,000 ATMs and 122.5mppa by the year 2033.

**Step 8** is aligned to **Phase 4** where by 2050, the capacity at Heathrow is expected to be 142mppa.

This **Step 0** report has assessed whether HAL's Preferred Masterplan and associated infrastructure required for the runway opening day in 2026 can deliver expansion in a manner that is operable, deliverable, timely, reasonably and reliably costed and is in the interest of consumers.

Two further reports will consider the delivery of expansion at **Step 3** and **Step 8** against the same objectives of this review.

Our assessment has been based on workshop and presentation sessions held between the CAA and HAL teams, and the review material provided by HAL. As part of the assessment process, Arcadis has raised queries with HAL based on these workshops, presentations and material. In addition, Arcadis has undertaken independent benchmarking assessments

It is worth noting that the meetings to date with HAL have been of a productive nature and the exchange of information and response to queries has in general been direct and forthcoming. Arcadis appreciates that some information that HAL has used to develop their Preferred Masterplan is

commercially sensitive and access to this has been limited.

## Report Themes

This report considers whether HAL's Preferred Masterplan proposal is:

- Operable;
- Deliverable;
- Timely;
- Reasonably and Reliably Costed; and
- In the Interest of Consumers.

All of the above themes are assessed in detail in separate chapters. The theme relating to 'In the Interest of Consumers' is assessed in all of the other themes and is concluded substantively in the last chapter of this report.

## Operability

Heathrow is a live operational environment and the existing airport has to be able to function unhindered during the construction phases. To achieve this, airport operations must be maintained during the development of the proposed infrastructure and facilities. The development phases must also integrate into existing airport infrastructure.

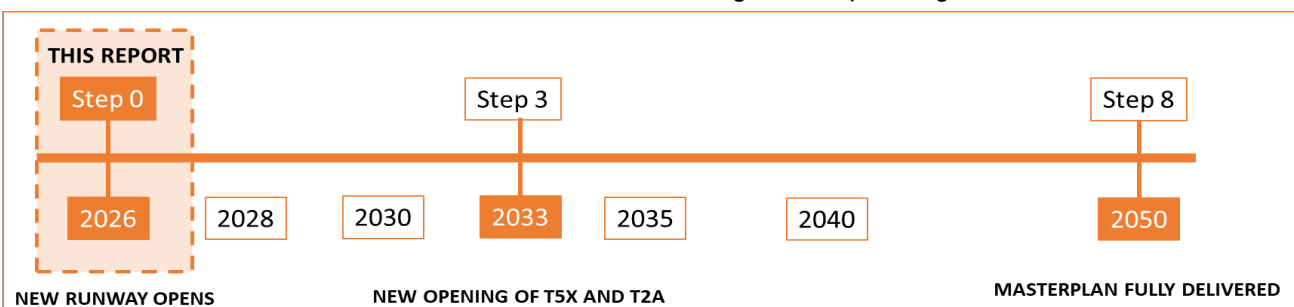
Arcadis has assessed both the design and the programme of the Preferred Masterplan to assess the operability of the airport from the existing situation to **Step 0** that takes the expansion up to the opening of the new 3<sup>rd</sup> runway.

## Summary

Arcadis has undertaken its assessment using the information provided by HAL either directly or out in the public domain that takes the scheme to **Step 0**. The Preferred Masterplan sets out the infrastructure requirements up to **Step 0** using clearly developed capacity assessments of the airside, terminal and landside facilities.

Arcadis has analysed these assessments and is satisfied that HAL has undertaken the appropriate level of detail to assure the proposed infrastructure will meet the operational demands placed on it at this step of the development.

Arcadis has considered the level of flexibility and resilience that will be in place at **Step 0**. On the basis that the information provided by HAL has demonstrated the airport can adequately provide for the growth in passenger numbers and the increase



in runway capacity will provide more operational flexibility and resilience.

Arcadis acknowledges that HAL has used the masterplanning process to also look at today's operation and to take the opportunity to remove existing Airfield Hotspots. In addition, HAL is seeking to introduce taxiways around the end of runways (Around the End Taxiways (ATETs)) that will increase the flexibility of runway operations and be the first purpose built for this purpose incorporating international standards in a UK context.

Arcadis has identified potential challenges that may arise at **Step 0** in Landside areas if passenger mode choice is unchanged through some of the Surface Access Strategy work proposed by HAL.

If HAL cannot deliver the shift in mode share to public transport, there may be a greater demand on parking and forecourts than anticipated which could cause delays and congestion at the airport. However, at this stage in the masterplan process the level of detail required to assure the plan is not yet fully developed.

Arcadis is satisfied that the assimilation of the new infrastructure with the existing airport operation is feasible and is unlikely to conflict with current operations. HAL is yet to develop detailed Operational Readiness and Trials workstreams which will be key to ensuring a smooth transition without causing any operational issues.

Notwithstanding Arcadis' opinion that the Preferred Masterplan at **Step 0** will be operable, the challenges of deliverability, timeliness and cost still present the scheme with some challenges to open the new runway by 2026.

### Delivery

The delivery of such a large and complex infrastructure project requires HAL to develop a delivery plan that is phased in a logical, feasible manner and has a robust programme for delivery taking into account the risks associated with it.

Arcadis has reviewed the Preferred Masterplan material to assess whether **Step 0** is deliverable and how new and impacted facilities will link with existing infrastructure and how HAL will maintain key assets during construction phases of delivery.

### Summary

Arcadis has assessed the key elements required for the delivery of the new runway from the existing airport operation to 2026, **Step 0**.

It is clear from the significant amount of work that HAL has undertaken that the sequencing and multiple elements of the scheme are presented in a logical and well thought out sequence.

Arcadis has seen evidence that HAL has sought to deliver the most efficient sequencing to aim to deliver the new runway by 2026. This efficiency has however created a programme that has elements

that HAL does not have direct control over that could create little margin for delays or risk.

HAL has undertaken a Quantitative Schedule Risk Analysis (QSRA) assessment of the proposed schedule, with respect to schedule integrity. This assessment resulted in a P value of [REDACTED], indicating a [REDACTED] likelihood of achieving the schedule. Arcadis recognises that this reflects a schedule that has been designed to deliver the new 3rd runway at the earliest possible opportunity. Arcadis has not reviewed the likelihood of any alternative runway opening dates as part of this review.

Although it is not unfeasible that this programme and sequencing for the delivery of the required infrastructure is achievable, this is reliant on the programme timings set out in the plan to be delivered on time.

Arcadis has identified a number of deliverability challenges that, although achievable to meet the ANPS target of 2030, could only be deliverable by 2026 if no significant delays take place in the programme.

The challenge presented by the development of a Preferred Masterplan is about creating the space and then using that space to deliver a new runway and the associated infrastructure. This involves a significant amount of clearance of existing assets as well as undertaking a very significant number of earthworks to enable construction to proceed.

Much of this work is outside of the airport's existing boundary and will be reliant on gaining the appropriate consents, acquiring land and working with other agencies or organisations. This could create a level of risk to the programme that HAL may not be able to mitigate.

It is clear from the evidence that HAL has undertaken a significant amount of planning in connection with logistics and the use of off-site hubs that are a mitigation to some of the delivery risks identified.

As well as off-site hubs, HAL has sought to develop its procurement strategy to ensure it has mitigated the supply chain risks associated with delivering such a complex programme.

### Timing

The success of delivering expansion at Heathrow is predicated on the fact that the planned deliverables for each step can be provided in accordance with the specified duration in the programme and the dates and deadlines detailed.

Arcadis has assessed whether the Preferred Masterplan can be delivered in a timely manner. In doing so, consideration has been given to the risks to delivery and what the potential impact of failing to provide for the relevant deliverables does to the programme.

The review has considered the strategies HAL has developed to mitigate risks and any subsequent



impacts from failure to deliver in a timely manner, with consideration for interdependencies

### Summary

Arcadis considers that the overall Preferred Masterplan programme schedule is at the level of detail required for a programme of this scale at this stage of the development process.

HAL has developed a programme that has all the necessary steps needed to achieve the ANPS target for 2030 and there is no reason to suggest this date is not achievable.

The assessment by Arcadis highlights that whilst the activities controlled by HAL can probably be delivered within the timescales indicated in the masterplan programme, the overall sequence necessary to deliver an operational runway by 2026 are dependent on the timely completion of activities that are outside of the control of HAL. For example, the masterplan assumes that the DCO will be resolved within statutory timescales.

Furthermore, whilst individual elements of the masterplan include risk allowances based on benchmarks, there is little programme-wide contingency. With such a complex programme involving many critical interdependencies, the objective to deliver an operational runway by 2026 is associated with a high level of risk.

Arcadis can see from the evidence that HAL has undertaken the appropriate level of work in developing its plans and is confident that the approach used would allow HAL to achieve the ANPS target for increased runway capacity by 2030.

Although HAL has indicated that they could mitigate some of the potential delays through re-phasing and moving around work elements within the programme, the key consequence of delays to the delivery of the runway or re-scheduling of works is likely to be an increase in costs and a risk of not achieving the 2026 date.

In the report we highlight four areas where we believe that HAL is particularly reliant on positive programme outcomes to deliver the 2026 operational date:

- Dependency on the timing of the DCO;
- Delivery of enabling infrastructure (e.g. A4 relocation);
- Earthworks schedule; and
- Operational readiness.

### Cost Estimate

A high-level summary of the Cost Estimate is detailed in the Table 1. A breakdown of the Task Orders contained in the **Step 0** report are detailed in Section 5. All costs within HAL's Cost Estimates are based on Q3 2014 prices.

The Risk Reserve detailed in Table 1 is HAL's assessment of programme level risk. Risk allocation related to the Task Orders is contained as

contingency and is included in the Direct and Indirect Costs in Table 1.



Arcadis has assessed whether the capital expenditure of the Preferred Masterplan phase for **Step 0** has been reasonably and reliably costed in relation to its design and programme.

Arcadis has reviewed HAL's approach to the Cost Estimate and process for development and has assessed the certainty and reliability of the Cost Estimate, including quantification, pricing and confidence in costs, the application of on-costs and HAL's approach to risk.

The review has observed that the level of maturity within the Cost Estimate, including the robustness of the evidence provided by HAL, in relation to its Preferred Masterplan and associated cost is appropriate for the current stage of the programme.

Arcadis has not reviewed property valuations as part of this review, and due to the confidential nature of the property cost estimate a breakdown of these costs is not available as part of this report.

### Summary

It is Arcadis' opinion that on balance, HAL's Cost Estimate for **Step 0** is reasonably and reliably costed.

HAL has taken on board Arcadis's comments from previous reports regarding the structure of the Cost Estimate and produced a comprehensive document capturing all the relevant Cost Estimate data in one singular, well integrated, document.

The structure of the Cost Estimate reflects industry best practice standards and forms a good baseline on which to move forward. This can now form the basis on which to monitor and implement a change control process.

The structure of the Cost Estimates for each Task Order (TO) provides a standard platform for approaching the estimate and reflects best practice with how HAL has approached the quantification and pricing of direct and indirect costs

The level of quantification within the detailed estimates reflects the level of detail provided by HAL. The extent of quantification has increased since the Purple Book and the reliance on

allowances reduced which leads to an increased level of certainty.

Whilst HAL has reflected schedule risks in their risk models Arcadis is of the opinion that due to the ambitious and optimistic programme, as discussed in Sections 3 and 4 of this report, there remains further risk on the programme which could have an inherent risk on the Cost Estimate and the associated risks realised. The Cost Estimate is currently based on a risk percentage, the level of which has been reviewed against the Quantitative Cost Analysis.

### Interest of Consumers

For the purpose of this report 'consumers' are defined as both passengers and users of the cargo users at the airport.

To review HAL's Preferred Masterplan with regards to the interest of consumers Arcadis has considered how HAL has acquired consumer insight and how well HAL has incorporated consumer insight into their masterplan development process.

This review will be building upon a previous Arcadis report submitted in December 2018, '*An initial review of consumer interests in the development of the HAL Masterplan*'.

### Summary

Although not explicitly considered as part of this report, Arcadis has continued to see examples where the interests of consumers are being tested

through the development of the Preferred Masterplan.

In considering elements that are valued by consumers, the development of the infrastructure seeks to ensure that the existing airport operation can function whilst this phase of construction is taking place.

In addition, some of the work seen by Arcadis is seeking to increase the flexibility of the airport and ensure there is sufficient resilience available to cope with operational challenges.

HAL is seeking to minimise disruption for both consumers and the local community. HAL has spent a significant amount of effort to develop its delivery programme in a logical sequence to reduce the impact the works will have on both these groups.

In **Step 0**, there are no direct infrastructure improvements being proposed to support cargo users. However, there is evidence that HAL is actively engaging with the cargo community to develop improvements that will be delivered in future steps of the masterplan.

The majority of infrastructure improvements will benefit the consumers at Heathrow. The increase in runway capacity and on-going capacity improvements should contribute to delivering a scheme that is in the interest of consumers.

# 1 INTRODUCTION

Arcadis has undertaken a review of the Heathrow Airport Expansion Programme (HEP). This section sets out the objectives and approach to the key areas of focus Arcadis has adopted in compiling the report.

The steps taken by Arcadis to gather the relevant supporting information from HAL and other stakeholders have been identified and outlined in this section.

## 1.1 Background

Arcadis has been appointed by the Civil Aviation Authority (CAA) to provide technical advice in support of their work on capacity expansion at Heathrow Airport.

As part of this process Arcadis is undertaking a review of the Heathrow Airport expansion plans as detailed in their Preferred Masterplan published in June 2019. The Preferred Masterplan will act as part of Heathrow Airport Limited's (HAL) application for a Development Consent Order (DCO). HAL's

application for a DCO is anticipated to be submitted in 2020. The DCO, if granted, will contain the relevant permissions for building and operating an expanded Heathrow.

The Preferred Masterplan comprises of four phases. Each phase indicates the predicted annual passenger throughput, air traffic movements (ATMs) and the infrastructure enhancements required to accommodate this growth.

The phases represented in HAL's Preferred Masterplan are split into sub-phases. Previously the phases and sub-phases were identified as 'Steps'.

Preferred Masterplan Phases						
Phase	Step	Year	Passengers (mppa)	ATMs (000s)	Infrastructure	
1	0	2026	█	█	█	█
1a	1	2028	█	█	█	█
2	2	2030	█	█	█	█
2a	3	2033	█	█	█	█
3	4	2035	█	█	█	█
3a	5	2040	█	█	█	█
3b	6	2040+	█	█	-	-
3c	7	2040+	█	█	-	-
4	8	2050	█	█	█	█

Table 2 Preferred Masterplan Phases

Source: (01 Masterplan Briefing - HAL May 2019), (04 Forecasting and Capacity - HAL 2019)

Arcadis has been tasked with reviewing three key steps throughout the entire process: **Step 0**, **Step 3** and **Step 8**.

Arcadis' review of HAL's Preferred Masterplan will take the form of three reports. This approach has been approved by the CAA.

**Step 0 Report (this report):** Reviews the Preferred Masterplan with a focus on the requirements to open the 3<sup>rd</sup> runway in 2026 providing a capacity of 95mppa.

**Step 3 Report:** Reviews the requirements to achieve a capacity expansion of 122mppa using 2033 as the indicative point that this number of passengers will be processed.

**Step 8 Report:** Reviews the requirements up to the planned completion of the expansion programme with a date point of 2050, achieving a capacity of 142mppa.

## 1.2 Objectives

Our review of HAL's Preferred Masterplan considers whether the proposal is:

- Operable;
- Deliverable;
- Timely;
- Reasonably and Reliably Costed; and
- In the Interest of Consumers.

All of these themes are assessed in detail through the reports in separate chapters. The theme relating to 'In the Interest of Consumers' is featured in all of the chapters and is concluded substantively in the last chapter of the **Step 0** report.

This report focuses on analysing the themes as part of the **Step 0** proposals linked to the opening of the 3<sup>rd</sup> Runway. Steps 3 and Step 8 will be addressed in future reports.

When conducting our review, we have focussed on the following key technical areas, including elements of capex:

- Airfield;
- Terminals and Satellites;
- Landside;
- Surface Access; and
- Other key components including enabling works.

All the above key technical areas have been reviewed from the perspective of the themes identified. The scope of our review with regards to each theme is described in the following sections.

### 1.2.1 Operability

The airport will remain open during the construction phases. To achieve this, airport operations must be maintained during the development of the proposed infrastructure and facilities. The development

phases must also integrate into existing airport infrastructure.

Arcadis has assessed both the design and the programme of the Preferred Masterplan to assess the operability of the airport from the existing situation to **Step 0** that takes the expansion up to the opening of the 3<sup>rd</sup> runway.

Arcadis's assessment includes analysis on the following:

- The impact the Preferred Masterplan has on existing and future airport operations, including: Airfield, Terminals, Landside & Surface Access;
- Analysis of the operability of the plan with regards to complex issues including configuration, flexibility and resilience;
- Testing the reliability of forecasts and evaluating assumptions made by HAL;
- Reviewing the detail and calculations behind capacity assessments produced by HAL;
- The anticipated impact on existing consumers and operating airlines; and
- Observed level of maturity with regards to airport operations in the future.

### 1.2.2 Delivery

Arcadis has reviewed the Preferred Masterplan material to assess whether **Step 0** is deliverable. Our review has considered the following:

- The scope, design and programme;
- Feasibility of construction and ongoing airport operation during construction;
- Scope gap in deliverables, including the robustness of the programme for delivery and any risks associated with it;
- How new and impacted facilities will link with existing infrastructure and how HAL will maintain key assets during construction phases of delivery;
- The appropriateness of the detail provided in Project Management Plans and Programmes;
- The observed level of maturity with regards to deliverability; and
- Evidence that the single Preferred Masterplan and future development of the masterplan to DCO submission are adequately considered and appropriate for DCO award.

Some of these issues will be discussed in more detail in further reports as their impact on the deliverability of the scheme in **Step 0** is minimal.

### 1.2.3 Timing

This report assesses whether the single Preferred Masterplan at **Step 0** can be delivered to the anticipated timelines. Our analysis considers the following:

- Evidence that the single Preferred Masterplan and planned deliverables for each step can be provided in accordance with the specified duration in the programme and the dates and deadlines detailed;
- The risks to providing the relevant deliverables in accordance with the current specified duration in the programme and/or on the dates and deadlines detailed;
- The potential effect on overall programme durations of requirements that are not directly controlled by HAL, including the DCO and consent for the Energy from Waste (EfW) Plant.
- The impact of failing to provide for the relevant deliverables in accordance with the current specified duration in the programme;
- What strategies have been developed to mitigate risks and any subsequent impacts from failure to delivery in a timely manner, with consideration for interdependencies; and
- Evidence that the single Preferred Masterplan and future development of the masterplan to DCO submission are adequately considered and appropriate for DCO award.

#### 1.2.4 Cost Estimate

Arcadis has assessed whether the capital expenditure of the Preferred Masterplan phase for **Step 0** has been reasonably and reliably costed in relation to the design and programme provided in the single Preferred Masterplan.

Arcadis' study has reviewed HAL's approach to create and develop the Cost Estimate of their masterplan, including:

- Review of approach to Cost Estimate and process for development and future development, amendments to Cost Estimate based on progress, assessment of progress and amendments to date;
- Scope gap review;
- Accounting for inflation; and
- Any corresponding impact with Opex and/or Totex.

Arcadis has assessed the certainty and reliability of the Cost Estimate, including:

- Quantification of costs (assessing the amount measured, the basis of the measurements and the extent of the work where quantification has not yet been undertaken);
- Pricing and confidence in costs (total, measured, assessed, benchmarks);
- Application of on-costs; and
- Approach to risk.

In addition, Arcadis has observed the level of maturity within the Cost Estimate. This includes:

- The robustness of evidence provided by HAL in relation to its single Preferred Masterplan and associated cost; and
- The integration of Cost Estimate with other elements of the single Preferred Masterplan such as; design, procurement, programme, logistics, external and mitigating factors, project specifics.

#### 1.2.5 Interest of Consumers

For the purpose of this report 'consumers' are defined as both passengers and cargo operators of the airport.

To review HAL's Masterplan with regards to the interest of consumers Arcadis has considered the following:

- HAL's process for acquiring consumer insight
- The relevance of the information and the utilisation of customer insight;
- How well HAL has incorporated consumer insight into their masterplan development process;
- How well HAL's Masterplan reflects the stated and expected interests of existing and future consumers; and
- How well the future development of the masterplan reflects the interests of consumers.

This review will be building upon a previous Arcadis report submitted in December 2018, '*An initial review of consumer interests in the development of the HAL Masterplan*'.

### 1.3 Review Approach and Key Steps

Arcadis has proposed an approach to this masterplan review to meet the objectives identified above. The approach is aligned with CAA's expectations as agreed in a memo titled *HAL Masterplan Review* submitted by Arcadis to the CAA in July 2019.

The approach, and key steps taken are set out below:

- Arcadis has collected data and assessed all the information provided to it by HAL and has also used its own information and data for benchmarking and industry standards;
- Data and information have been analysed to understand the basis or source of the data. In addition, an assessment of the assumptions and parameters have been checked to ensure any proposed outcomes are aligned with these;
- The proposed technical solutions in the Preferred Masterplan have been reviewed and validated to ensure they meet the required criteria and objectives set;

- The impact of the proposed masterplan on various stakeholders has been considered;
- The delivery sequence and timing of the proposed masterplan has been reviewed;
- A study of the existing infrastructure has been undertaken to understand its link to the proposed facilities;
- The future demand and capacity needs of the expanded airport have been analysed and validated;
- An identification of any gaps in the robustness of the proposed masterplan, and an assessment of confidence in its delivery, have been undertaken;
- An interrogation of capacity assessments/calculations has been made and these have been validated to ensure their alignment to expectations; and
- A review of the direct costs, indirect costs and programme specific costs in the Cost Estimate has been made to determine the

appropriateness of quantities, rates, percentage additions and allowances.

### In the Interest of Consumers

Although this theme does not have a dedicated chapter as part of this **Step 0** report, Arcadis has considered the consequential impact that the themes will have on consumers and has made the relevant commentary within the theme chapters.

Arcadis has considered:

- To what extent HAL has gathered and utilised consumer insights to develop the masterplan;
- How well HAL has incorporated the interests of consumers into its masterplan development process; and
- Whether the masterplan reasonably reflects the stated and expected interests of existing and future consumers.

This element primarily builds upon the recent Arcadis Report '*An initial review of consumer interests in the development of the HAL Masterplan*' (dated December 2018).



# 2 OPERABILITY

Arcadis has assessed the **Step 0** proposals from an operational perspective. The impact on airport operations, configuration, flexibility and resilience has been assessed. This includes analysis of airside, terminal and landside infrastructure.

Arcadis has considered the simulation studies, assessed the reliability of forecasts and evaluated assumptions used in determining HAL’s models. **Step 0** has also been assessed against industry planning and compliance standards.

Arcadis’s key findings are:

- HAL has undertaken the appropriate level of detail to assure the proposed infrastructure will meet the operational demands placed on it at **Step 0**;
- HAL has demonstrated the increase in runway capacity will provide more operational flexibility and resilience;
- The integration of the new infrastructure with the existing airport operation is feasible and is unlikely to conflict with current operations; and
- HAL is yet to develop detailed Operational Readiness and Trials workstreams which will be key to ensuring a smooth transition without causing any operational issues.

## 2.1 Definition of Theme

This section of the report reviews the operability of **Step 0** and included an overview of the existing airport infrastructure and an analysis of the future infrastructure required to achieve the objectives of the HAL’s Preferred Masterplan.

**Step 0** corresponds to Phase 1 of the Preferred Masterplan. This step/phase is when the new third runway becomes operational. This is currently anticipated to be 2026. This phase also includes some enhancements to existing facilities to meet the terminal and apron capacity demand.

This section of the report also assessed the assumptions contained within the Preferred Masterplan, considered the compatibility of the proposals with the existing layout of Heathrow Airport and reviewed the adherence to statutory requirements and known constraints.

In this high-level assessment of operability, we have considered the following elements of the Preferred Masterplan:

- Airfield, including the 3<sup>rd</sup> Runway;
- Terminals;
- Landside; and
- Wider surface access considerations.

As part of the masterplan HAL has completed forecasting and demand analysis. The Arcadis analysis has considered the appropriate metrics,

including passenger numbers and aircraft movements, in the review.

## 2.2 Assessment

### 2.2.1 Methodology

Our review consists of a high-level assessment of publicly available information and documentation provided to us by HAL at the time of writing this report. This documentation (listed in Table 3) includes a number of reports, presentations as well as a number of reference drawings.

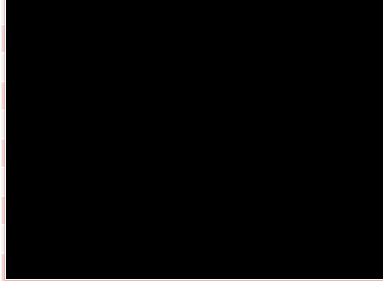
Report Title	Report Source
Heathrow Strategic Brief	HAL – Public Documents
Preferred-Masterplan - June 2019	HAL – Public Documents
Updated-Scheme-Development-Report-Documents-1-of-5	HAL – Public Documents
Updated-Scheme-Development-Report-Documents-2-of-5	HAL – Public Documents
Updated-Scheme-Development-Report-Documents-3-of-5	HAL – Public Documents
Updated-Scheme-Development-Report-Documents-4-of-5	HAL – Public Documents
Updated-Scheme-Development-Report-Documents-5-of-5	HAL – Public Documents
	HAL – Airline Sharepoint
	HAL - Presentations
	HAL - Presentations
	HAL - Presentations
	HAL - Presentations
	HAL
Cargo Transformation Board pack	HAL
	HAL
	HAL – Airline Sharepoint
	HAL – Airline Sharepoint
	CAA

Table 3 Operability Documents Reviewed  
Source: (CAA 2019), (HAL 2019)

## 2.2.2 Overview of Existing Infrastructure

The airport currently operates with a two-runway configuration. The runways are parallel and spaced far enough apart to enable independent parallel approaches. The dimensions of the runways are as follows:

- Northern Runway (09L/27R) – 3,902m x 50m; and
- Southern Runway (09R/27L) – 3,660m x 50m.

The declared capacity of the existing airfield is 88 movements per hour. The airport is currently limited to a total of 480,000 ATMs per year due to a planning condition associated with the construction of Terminal 5.

In the period 1<sup>st</sup> April 2018 to 31<sup>st</sup> March 2019, the airport handled 467,000 ATMs which is 98% of the capacity limit and equates to approximately 650 arrivals and 650 departures per day.

The terminal infrastructure at Heathrow consists of four terminals. Terminals 2, 3 and 5 are situated between the runways and Terminal 4 is located to the South of the Southern Runway.

In 2018 the airport handled approximately 80 million passengers per annum (mppa). The following data has been provided by HAL for each Terminal:

- Terminal 2 – [REDACTED] mppa;
- Terminal 3 – [REDACTED] mppa;
- Terminal 4 – [REDACTED] mppa; and
- Terminal 5 – [REDACTED] mppa.

The terminal facilities have surface access links for both private vehicles and public transport. The surface access infrastructure consists of adjacent vehicle forecourts, short stay car parks, road links to the motorway network and public transport interchanges for coaches, local buses, London Underground, and taxis.

## 2.2.3 Background of Current Operations

### 2.2.3.1 Airfield

#### Runways

The existing two runways at Heathrow are 3,902m x 50m and 3,660m x 50m. The runways are separated by 1,425m between centrelines. This allows for independent parallel approach. The runways are designed to operate the largest commercial aircraft, categorised as Code F by European Aviation Safety Agency (EASA) standards, which have a wingspan of up to 80m wide.

The runways are generally operated in segregated mode – landing aircraft are allocated to one runway and departing aircraft to the other. At specific times of the day when there is a build-up of airborne holding for arriving aircraft, tactical measures such

as using both runways for landings can be applied to minimise delays.

Despite the fact the minimum runways separation requirements as per EASA CS-ADR-DSN issue 4 and ICAO Aerodrome Design Manual (Doc 9157 ) Part 1 Runways are met, there is still a dependency between where air traffic control can position the arrival of an aircraft approaching one runway and an arrival on the other runway. The reasons behind this constraint are related to thresholds, approach categories, approach slopes, CTR Obstacles and abatement procedures. Separation between aircraft needs to be increased which reduces the landing rate on the runways and therefore the overall capacity. Solving the capacity constraint in this respect may impose the upgrade of the approach instruments / equipment and procedures and more advanced radar monitoring techniques.

Heathrow currently utilises its runways in an alternating operation, where they are switched for departing and arriving aircraft. This is done primarily to offer respite to local communities living under the flight paths from noise and overflying of aircraft. During westerly operations, the runways are alternated at 3pm each day. During easterly operations, the legacy of the now rescinded Cranford Agreement which prevented departures over Cranford from the northern runway, prevents runway alternation.

### 2.2.3.2 Terminals and Satellites

Heathrow has four operational terminals – T2, T3, T4 and T5. Terminal 1 is closed but houses the baggage handling system for T2. Terminal 1 is scheduled for demolition to enable future expansion of T2.

#### Terminal 2

- T2 opened in 2014;
- The main T2 terminal building is supported by a satellite – T2B;
- T2 is used by Star Alliance members and also by other non-affiliated airlines e.g. Aer Lingus;
- Handled [REDACTED] million passengers in 2018; and
- Current T2 area – 297,900m<sup>2</sup>.

#### Terminal 3

- T3 is the oldest operational terminal at Heathrow today and opened in 1961;
- T3 is used by Oneworld members, Virgin Delta and SkyTeam;
- Handled [REDACTED] million passengers in 2018; and
- Current T3 area – 225,780m<sup>2</sup>.

#### Terminal 4

- T4 is the only terminal located outside of the central core of the airport, being situated to the south of the southern runway;
- T4 opened in 1986;



- T4 is used by SkyTeam Alliance members and other non-aligned airlines;
- T4 handled █ million passengers in 2018; and
- Current T4 area – 132,400m<sup>2</sup>.

#### Terminal 5

- T5 opened in 2008;
- T5 is used exclusively by British Airways and Iberia;
- T5 handled █ million passengers in 2018; and
- Current T5 area – 526,000m<sup>2</sup>.

#### 2.2.3.3 Landside

##### Car Parking

HAL has stated that the current car parking facilities for both airport workers and passengers total 67,050 spaces around the airport. This is made up of:

- 42,000, HAL controlled spaces;
- 9,500 off-site (Purple Parking in Southall, Bath Road and other)\*;
- 9,300 onsite tenanted spaces;
- 3,100 off-site tenanted spaces;
- 2,700 car hire; and
- 450 taxi feeder park.

The airport has an existing cap of 42,000 spaces as part of the planning consent obtained for Terminal 5.

Of the total 67,050 car park spaces available the following spaces reserved for passengers and staff are:

- 33,000 passenger spaces across short stay, multi-storey and surface car parks including offsite locations;
- 24,800 staff spaces; and
- The remaining spaces are onsite tenanted spaces.

\*It should be noted that the 9,500 off-site spaces declared by HAL has significantly decreased since the site being used by Purple Parking has now been redeveloped for housing.

#### 2.2.2.4 Surface Access

Heathrow's baseline 2017 Public Transport mode share is circa. 40%. The mix of Public Transport services at the airport consist of:

- Heathrow Express – 4 trains per hour (tph);
- Piccadilly line – 12tph;
- TfL Rail Service – 2tph; and
- Various bus and coach services from CTA, T5 and T4.

This Public Transport infrastructure is currently not operating at full capacity which gives the airport scope to increase the use of public transport with this existing infrastructure as well as introducing new services such as the recently launched *Guildford Railair* coach as indicated in its plans.

### 2.2.4 Review of Preferred Masterplan

#### 2.2.4.1 General Overview

The previous sections provided an overview of the infrastructure and operations of the current airport. This provides context for the review of the Preferred Masterplan proposals.

This section follows the overview by providing analysis on the operability of the masterplan proposals. It follows a logical sequence starting with the work HAL has undertaken on traffic forecasting and the design day schedule. This forms the basis of the capacity and design of the masterplan proposals.

The review then focuses on the individual aspects of the **Step 0** proposals, namely airfield, terminal and landside developments.

#### 2.2.4.2 Traffic Forecasting

A fundamental aspect of airport masterplanning is the development of traffic forecasts. This provides the basic assumptions required to plan for the future growth of the airport.

HAL has developed Design Day Schedules (DDS) as part of this process. The DDS is typically used as the basis of designing the future size and capacity of an airport.

From our engagement with HAL, Arcadis has seen examples of the DDS and summaries of the methodology process behind their development. We note references to the █ and █ that documents the schedule generation methodology. Arcadis has not been provided with this documentation.

The DDS examples and extracts that were presented to Arcadis, included the following information:

- Flight and passenger information;
- Load factors;
- Annual passengers;
- Transfer rates; and
- Allocated stands.

The DDS has been used to derive passenger flows, transfer volumes and number of aircraft on the ground. The DDS information has been used for a range of workstreams in the masterplan process. The DDS has been used to inform the following sections of the masterplan:

- Masterplan design;

- Airfield;
- Terminal, satellites, aprons;
- Connectivity (bags and passengers);
- Surface Access;
- Environmental; and
- Utilities.

For example, the data from the DDS has been used in conjunction with the input assumptions for terminal and airside capacity modelling. The DDS suite serves as a single source so that all HAL workstreams use the same data for consistency.

Arcadis has seen evidence that a comprehensive suite of DDS has been developed by HAL. These were initially formulated back in 2015 and have been updated over subsequent years as the masterplan process has progressed.

The initial DDS were developed to match the Airports Commission and were provided for key years (2030 and 2040) with different scenarios, including carbon capped, carbon traded and baseline. These have been updated to account for future traffic, new layouts and phasing years. As a result, the DDS suite has expanded to encompass schedules for additional phasing years and different traffic scenarios such as high and base case.

Table 4 shows that HAL has developed DDS for a number of scenarios including a base and high case up to the opening of the new runway, and a base case and three variations of a high case in the year the third runway becomes operational. It should be noted that HAL has also developed DDS for two runway operations with increased traffic scenarios in the years prior to the opening of the third runway.

Year	Runways	Annual Movements			
		Scenario 1	Scenario 2	Scenario 3	Scenario 4
2018	2				
2022	2				
2023	2				
2024	2				
2025	2				
2026	2				
2027	3				
2030	3				
2035	3				
2040	3				
2045	3				
2050	3				

Table 4 Suite of DDS Currently Available for Use  
Source: (b) (6)

Based on this information, Arcadis is satisfied that the DDS suite appears comprehensive, providing parameters and assumptions that should aid various disciplines under the masterplan process, such as the terminal and airfield capacity studies.

The provision of schedules for a range of years in the masterplan period, as well as different traffic levels (high and base) indicates that HAL are testing different operating and growth scenarios for the development of the airfield.

The DDS for a two-runway scenario between 2018 to 2026 demonstrates that HAL has considered the operation of the airfield during the development works prior to the opening of the third runway (**Step 0**).

The DDS work appears to be detailed and is an ongoing process as per the Preferred Masterplan and phasing, as well as any layout changes. Arcadis notes that the DDS suite encompasses important years in the masterplan period and a variety of air traffic growth scenarios. To ensure confidence in the validity of the DDS data as an input to the different masterplan interfaces, we recommend that ongoing monitoring of the process is maintained by HAL in order to mitigate any potential risk.

### 2.2.4.3 Airside

#### 3<sup>rd</sup> Runway Location

The requirement of the Airports National Policy Statement (ANPS) is that the runway must be at least 3,500m in length and enable an additional 260,000 ATMs per year. The position of the new runway must enable independent runway operations.

The position of the new runway has been through an extensive evaluation process and has been sited in accordance with the ANPS. This review does not revisit the previous study, but HAL has detailed the process in *Document 2* of their *Updated Scheme Development Report*.

The new runway will be separated by 1,035m from the existing Northern Runway, from centreline to centreline. This will enable independent runway operations. HAL has previously stated that further benefits would be realised by separating the runways further apart than 1,035m. However, they have decided against this as greater separation would require further loss of property in Harmondsworth and 1,035m runway separation would be more efficient for ground operations. As a comparison, the centreline separation between the existing Northern and Southern Runways is 1,425m.

Arcadis agree with HAL's assessment with regards to the separation of the new 3<sup>rd</sup> runway from the existing Northern Runway and believe that a separation of 1,035m ( as per the ICAO & EASA requirements ) creates the conditions for operations density increase by introducing the independent parallel approaches and departures strategy, leading therefore toward absolute higher probabilities to meet the objectives in the ANSP. However, the delivery of the extra 260,000 ATMs is still subject to modelling which is currently an ongoing process.

#### 3<sup>rd</sup> Runway Length

Analysis into the appropriate length of the runway was completed during the Airports Commission process. HAL provide a summary of the approach taken to the determine the length of the runway in *Document 2* of their *Updated Scheme Development Report*.

The length of the proposed runway is 3,500m. It will be 60m in width, comprising 45m of runway and 7.5m wide shoulders on either side. This enables Code F operations.

The design of the runway also includes provision of displaced thresholds at both ends. These would be 550m (subject to final NATS/HAL safety case) at each runway end and this is designed to reduce noise impacts from aircraft on surrounding communities.

### **Runway Infrastructure and System**

With the provision of the 3<sup>rd</sup> Runway, adjustments have been proposed for the two existing runways that will enable independent alternation of flightpaths across the three runways. These adjustments are designed to reduce the impact of aircraft noise on the surrounding community, enable efficient use of taxiways around the end of runways (Around the End Taxiways (ATETs)) and increase the flexibility of runway operations.

ATETs are a type of taxiway with the same characteristics as existing taxiways across the airfield. The only difference is that they are positioned at the end of runways to enable aircraft to taxi from one side of a runway to the other without having to cross an active runway. They are designed to be operated independently of runways and the ATET and the runway can be used simultaneously. Arcadis believes that this will contribute to the more effective operation of the airport and is configured for minimum land take.

On the existing southern runway, a 550m displaced threshold will be introduced. The centre runway (existing northern runway) will have 1,101m displaced thresholds introduced at both ends. Aircraft on approach will be at a higher altitude as they overfly local communities with the aim of reducing noise impact. At the east end of the centre runway, a new 211m starter extension strip will be provided to maintain a 3,500m take off run available as a result of the ATETs located at the western end.

The introduction of the 3<sup>rd</sup> runway requires changes to the modes of operation. One runway will be dedicated to landing aircraft, one to departures and the other used for landing and departing aircraft in a mixed mode operation. The different modes of operation will be circulated around the three runways to provide periods of respite from aircraft noise for local communities.

### **Airfield Modelling**

Airfield modelling and simulation work has been undertaken for the future runway operations by HAL. This has been undertaken in conjunction with NATS. The modelling software used by HAL is Total Airspace and Airport Modeler (TAAM). TAAM is an industry recognised tool for airfield modelling and it is understood that this has been used for a number of years by HAL. Arcadis is satisfied that this is an appropriate tool to conduct airfield modelling.

HAL has confirmed that the modelling process has included engagement with airlines on a bi-lateral and multi-lateral basis. It is understood that these

discussions are confidential but Arcadis is satisfied that the airlines have been involved to provide a further level of verification, debate and analysis to the modelling process.

We have seen evidence that the simulation work has taken into account the daytime mode changes – alternating each runway between landing, departure and mixed mode. Furthermore, simulation has been undertaken for both easterly and westerly runway operations.

From our review of supporting documentation relating to the airfield design provided by HAL, a comprehensive list of modelling assumptions demonstrates that development work and analysis has been undertaken behind the future runway operations and airfield assessments for the masterplan development. The list of modelling assumptions encompasses both airspace and airfield characteristics which relate to aircraft separation, arrival and departure routings, taxiway flows, stand plans, ground movement speeds and the planned runway threshold displacements.

From these modelling assumptions, Arcadis believes that HAL has conducted airfield modelling that accurately replicates the future layout and assumed operation that this might entail. Arcadis has seen select outputs of the airfield modelling work that has been undertaken by HAL which were presented in workshop sessions. The outputs that have been made available indicate airborne delay, arrival taxi time and departure taxi time for different configurations of the runway operating modes.

HAL has not completed modelling for low visibility procedures at this stage but has started initial consideration for understanding the impact on the most complicated areas of the airfield. Arcadis is satisfied that the modelling is sufficiently advanced at this stage and would not expect this level of detail for a masterplan.

Overall, Arcadis is satisfied that HAL has conducted modelling that accurately tests their assumptions and proposed airfield infrastructure. It has been indicated by HAL that airfield modelling is ongoing to further develop the airfield design and test the proposed infrastructure against other scenarios such as low visibility operations and runway outages.

### **Taxiway System**

The taxiway system is thoroughly described in the *Updated Scheme Development Report* produced by HAL in *Chapter 2, Document 2*.

The general layout of the current taxiway system consists of dual parallel taxiways assigned to each runway in part connected with nine cross-field taxiways linking north and south areas. Located to the south side of the Southern Runway (09R/27L) are Terminal 4 and the cargo area which are also linked with the whole airport taxiway system.

The new runway will require a taxiway system that connects with the new aprons and terminal as well as with the existing taxiway system. The taxiway system will have to comply with many requirements

to avoid any single points of failure, predictable and reliable respite from noise and compliance to EASA requirements for airfield geometry. In order to meet the above criteria, HAL decided to adopt a detailed scheme development process of optimisation regarding options development and selection.

The current layout of the airfield does not include any taxiways that go around the ends of the runways. All aircraft currently accessing T4 and the cargo area must cross the Southern Runway. The new sections of the airfield are designed to eliminate similar scenarios. Aircraft using the new 3<sup>rd</sup> Runway will not be required to cross the central runway to reach the rest of the airfield. It is preferable that, following the requirements for taxi time reduction, aircraft using T4 and the cargo area to be assigned the use of the future Centre and South Runways. Longer term, aircraft using T5N will use the new 3<sup>rd</sup> Runway and the existing Northern Runway.

The Total Airspace and Airport Modeller (TAAM) and Air Traffic Control (ATC) simulator modelling employed by HAL indicates that if aircraft were required to cross the central runway then it would not be possible to deliver the additional 260,000 ATMs as detailed in the NSP.

HAL propose dual Around the End Taxiways (ATETs) on the central runway to prevent aircraft having to cross active runways. These will be located at the west side of the airfield where the majority of the apron capacity is located. Situating the ATETs on this side reduces the overall land take required. This will also provide environmental and operational benefits as it minimises taxi times for aircraft accessing the new runway.

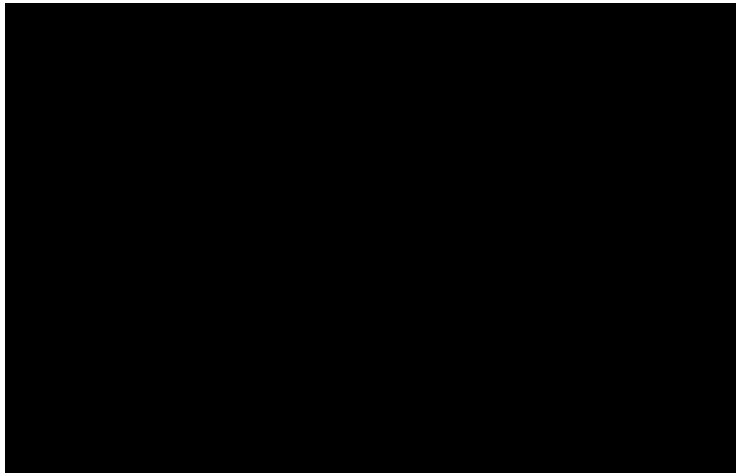
The ATETs will be Code F compliant and therefore compatible with all aircraft sizes using the airport. This provides maximum operational benefits and, as they are dual taxiways, will enable one taxiway to be used for departures and the other for arrivals.

On a localised section of the ATETs, the vertical stabiliser of Code F and some larger Code E (Boeing 747-8i) aircraft will infringe the take-off climb surface of the obstacle limitation surfaces (OLS) associated with the central runway, as indicated in Figure 1. This will have an impact upon airfield operations whilst Code F aircraft are taxiing in this area. The impact of this could be either airfield operations related restrictions or amendments to aircraft performance (through updates to Type A charts) depending on detailed solutions to be agreed upon with the airlines at the detailed design stage.

However, considering the small proportion of Code F aircraft movements Arcadis does not believe this should have a detrimental impact on safety or capacity. Movement of Code F aircraft in this area will be managed operationally by ATC to comply with airfield operations requirements and maintain the safe movement of aircraft, expected by routing Code F aircraft on the outer of the two taxiways.

The alternative would be to redesign the airfield with wider spacing between the runway and taxiways.

Arcadis believes that this would be excessive and is satisfied that the design proposed is sufficient with regards to safety and operational risks and that HAL has provided a pragmatic solution.



Overall, Arcadis agrees with the location and the design of the ATETs from an operational and airfield safety perspective.

### Aprons and Stands

During **Step 0** there is no significant terminal expansion proposed with additional capacity being accommodated within the existing infrastructure. As a result, the apron infrastructure will remain similar to the existing layout. However, additional aircraft stands will be provided on existing airside areas.

Currently, Taxiway Kilo is under construction. The taxiway is located between the now closed Terminal 1 and Terminal 2B, as can be seen from Figure 2. Its completion will provide a new link between the two existing runways. The completion of the taxiway will also allow for additional aircraft parking space (Kilo box stands) either side of the taxiway. Some of these are already operational whilst others are under construction.

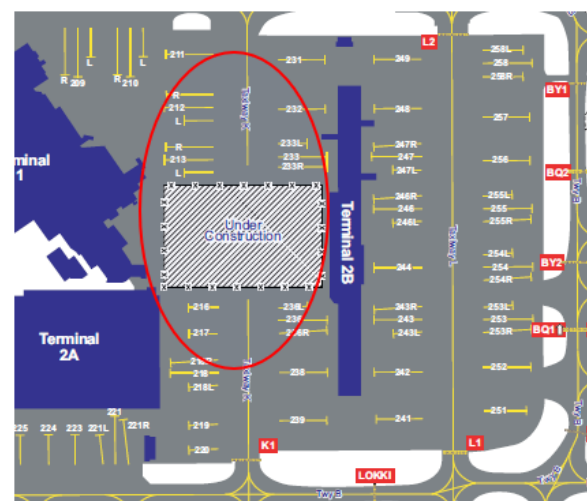


Figure 2 Taxiway Kilo and Associated Stands  
Source: (NATS - AIS 2019)

As part of the 'T5 Plus' scheme, five non-contact stands located at the northern and southern ends of the T5B and T5C satellites will be converted to contact stands. It is expected that the required conversion works would render these stands temporarily unavailable and that during this period, alternative stands should be provided to accommodate any associated shortfall in capacity that may arise on the T5 apron. If the stands are currently used for towing, when aircraft are on the ground for prolonged periods between flights, then we believe that this would not be an issue as these can be accommodated elsewhere, for example in the Eastern Maintenance Base or on the 580s/590 stands.

It is proposed in HAL's *Stand Throughput* report that some or all of stand numbers 580s and 590s, currently located in the middle of the airfield between Terminal 5C and Terminal 3, could be reallocated from T3 to T5.

Arcadis are satisfied that these additions can be provided in an operable manner. The new stands will be accommodated within the existing airside infrastructure.

The *Stand Throughput* document outlines the mppa/stand ratio for the actual and declared capacity in 2018, on a per terminal and total stand basis. For both actual and declared capacity, the mppa/stand ratio is just below 0.5mppa.

At **Step 0**, the proposed additions and re-allocation of stand infrastructure, along with the envisioned capacity, the mppa/stand ratio for the overall airfield is 0.51 mppa. We have undertaken a high-level benchmark of airports which are either operating with three runways or have proposed development of a third runway with passenger throughput similar to the rate that is expected in **Step 0** (see Table 5 below).

For clarity, HAL provide two scenarios (A & B) in the *Stand Throughput* document. The difference between the two scenarios is the allocation of remote stands between terminals and consequently how this corresponds to the mppa/stand figures. However, in each scenario the total number of stands, the overall airport capacity and the overall

mppa/stand throughput is constant. Therefore, the analysis in Table 5 accounts for both scenarios.

Our high-level benchmark analysis indicates that the annual passenger to stand ratio in **Step 0** is aligned with similar sized airports operating with or proposing a third parallel runway. It is Arcadis' opinion that the annual passenger to stand ratio is in the upper range. However, based on comparison with similar sized airports, Arcadis is comfortable with the stand throughput proposed by HAL.

### Airfield Hotspots

The existing layout has four airfield hotspots as indicated below:

- **HS1 (Links 23, 22 and 21)** – Pilots must maintain a good lookout and are responsible for wing tip clearance;
- **HS2 (SATUN)** – Pilots must maintain a good lookout and are responsible for wing tip clearance;
- **HS3 (Link 28)** – Code F movements must take care. Link 28 East of Taxiway Alpha is not Code F compliant; and
- **HS4 (TWY Y)** – Pilots are to ensure they have clearance to enter the runway before crossing the holding point.

The masterplan process is removing these hotspots by design over a period of time. Arcadis believes using the masterplan process to eliminate the hotspots is a sensible approach to enhancing the safety of the airfield. Arcadis' analysis of the airfield layout does not indicate that any new hotspots will be created.

### Cargo Facilities

In 2018, approximately 1/3 of the UK's long-haul export goods moved through Heathrow airport and the airport is the UK's biggest port by value. The main cargo facilities are located to the south of the airport. This infrastructure handles a significant amount of cargo which equates to c. 1.7 million tonnes per annum. This is supported by the large amount of freight and logistics businesses located

Airport	Total No. of Terminals	Annual Pax - based on 3 parallel runways (MPPA)	Total No. of Stands	Annual Pax per Stand (MPPA)	Comments
Heathrow*	4	95.0	186	0.51	
Hong Kong*	3	97.0	160	0.61	Based on three runway system with 3rd runway passenger building (Masterplan 2030)
Singapore Changi*	4	82.0	159	0.52	
Kuala Lumpur	2	70.0	162	0.43	
Munich*	2	61.0	156	0.39	Third runway plans submitted but not pursued during the current Bavaria Coalition Government legislative period (2018 – 2023).
Beijing Capital	3	95.5	171	0.56	

\*Third runway proposed or in development

Table 5 Comparison of Heathrow Step 0 Scenario mppa per Stand Ratio  
Source: (Arcadis Internal Library 2019)



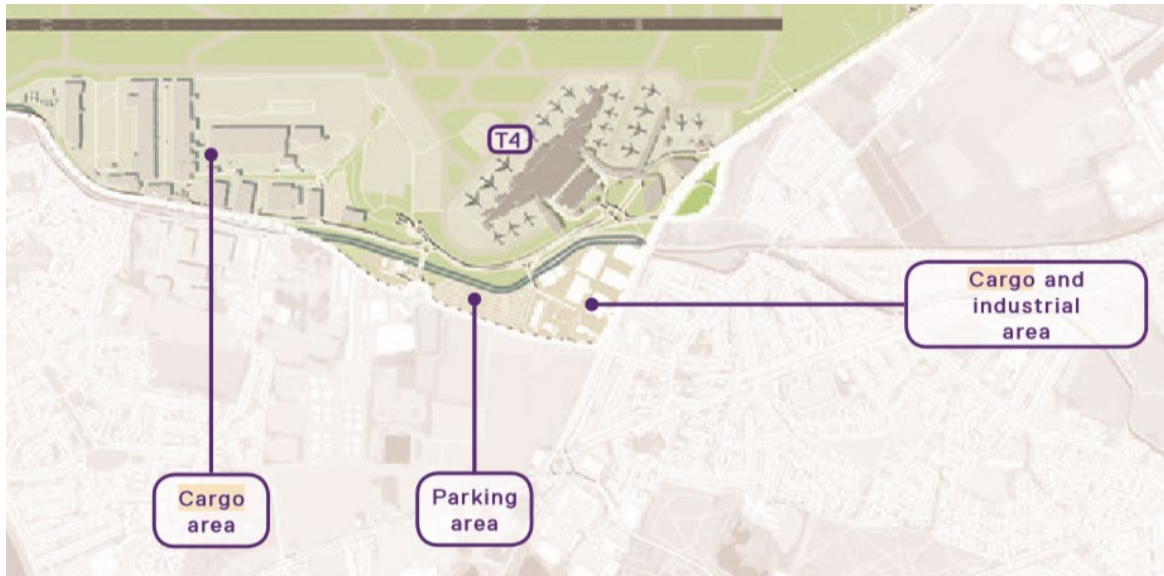


Figure 3 Location of Cargo Terminal and Cargo Related Businesses in the Surrounding Area  
Source: (Preferred Masterplan - HAL 2019)

in the surrounding areas of this airport (refer to Figure 3 above).

Arcadis understands that new third runway would permit the growth of cargo volumes to the forecasted demand which is anticipated to reach 3 million tonnes per annum by the year 2040.

The Preferred Masterplan proposes up to 206,000m<sup>2</sup> of additional cargo facilities to support the forecasted demand. The development strategy followed to meet the projected demand comprises of four key criteria:

- Increasing capacity to facilitate the throughput of 3M tonnes per annum;
- Improving performance and efficiency;
- Reducing freight vehicle traffic; and
- Minimising risk of delivery vehicles.

HAL has proposed improvement measures support each of the development strategies. The improvement measures are explained concisely in Table 6.

These infrastructure developments are not proposed to be delivered before 2026 so are not covered in the **Step 0** report. Arcadis aims to undertake a full analysis of the proposed cargo infrastructure in the Step 3 and Step 8 reports.

#### Air Traffic Control Tower

A second ATC tower is proposed in the masterplan (refer Figure 4). This is positioned adjacent to the hard stands array facing T5XN in the west side.

HAL anticipates that technology may negate the need for a second tower. Therefore, the position of the tower is for safeguarding purposes only should it be required in future.

Arcadis has no information about the height, line of sight or any other parameter in relation to its construction.

From aeronautical point of view the location of the tower must be checked against the height limitations imposed by the Obstacle Limitation

Development Strategy	Improvement Measures
Increasing Capacity To facilitate cargo throughput of 3M Tonnes P.A	<ul style="list-style-type: none"> <li>• Facilitating growth and intensification of land use on site</li> <li>• Provision of additional capacity through development of new cargo terminals / transshipment facilities</li> </ul>
Improve performance and efficiency	<ul style="list-style-type: none"> <li>• Minimising Minimum Connection Times (MCTs) for transiting freight through</li> <li>• Addressing traffic issues at Control Posts</li> <li>• Addressing access issues with Dnata City</li> <li>• Reducing number of touch-points</li> </ul>
Reducing Freight Vehicle Traffic	<ul style="list-style-type: none"> <li>• Consolidation of freight forwarder facilities</li> <li>• Providing excellent airside road links from new apron areas to the cargo areas</li> <li>• Provision of cargo staging areas close to aprons</li> <li>• Provision of transshipment areas</li> </ul>
Minimising risk of delivery vehicles using residential roads by	<ul style="list-style-type: none"> <li>• Developing a truck park with appropriate call forward facilities</li> <li>• Investigate the possibility of an Intermodal / Rail hub for cargo</li> </ul>

Table 6 HAL Development Strategy for Cargo  
Source: (Cargo Transformation Board pack 2019)

Surfaces provisions – EASA CS ADR DSN – Chapter H.

### Rescue and Fire Fighting Services

ICAO Document 9137 – Airport Services Manual Part 1 details the regulations and requirements for the fire protection level based upon the air traffic movements at airports. Heathrow Airport is able to provide Rescue and Fire-Fighting Services category A 10 level.

Within the Preferred Masterplan document HAL is declaring a Satellite Fire Station in relation to the 3<sup>rd</sup> Runway operation positioned in proximity of new THR 27R, east of TXN satellite. The requirement is that the fire service must be able to respond to emergencies and reach the runway thresholds within three minutes of a call.

It is noted that the position of the facility may require 90 degree turns when accessing taxiways. ICAO recommends that 90-degree turns should be avoided. However, Arcadis accepts that the level of

detail in the masterplan may not show all of the airside roads. We would expect that the design will allow provision for local airside roads to prevent this scenario.

A more centrally located position to the runway would provide a faster response time to the west side of the new 3<sup>rd</sup> Runway, however, with the competing demands of other airfield infrastructure Arcadis believes the proposed location can provide a compliant solution.

Therefore, Arcadis is satisfied that the location of the fire station can be made compliant regarding emergency response times.

As the masterplan develops the final design of the facility will be determined. This will include items such as the vehicle fleet allocation and the extinguishing agents. Following this, the Emergency Plan will detail the response plan for emergencies and the specific detail regarding equipment and personnel.

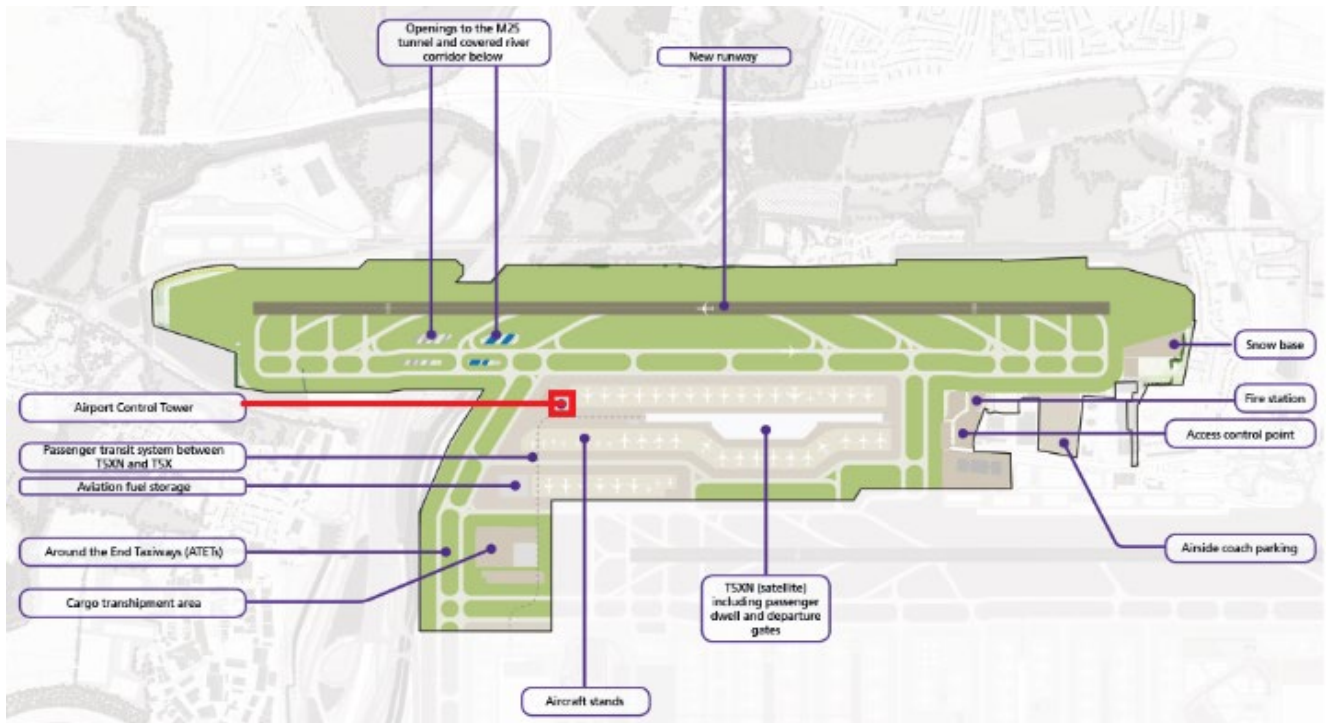


Figure 4 ATC Second Tower Location – 3<sup>rd</sup> Runway  
Source: (Preferred Masterplan - HAL 2019)

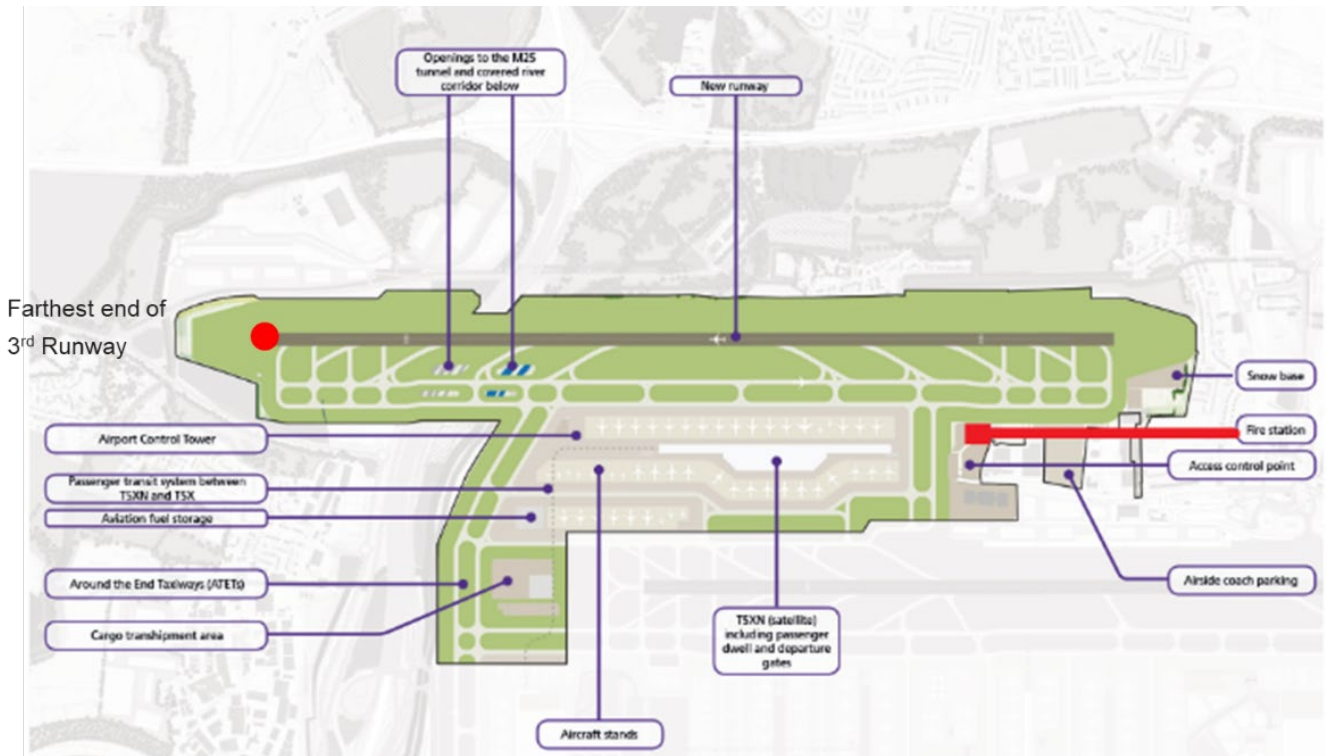


Figure 5 Satellite Fire Station Location  
Source: (Preferred Masterplan - HAL 2019)

### Fuel Farm

The aviation fuel demand at Heathrow today is █ million litres per day. This is delivered primarily through an extensive pipeline system including the use of rail transport.

Before being pumped through the hydrant systems, the aviation fuel needs a buffer (ground level tanks) in order to ensure a settling period for quality aircraft delivery purposes and in a certain adequate volume aiming to continue to feed the airport in case of supply disruption.

There are two fuel farms at Heathrow today:

- Northern (Perry Oaks) Fuel Farm; and
- Southern (Cargo Zone) Fuel Farm.



Figure 6 Existing Fuel Farm – Perry Oaks Depot  
Source: (NATS - AIS 2019)

The Northern Fuel Farm is located west of Pier 5 Terminal 3, South from TWY B, neighbouring Stands 596, 595, 594. (Figure 6).

The Cargo Zone Fuel Farm is located South from TWY S, across Cargo Apron Z (Figure 7).

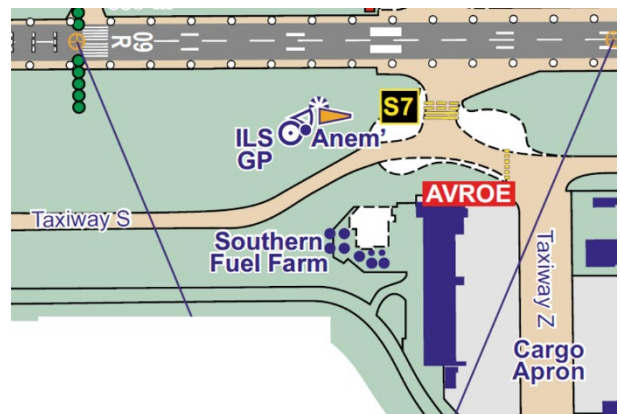


Figure 7 Cargo Apron Fuel Farm  
Source: (NATS - AIS 2019)

HAL has evaluated several options for fuel storage facilities development in order to cope with the forecasted 740k ATMs average peak demand schedule and █ million litres per day required by the expanded airport. Some supply disruptions were considered - ranging from 2 to 14 days with severity of fuel loss of supply from 25% to 40%.

The most fuel resilient option identified as optimum was the construction of four supplementary tanks next to Perry Oaks Depot, on parking stand 596 and six more tanks on the Southern Apron. Thus, this option would be able to withstand a prolonged 35% supply disruption and up to five days at 40%.



Together with the above planned extension there are also reconfiguration of the supply network as pipelines and Railhead.

The development of the fuel farms and space reconfiguration must also take into account the safe distances in relation to the existing structures and operating aircrafts. Information received from HAL indicates that the safety clearances for the fuel tanks are compliant with the Control of Major Accidents Hazards (COMAH) regulations.

Arcadis believes that HAL has undertaken a comprehensive analysis of the fuel demand. The proposed expansion of the existing facilities planned to meet this demand, whilst providing the necessary capacity for disruption.

### Ground Support Equipment (GSE)

HAL has presented a high-level view within the Preferred Masterplan document setting out the positioning of the Maintenance Base for Ground Support Equipment (GSE) repairment and parking within Area A, 3<sup>rd</sup> Runway related.

While the location of the GSE Maintenance (and other similar facilities) is dictated by the aerodrome performance and standard operating practices, the GSE inventory and capability is important for the entire airport operations.

This defines the services assumed by HAL and technical capabilities of other airport users such as Handling Companies.

Currently, Arcadis has not analysed any GSE fleet inventory, capacity estimation or planning in relation to the new 3<sup>rd</sup> Runway operations. There is a risk that GSE may need to take up stand space that could cause operational inefficiencies.

### Snow Base

The Preferred Masterplan has the location of the Snow Base at the east end of new runway 09L/27R in the proximity of the GSE Repairment facility.

The location of the Snow Base as indicated in Figure 8 below is dictated by the local standard operating procedures of the aerodrome.

Arcadis believes that the snow base is located in a suitable position on the airfield to respond to operational needs in periods of adverse weather.

### 2.2.4.4 Terminal and Satellites

As **Step 0** does not include expansion to existing terminals or the construction of new terminals, Arcadis has focused on the external airport infrastructure and the construction of the runway. However, as part of the existing 'On-Airport' portfolio of capital projects, HAL currently has plans to increase the capacity of T5 and potentially T3 in advance of the new terminal facilities being developed and to maximise the opportunity of a potential uplift in ATMs following the DCO approval. These projects are referred to as the 'Plus' projects.

Additional demand in this period is anticipated by HAL to be absorbed by the existing terminal facilities. There will be additional capacity measures implemented but these will be through alterations to the existing infrastructure and measures including technological enhancements to processing facilities.

Arcadis is satisfied with the approach taken by HAL. Namely, that **Step 0** concentrates on external infrastructure and airfield infrastructure. Arcadis after a high-level assessment based on the thumb

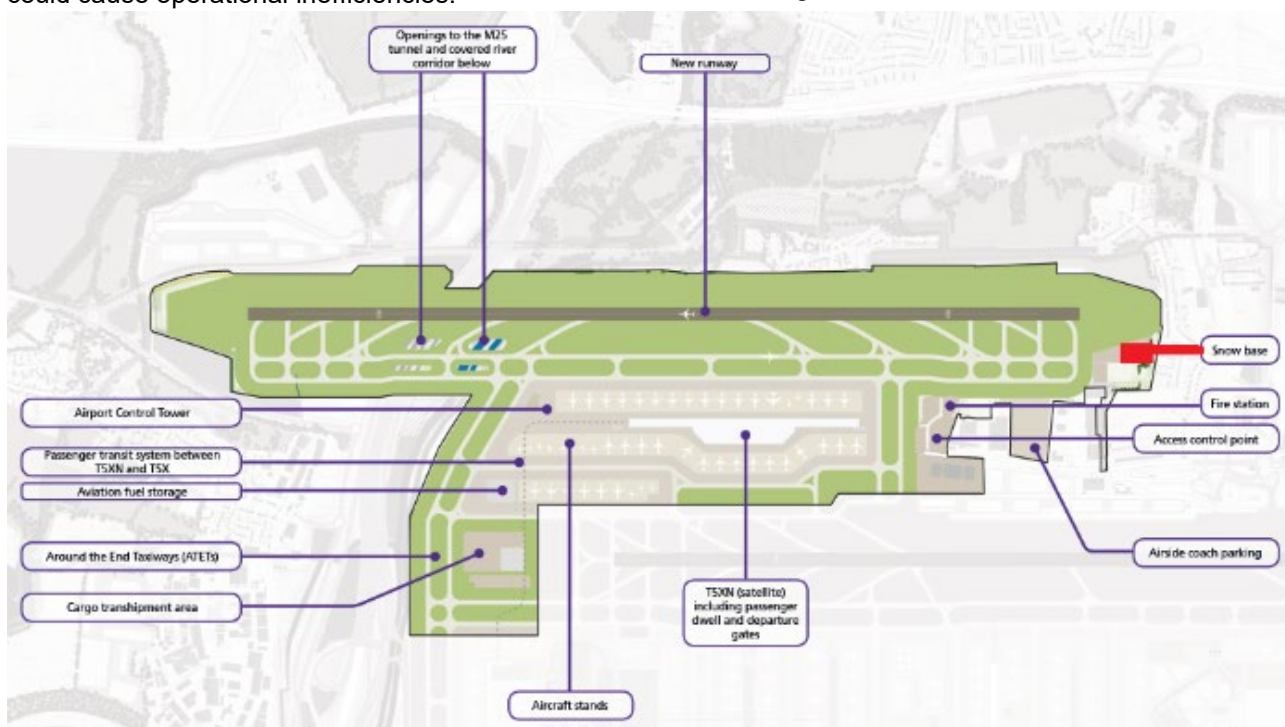


Figure 8 Snow Base Location Zone A  
Source: (Preferred Masterplan - HAL 2019)

rules and benchmarks due to limited access to information is satisfied that the terminal facilities can cater for the passenger demand in the Step 0 phase.

#### 2.2.4.5 Landside

##### Forecourts

HAL is proposing to provide 'Kiss and Fly' facilities within the new parkways. Arcadis has measured the total airport wide kerbside that amounts to circa 32m per mppa. Arcadis has not been provided with any figures for the equivalent Kerb length HAL's new scheme will provide. It is not possible to make any meaningful analysis on whether this will be operable to a reasonable level of service. Arcadis considers that if HAL significantly reduces capacity from today's available kerb capacity, the drop off services may become have operational challenges

##### Taxi and Private Hire Vehicles

Arcadis has considered the effect that the proposed Heathrow Access Charge may have on Black Taxi and Private Hire Vehicle (PHV) fares and availability. The Heathrow Access Charge is a strategy to be implemented, originally as a pollution charge and then moving on to an access charge in 2026, this fare will be enforced for both private vehicles and taxis, with staff, freight and busses/coaches being exempt. If the access charge is applied upon every entry rather than on a daily basis, passengers will have to pay more to use these services.

Some passengers are unable to use public transport due to their location (when the public transport network is not operational -such as very early mornings) or due to a physical disability (that reduces access to public transport). Those passengers are likely to be adversely impacted financially by HAL's access scheme

In addition, this may lead to a reduction in the number of taxis and PHVs available at the airport, which would create longer queues at the Taxi ranks and for passengers seeking to use PHVs.

##### Bus and Coach

HAL has stated that they will expand the Central Bus Station and landside terminal zones to account for their improved bus and coach network. Arcadis has not been provided information by HAL of any plans to expand the bus and coach facilities at T4 and T5, with the proposed increased bus and coach services.

Arcadis considers that there is a risk that without an increase in available facilities, the airport will be unable to manage this increase in demand which will cause operability problems and cause delays to both passengers and staff using these services.

##### Car Parking

The current number of passenger parking spaces both short and long stay is 33,000, this includes both HAL controlled spaces and offsite Purple Parking. This sets a ratio of 435 parking spaces per mppa.

Whilst HAL do not have a target for **Step 0**, the current proposals for the number of HAL controlled parking spaces for passengers is 38,600 for 2030 with this number increasing in line with expansion through to **Step 8** (2050). This level of parking sets a ratio of between 330 and 335 parking spaces per mppa.

Arcadis notes that HAL has included 9,500 off-site parking spaces currently outside of their control in their baseline numbers. This has created a surplus of parking in their current levels compared to the proposed expansion plans as the latter only includes HAL controlled spaces.

As HAL is unable to rely on the additional provision of external parking for passengers, Arcadis have analysed the HAL provided numbers in terms of operability despite this discrepancy in methodology.

This reduction is reliant upon a significant level of change in how passengers choose to travel to and from the airport over the next ten years where the airport has little control. HAL has set out its Surface Access Strategy which includes high level information on incentives that aim to offer a Public Transport alternative for passengers travelling to and from the airport.

However, aside from the introduction of the Heathrow Access Charge, it is not apparent within the documentation how HAL will achieve this reduction in demand if passengers choose to continue to access the airport by private car and wish to park.

The risk associated with the reduction in parking space ratios is that HAL will have to manage the demand.

##### Staff Travel

The baseline of staff parking numbers for 2013 originally recorded has been flagged as anomalous by HAL, and as such are mediating between the significantly higher 2009 and 2017 values for their baseline. This does not affect their ability to operate the airport post 2026 but will significantly affect their ability to meet the 2030 and 2040 ANPS targets.

A modal shift to public transport will reduce car parking spaces for staff allowing spaces to be used for passengers. Car parks are to be consolidated into fewer sites that are clustered together into groups with good access to road networks. HAL has anticipated an increase of 2,150 car parking space provision in 2026.

The allocation of staff car parking is within HAL's control and the opportunity to achieve their proposed reduction is possible. This is however dependant on alternative options being available for staff to be able to get to and from work. Arcadis notes that without other options being available, there is a risk that the ability of the airport to bring in this change is limited and their ability to deliver the parking capacity for use by passengers at **Step 0** is reduced. This again may create the knock-on operability issues highlighted above in both the car parks and forecourts.

## Freight

The opening of the 3<sup>rd</sup> Runway will see an increase in ATMs and will result in an increase in the availability of air freight capacity at the airport. This will mainly be in the availability of more 'belly hold' capacity rather than through a significant growth in dedicated air cargo flights.

Although HAL has set out a plan to increase the use of virtual consolidation of freight, the evidence or impact of this is yet to be demonstrated. Arcadis believes that the increase in air freight capacity at Heathrow is likely to lead to a greater volume of road-based freight traffic accessing the airport campus to feed this demand.

This increase in air freight activity will impact on the operability of the airport as the resulting increase in road-based freight is likely to increase queuing at control posts and delays on the airport and wider road networks.

HAL has not set out detailed information on the level of freight activity linked to the opening of the 3<sup>rd</sup> Runway in 2026. Arcadis is therefore unable to fully review the operability implication the growth of air freight will have in Step 0 at this stage.

### 2.2.4.6 Surface Access Strategy

The ANPS detailed a number of requirements for surface access as follows:

- Increase the proportion of passengers accessing the airport by public transport, cycling and walking to at least 50% by 2030 and at least 55% by 2040;
- Reduce staff car journeys by 25% by 2030 and by 50% by 2040 from a 2013 baseline level;
- Strive to meet the HAL public pledge to keep landside related traffic no greater than 2019 levels;
- Set out the mitigation measures that it considers are required to minimise and mitigate the effect of expansion on existing surface access arrangements; and
- Keep CO<sup>2</sup> emissions within UK climate change targets.

This section analyses the assessment for Step 0 up until the anticipated runway opening in 2026. It should be noted that there are no specific ANPS targets set for this period. However, the existing Surface Access Strategy mode share targets seek to maintain a public transport mode share above 40% with a goal of 45% by 2024.

Most of the targets set out as part of the ANPS for an expanded airport are measures that are required beyond the Step 0 date. Arcadis recommends that the work to achieve these targets should begin in the early phases. The masterplan does not include the anticipated metrics for achieving these targets

by 2026. However, it does include the progress expected to be made by HAL by 2027.

HAL has stated that 'good progress' is expected to be made on the mode share and staff travel targets. HAL also state that compliance with UK Air Quality limits is expected to be achieved by 2027. HAL is confident that the pledge to keep landside traffic levels no greater than 2019 levels is expected to be achieved.

HAL's pledge of generating no more airport related traffic greater than 2019 levels is in the process of being monitored by HAL for the purpose of setting a baseline. HAL are utilising an Automatic Number Plate Recognition (ANPR) systems in a tight corridor around the airport. To date, HAL has not provided information on how their consolidation areas for retail and construction traffic will be taken into account for this purpose.

As the current proposed monitoring cordon does not include airport specific facilities such as the proposed Consolidation Centre the quantity of traffic not using 'airport roads' but still Heathrow related traffic will not be captured as part of this calculation.

In order to achieve this a range of infrastructure measures have been proposed for the period up to 2027. The relevant tangible measures proposed to achieve these targets include:

- Expanded coach facilities at Central Bus Station and Landside Terminal Zones;
- Cycle lanes and bus priority on A3044;
- Cycle lanes and bus priority on A4;
- Piccadilly Line enhancements (by TfL);
- New Multi-storey long stay car park at T4 (on site of existing surface level parking); and
- Staff parking reduced from approximately 25,000 spaces to approximately 19,000.

The following operational improvements are proposed:

- New taxi backfilling model;
- Vehicle access charge;
- Elizabeth Line operational;
- New Heathrow Travel Account for staff; and
- New coach services.

The above measures will contribute to the achievement of increasing the use of Public Transport and sustainable modes of travel and that these infrastructure and operational models will help meet the surface access targets. However, the targets for **Step 0** are not clearly defined and these are only specified for later phases.

The provision of this information for **Step 0** would assist Arcadis in determining the potential impact that these could have on the operability of the Landside areas of the airport in 2026.

## 2.2.5 Review of ANPS and Regulatory Compliance

This section of the report reviews **Step 0** against the main principles of the ANPS. The main points for **Step 0** relate to the airport design specifications and the surface access considerations.

### 2.2.5.1 Airport Design

The Preferred Masterplan has adopted the airport planning principles including those provided by:

- International Civil Aviation Organization (ICAO);
- European Aviation Safety Agency (EASA) Certification Specifications and Guidance Material for Aerodromes Design (CS-ADR-DSN);
- UK Department for Transport (DfT); and
- Civil Aviation Authority (CAA).

Arcadis agrees that the Preferred Masterplan provides the minimum required runway length and meets the requirements set out in ANPS regarding the 3<sup>rd</sup> Runway.

The working assumption is that the new 3<sup>rd</sup> Runway will be operational by 2026. In order to achieve this a significant amount of non-airport infrastructure works will be required to accommodate the new runway including river diversions, moving the M25 motorway, building other local roads etc. This is in addition to the works necessary to integrate the new runway and associated infrastructure including taxiways, service roads and utilities.

Analysis of how this will be achieved is detailed in the Delivery section of this report however from an operational perspective there are a range of issues to consider. The analysis in this section focuses on the on airport operational aspects once the infrastructure has been completed.

**Step 0** assumes that when the runway opens the maximum capacity of the airport will be 95mppa (Updated Scheme Development Report 2 of 5) split between terminals as per the *Masterplan Proposal Study* and [REDACTED]

[REDACTED]

However, **Step 0** does not propose any significant changes to the existing terminal facilities. Additional demand is anticipated to be catered for by enhancing existing facilities which are part of the existing 'On-Airport' portfolio of capital projects and are referred to as the *Plus* projects. This includes

increasing T5 capacity to 40mppa through the T5 plus programme comprising of works including the extension of T5B and C by converting remote stands to contact stands.

A layout of the airport at **Step 0** is located in Appendix A. This image is sourced from HAL's *Preferred Masterplan* dated June 2019.

## 2.3 Capacity Review

### 2.3.1 Airside

Arcadis is aware that prior to **Step 0** HAL is seeking to raise the capacity through the removal of the ATM cap through the DCO process. The removal of the cap will enable an additional 25,000 ATMs per annum on the two existing runways.

HAL states that this growth can be achieved mainly with airspace and operational changes along with minor infrastructure changes. For this reason, this has not been considered as a separate phase of the masterplan.

HAL states that the capacity of the three-runway system will achieve a minimum rate of 129 movements per hour. This is broken down per runway as follows:

- 48 movement per hour on the mixed mode runway (arrivals and departures);
- 39 arrivals per hour on the arrivals runway; and
- 42 departures per hour on the departures runway.

This capacity that this achieves will enable HAL to deliver its stated aim of achieving 756,000 ATMs, supporting 142mppa including an 8% resilience allowance.

Arcadis is satisfied with the fact that HAL has considered consumer interest as a key consideration in the evaluation of masterplan assembly options and also during the development of the Preferred Masterplan. However, we still foresee possibility of passenger dissatisfaction due to increased taxi time from the new 3<sup>rd</sup> Runway.

The forecasted proportion of narrow-body aircraft to the total traffic at Heathrow is more than 62% while for wide-body aircrafts is around 38% in the year 2022 and 2023. Arcadis foresees a scope for up gauging the fleet mix. This might result in substantial reductions in infrastructure requirements. Due to insufficient data, we are unable to analyse the rationale used behind keeping the percentage of NB aircrafts as high as 62%. However, to support our observation we have prepared a benchmark study in comparison with the Paris Charles de Gaulle Airport which is Europe's second-busiest airport after London Heathrow airport. This analysis can be found in Table 7.



Airport	LHR		CDG
	2022	2023	2018*
Year			2018*
Annual ATM's (000s)			481
Annual Pax (MPPA)			72.22
% of NB Daily Pax ATM's			48%
% of WB Daily Pax ATM's			52%
Total	100%	100%	100%

\*2018 data is used for comparison due to unavailability of future fleet mix

Table 7 Comparison of Aircraft Fleet Mix with Arcadis Benchmarked Data

Source: (Arcadis Internal Library 2019)

Arcadis believes that there will be potential to increase the proportion of wide-bodied aircraft once the NWR is operational. Prior to this, Arcadis believes that the proportion of narrow-body to wide-body aircraft is unlikely to change due to the existing capacity constraints and business models.

However, after assessing all the available documents and information provided by HAL, Arcadis is satisfied that HAL has undertaken the necessary detailed work in the development of **Step 0** proposal.

### Apron Facility Review

This section reviews the proposals for the planning and design of the apron and stand facilities. It also reviews the methods used for stand planning.

The [redacted] document details the current assumptions being used by HAL to generate apron frontage and stand planning. HAL has used the ICAO wingspan standards for Code C, E and F aircraft.

The proposed clearances being used by HAL are a 7m inter-stand clearway plus 1m clearance either side. The ICAO publication, *Document 9157 Aerodrome Design Manual*, states a minimum of 7.5m clearance for Code E and F aircraft and 4.5m for Code C.

HAL is using an approximate stand depth of 92m. The justification for this depth is that there is sufficient space for an 82m length aircraft with clearance all around. HAL has indicated that Heathrow is not considered by the airlines as being a critical airport for fuselage length. These are also dimensions that HAL has previously used for apron and stand facilities.

HAL is also applying a [redacted] buffer to the calculated stand frontage to provide resilience for events such as:

- Arrivals / departures off slot;
- Stand outages;
- Clearing time between aircraft departing or arriving; and
- Layout inefficiencies.

This [redacted] buffer is based on historic planning figures validated by HAL data from 2009 and 2016.

Although Arcadis does not see this approach as being unreasonable, no rationale has been provided as to why the resilience buffer is a percentage of stand frontage and if alternatives have been considered. For example, additional stands for resilience are based on a percentage of provided stands rather than frontage.

However, Arcadis is satisfied that the HAL parameters comply to relevant industry standards and in some cases exceed the standards for apron and stand design.

With regards to stand planning, HAL has used stand planning models to determine how effectively flights can be allocated to the defined stand layouts within the masterplan. This includes validating the stand frontage. The relevant stand planning assumptions include:

- Linking flights i.e. the turnarounds based on the design day schedules;
- Time between flights on stands (buffer) to build in resilience – [redacted] minutes;
- Towing of aircraft that are on the ground for a prolonged period of time between flights – HAL has used a time of more than [redacted] hours and a minimum of [redacted] minutes on stand for arrivals and departures if an aircraft is towed as per the HAL operational stand planning;
- No allocation preferences other than the overarching terminal occupancy – airlines are assigned any stand within the allocated terminal / apron;
- Resilience of one remote Code E contingency stand on each apron which aligns with HAL operational stand planning; and
- Target pier service level of 95% as per the current regulated service level.

This is a typical approach used in airport planning and Arcadis agrees with the principles being used to develop the input assumptions used for stand planning. The majority of the assumptions are aligned with HAL's operational stand planning practices and reflects the current operation and is assumed by HAL as being low risk.

It should be noted that although the stand planning model has been developed on the assumption that airlines can be assigned to any stand within their allocated terminal or apron, airlines currently have preferences for stands. HAL supports the principle that airlines can be assigned to any stand, as detailed in [redacted]

Arcadis notes that HAL's plans appear to be working on the assumption that this current airline behaviour will need to change. There is no supporting evidence that the airlines are willing to adopt to this new way of working.

Arcadis notes that there may be a risk that if the airlines do not change their current behaviours, the consequences may lead to the introduction of stand

inefficiencies and may therefore impact on the operation.

Notwithstanding this, Arcadis is satisfied that the approach being used by HAL for stand planning is appropriate and provides enough flexibility for operational purposes.

### 2.3.2 Terminals and Satellites

Arcadis has reviewed a document produced by HAL titled [REDACTED] in order to assess the requirements for terminal and apron facilities.

This document sets out the parameters and assumptions used by HAL in determining the initial view of terminal and apron facility requirements for each of the masterplans used for the M3 Gateway evaluation.

M3 is a milestone used to confirm the shortlisted masterplan options to be taken forward in the detailed masterplan evaluation.

The assumptions are based on information that is related to industry recommendations, operational assumptions and standards previously used by HAL:

- Assumptions that other airports / airlines have already achieved;
- IATA ADRM;
- Previous HAL standards;
- HAL standards relating to operations and passenger service levels;
- Service offering that is currently being worked towards at Heathrow; and
- Observations of passenger processor / transaction times and data.

[REDACTED] includes recommendations for sensitivity testing focussing in particular on assumptions that affect space take. The [REDACTED] document categorises the tabled parameters and assumptions under the following themes:

- Stand planning;
- Passenger waiting times;
- Passenger processing;
- Baggage Reclaim; and
- Transfers.

The parameters and assumptions are used within HAL's models to derive the facility requirements in each masterplan for:

- Stands;

- Check-in processing facilities;
- Ticket presentation ATP / desks;
- Security lanes;
- Lounge population;
- Immigration processing facilities;
- Baggage reclaim belts;
- Queue lengths to inform queueing space; and
- Transfers.

The *IATA Airport Development Reference Manual (ADRM)* – 9th and 10th editions – has also been considered by HAL. Arcadis is aware that the 11<sup>th</sup> edition of ADRM has been published and is the latest version.

Arcadis acknowledges that much of the masterplanning work undertaken by HAL was developed prior to the March 2019 publication of the 11<sup>th</sup> edition of the ADRM. HAL is aware of the latest edition of ADRM and will be undertaking a comparison with earlier editions to ensure that the input assumptions are aligned with the latest industry recommendations.

#### Terminal Assumptions

This section reviews the proposals for the planning and design of the terminal facilities.

A comparison of some of the relevant parameters relating to passenger processor waiting times in [REDACTED] with ADRM 10 are presented in Table 8. Arcadis is satisfied that the passenger processor waiting time assumptions in [REDACTED] appear to be within the range of IATA ADRM LoS C / Optimum.

Arcadis notes that for some processors, HAL has utilised a mid-range value such as for standard bag drop. However, for other processors, such as standard check-in or security lanes, a lower or upper range value has been applied.

Arcadis has observed that for some processors, [REDACTED] refers to a transaction. An example of this is for self-service kiosks and premium (business and first class) check-in counters. The transaction is a metric that accounts for varying processing times aligning with IATA ADRM. Arcadis assumes that these transaction times relate to the processor transaction assumptions stated in [REDACTED]. Clarification has been sought from HAL on this point.

Our analysis has identified that the immigration waiting time assumptions in [REDACTED] are noticeably different from the IATA ADRM recommendations (see Table 8).

Passenger Waiting Times (minutes)			
Processor	Passenger Type	IATA ADRM LoS	ADRM LoS Assumption
Kiosks	All Passengers	LoS C / Optimum	1 - 2
	Standard		1 - 5
Bag Drop	Premium		1 - 3
	Standard		10-20
Check-In Full Service	Business		3-5
	First		3-5
	All Passengers		ADRM 10 does not consider automated ticket inspection gates
Security	Standard		5-10
	Premium		1 - 3
	Transfer		5-10
Immigration*	Non-EEA		5 - 10
	EEA		
	eGates		ADRM 10 does not consider eGate processors
	Premium		1 - 5
	Transfer	5	
Baggage Reclaim	All terminals except northern apron	ADRM considers waiting times based on narrowbody / widebody aircraft	
	Northern apron		

Table 8 Comparison between ADRM LoS and ██████ Passenger Processor Waiting Time Assumptions  
Source: ██████ Modelling Assumptions 2018) & (IATA ADRM Edition 10 2014)

Although IATA ADRM does not distinguish the different types of immigration lanes (in the case of Heathrow, EEA and non-EEA immigration facilities), the parameters used by HAL does account for these different immigration lanes as well as standards that reflect the airport's operation i.e. previous BAA (HAL) standards. Arcadis believes that this is a sensible approach to immigration facilities reflecting the actual operations of the airport.

HAL has set out a comprehensive list of parameters and assumptions that relate to processor transaction times and modal splits for different check-in types (desks, kiosks, bag drop) or immigration routes (EEA/non-EEA or eGate).

Arcadis has reviewed these assumptions and compared with its own benchmarked data for New York – JFK and Paris – CDG airports. We consider that JFK and CDG are reasonable comparisons for terminal parameters and assumptions due to the mixture of traffic and the passenger profile. The figures in Table 9 provide a comparison of processing times.

The figures provided by HAL for ██████ indicate that check-in processing times are broadly in line with

JFK and CDG. The exception is with bag-drop where JFK and CDG are achieving lower processing times. However, Arcadis is comfortable that ██████ per transaction represents a reasonable assumption as HAL is in the process of testing the impacts of shorter and longer transaction times.

HAL currently process ██████ passengers per hour in security, which is lower than both JFK and CDG. The proposal in ██████ is for ██████ passengers per hour. Arcadis is comfortable that this is a reasonable assumption, considering that HAL aims to introduce high automation in its operating system.

However, Arcadis considers that significant improvements in the system and operational processes would be required to achieve reliable throughput above ██████ passengers per hour.

Arcadis understands that this is a sensitivity test and is attempted to make significant improvements in the process. However, Arcadis is unable to assess the impacts and benefits of such an aspirational number due to unavailability of further information as to how the expectations would be fulfilled.

		JFK (T5)	Paris CDG
Airport-wide Pax 2018 (MPPA)		62	72.
Processor		Processor Transaction Times (seconds)	
Self-Service Kiosk		125	90
Bag Drop		30	50
Assisted Check-In Desks		140	130
Security Lane		~180 pax per hour	~150 pax per hour
Immigration		Not useful for comparison as based on US CBP requirements.	Not available for comparison
		Provision (%)	
Departure Lounge		50%	70%

Table 9 Comparison of [REDACTED] Assumptions of Processor Transaction Times and Arcadis Benchmarked Data  
Source: [REDACTED] Modelling Assumptions 2018) & (Arcadis Internal Library 2019)

Arcadis is satisfied that HAL’s capacity modelling inputs are reasonable for the studies it has undertaken as part of its masterplanning process. The parameters / assumptions for the processor transaction times, modal splits for check-in methods and immigration channels (EEA or non-EEA) and baggage reclaim operation and capacity have been developed from a range of information sources including:

- British Airways data;
- Data from current terminal operations;
- Previous BAA (HAL) planning assumptions;
- HAL surveys;
- Passenger analysis;
- T5 modelling assumptions; and
- UK Border Force – source of assumptions relating to immigration.

Although these information sources are referenced in [REDACTED] they have not been made available to Arcadis by HAL.

Arcadis has been able to determine from our engagement with HAL and the available information in [REDACTED] that the planning parameters and assumptions have been developed from and align to industry recognised standards, such as *IATA ADRM Version 10* and a broad range of data related to Heathrow’s operation.

Arcadis is satisfied that these assumptions in [REDACTED] are reasonable inputs for the capacity analysis workstreams in the masterplan process. Arcadis has validated its assessment with analysis of industry guidelines such as IATA and our own benchmarked data.

### Terminal Sizing

The terminal buildings are not being expanded during **Step 0**. HAL has studied the maximum potential capacity of the terminal facilities, particularly for T5 as provided in the presentation 04 Forecasting and Capacity. This has resulted in the assumption that the maximum capacity can be increased. For example, T5’s capacity could be increased from the current [REDACTED] to [REDACTED]

According to HAL, this increased capacity could be achieved by implementing terminal operating process improvements, including stand and other facility upgrades. HAL’s studies have resulted in the updated capacities for all terminals:

[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]

This generates an overall capacity of 95mppa. No specific details of the internal terminal operating process improvements have been provided by HAL. Additional stands and stand upgrades are being provided on the T2 (with 4 new Code F stands) and T5 aprons.

The lack of information for the current and proposed passenger processor facilities within the terminals means that Arcadis is unable to assess and review in detail whether the capacity increases proposed by HAL can be achieved.

However, from a high-level perspective, Arcadis has analysed the terminal capacity in terms of required area and mppa. Based on the passenger throughput in 2018 and the terminal area, the



overall m<sup>2</sup> per mppa ratio for all terminals is [REDACTED]

This is substantially above the [REDACTED] per mppa ratio targeted by HAL in Evaluation 2 of the masterplan process. As indicated in Table 10, all terminals are currently achieving a m<sup>2</sup> per mppa greater than [REDACTED]

Arcadis has used the [REDACTED] per mppa ratio and the terminal areas to estimate the maximum highest potential capacity at high level in terms of mppa, the results of which are summarised in Table 12. When compared with the proposed capacity increases by HAL, it can be seen that by using HAL's own benchmark, there is excess capacity at a declared 95mppa throughput.

These high-level outputs cannot be used to arrive at a definitive conclusion. This would need to be verified by the capacity modelling undertaken by HAL which assesses the terminal facility and passenger processor requirements. From the available information provided by HAL, Arcadis understands that the terminal design will move to a 'bottom up' analysis, based on the DDS and input

assumptions as stated in technical note [REDACTED] HAL has stated that this will be completed at the end of August 2019.

Table 10 below presents the square metre per mppa currently achieved in all terminals. The square metre area per mppa ratio is used to validate the amount of space achieved per million passengers annually. This analysis clearly helps to establish that the area per mppa in T2, T4 and T5 is well above the targeted high-level metric of 12,500m<sup>2</sup>/mppa which was established during Evaluation 2. Whilst, in T3 the area per mppa falls just below the targeted value.

Subsequently, in Table 11 we have derived the terminal area requirements from the php numbers based on the regulations provided in the IATA ADRM 10. It is noted that the areas of T2 and T5 are substantially above the mandatory IATA space definition criteria. T3 just falls above the expected range, whilst T4 is experiencing a minor shortfall to align with the expected IATA requirements. However, we are comfortable that the Terminal areas are within the acceptable range of IATA recommendations.

Terminal Current	Terminal Area (sqm)	MPPA (2018)	Achieved Space (sqm/MPPA)
	Source: HAL	Source: www.heathrow.com	
T2	[REDACTED]	18.5	[REDACTED]
T3	[REDACTED]	19.5	[REDACTED]
T4	[REDACTED]	9.4	[REDACTED]
T5	[REDACTED]	32.8	[REDACTED]
Total	[REDACTED]	80.2	[REDACTED]

Table 10 Existing Square Metre per mppa Achieved  
Source: (Arcadis 2019)

Terminal	T2	T3	T4	T5	T5X
Area/PHP by IATA (sqm)	30	30	30	30	30
Required Area (sqm) per IATA	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Total Required Terminal Area (sqm) per IATA	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Existing Terminal Areas (sqm) from HAL	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	Not available
Difference (sqm)	63,900	5,280	-2,600	205,000	-

Table 11 Terminal Area Requirement Based on IATA ADRM 10  
Source: (IATA ADRM Edition 10 2014), (HAL 2019), [REDACTED] - HAL 2019), (Arcadis 2019)

Terminal Current	Terminal Area (sqm)	Space target (sqm/MPPA)	MPPA (2018)	Capacity Gap (MPPA)
Source	From HAL		www.heathrow.com	
T2				13
T3				4
T4				4
T5				22
Total				43

Table 12 Terminal Capacity Gap

Source: (www.heathrow.com 2018), (██████████ Modelling Assumptions 2018), (HAL 2019)

Arcadis is satisfied that HAL is undertaking the necessary detailed work in the development of planning parameters and assumptions for the purpose of determining the facility requirements for the terminals and aprons.

## 2.4 Summary

Arcadis has assessed all the available information and data shared during the **Step 0** to consider whether the Preferred Masterplan will be Operable.

The approach taken by Arcadis has been analyse the capacity assessments made by HAL of the airside, terminals and landside facilities and consider whether these are appropriate.

In addition, Arcadis has also assessed the simulation studies, forecasts, assumptions and parameters used in developing the HAL Preferred Masterplan to determine whether these use industry and compliant standards.

Arcadis is satisfied that HAL's capacity assessments are based on sound data and are fit for purpose. In addition, the forecasts, models and standards used to develop the Preferred Masterplan are also compliant with industry best practice and there are no departures from standards in the information used by HAL.

Arcadis observes that based on the capacity requirements set out by HAL, their Preferred Masterplan does provide a scheme that can

assimilate with the existing airport operation and the current configuration in **Step 0**.

Arcadis has considered the level of flexibility and resilience that will be in place at **Step 0**. On the basis that the information provided by HAL has demonstrated the airport can adequately provide for the growth in passenger numbers and the increase in runway capacity will provide more operational flexibility and resilience.

Arcadis has identified potential challenges that may arise at **Step 0** in Landside areas if passenger mode choice is unchanged through some of the Surface Access Strategy work proposed by HAL. However, at this stage in the masterplan process the level of detail required to assure the plan is not yet fully developed.

Although there may be some challenges that may arise, at this point in the masterplan process Arcadis is satisfied that on balance the proposals are operable and can be integrated into existing airport infrastructure.

HAL is yet to develop detailed Operational Readiness and Trials (ORAT) workstreams which will be key to ensuring a smooth transition without causing any operational issues.

Notwithstanding Arcadis' opinion that the Preferred Masterplan at **Step 0** will be operable, the challenges of deliverability, timeliness and cost still present the scheme with some challenges to open the new runway by 2026.

# 3 DELIVERY

Arcadis has assessed whether the masterplan and plans for **Step 0** are deliverable. As part of this review, consideration has been given to the scope and design provided for and when this is scheduled to be delivered according to HAL's current programme.

The review has assessed the feasibility of constructability (including logistics) and ongoing delivery during "construction" phases of the programme from today's existing operations to **Step 0**.

Arcadis has analysed any scope gap in deliverables, the robustness of the programme for delivery, the internal and external risks to delivery, and the confidence in HAL's ability to deliver the infrastructure required for **Step 0**.

Arcadis's key findings are:

- HAL's delivery of the elements of the scheme are presented in a logical sequence;
- HAL has sought to deliver the most efficient sequencing with the aim of delivering the new runway by 2026 however this has created a programme that has little margin to allow for delays or risk;
- HAL's programme is not unfeasible for the delivery of the required infrastructure however this is reliant on the programme timings set out in the plan to be delivered; and
- HAL will be reliant on other organisations to deliver some of the elements of the scheme which they do not control or can mitigate against. Delays could pose a risk to HAL's own delivery programme.

## 3.1 Definition of Theme

This section of the report reviews the deliverability of **Step 0** to understand if the required changes can be achieved in practice and can integrate with the existing airport infrastructure.

Arcadis has reviewed the proposals to ensure that they follow a logical delivery sequence. The scale and complexity of the proposed expansion of Heathrow requires a significant volume of work outside of the existing airport perimeter including earthworks, roads, rail, rivers and utilities before airport related infrastructure can be built.

The critical path to constructing the runway relies on these works being completed in a logical sequence. This review analyses the logical sequence of events to ensure that overall layout at the end of **Step 0** can be achieved.

Arcadis has reviewed the Preferred Masterplan material to assess whether **Step 0** is deliverable. Our review has considered the following:

- The scope, design and programme;

- Feasibility of construction and ongoing airport operation during construction;
- Scope gap in deliverables, including the robustness of the programme for delivery and any risks associated with it;
- How new and impacted facilities will link with existing infrastructure and how HAL will maintain key assets during construction phases of delivery;
- The appropriateness of the detail provided in Project Management Plans and Programmes;
- The observed level of maturity with regards to deliverability; and
- Evidence that the single Preferred Masterplan and future development of the masterplan to DCO submission are adequately considered and appropriate for DCO award.

Some of these issues will be discussed in more detail in further reports as their impact on the deliverability of the scheme in **Step 0** is minimal.

The review includes the following stages of the scheme delivery:

- Proposed Construction Phasing;
- Procurement;
- Pre-Construction;
- Early Works;
- Creating the Space;
- Earthworks; and
- Main Works.

Arcadis has identified potential risks to delivering the infrastructure needed to achieve Step 0. These are important to identify and mitigate against due to the volume of external infrastructure works required to achieve the Step 0 airport works.

## 3.2 Assessment

### 3.2.1 Methodology

This review is based upon discussions with HAL and a review of documentation released by HAL (listed in Table 13 below). This documentation includes a number of reports, presentations as well as a number of reference drawings.

Report Title	Report Source
HEP Procurement Strategy Review	Arcadis
[Redacted]	HAL
	HAL
	HAL
	HAL
	HAL
	Gardiner & Theobald LLP
	Gardiner & Theobald LLP
	Gardiner & Theobald LLP
	HAL
	HAL
	HAL
	DfT Heathrow Expansion Programme Assurance Review of Heathrow Airport Limited's Delivery Schedule

Table 13 Delivery and Timing documents reviewed  
Source: (CAA 2019), (HAL 2019), (Arcadis Internal Library 2019), (IFS 2019)

In addition to this documentation Arcadis has had various workshops and briefing meetings with HAL where there was the opportunity to discuss with HAL the detail behind the information presented.

It is apparent that a significant amount of work has been undertaken by HAL on the likely sequence, impacts and durations of the overall Preferred Masterplan schedule. This would be in keeping with a Nationally Significant Infrastructure Project seeking approval via the Development Consent Order (DCO) process.

The need to assess the impacts of construction on all the receptors around Heathrow required a detailed review of the methodologies and timings being proposed for the development.

The following sections review the deliverability of the proposed development at Heathrow. They will review the sequence of the works as a whole and in detail for key elements of the development.

### 3.2.2 Proposed Construction Phasing

**Step 0** requires an expansion of the airport boundary to accommodate the new runway and airfield infrastructure. Prior to this, the main works required are outside of the existing boundary.

The challenge presented by the development of a preferred Masterplan is about creating the space and then using that space to deliver a new runway and the associated infrastructure. This involves a significant amount of clearance of existing assets as well as undertaking a very significant number of earthworks to enable construction to proceed.

HAL has created a time slice walk through (images in Appendix A) of the likely construction process that will be undertaken to allow for a runway to open in the 4th quarter of 2026, **Step 0**.

These time slices are in 6-month windows and help to explain the thinking and challenges associated with the development. It is apparent from a detailed assessment of the points in time that the challenge to the development timescale is the creation of the space, the requirement for HAL to clear the construction zone of existing occupiers and incumbents prior to undertaking the construction process.

Any relocation, from rivers and roads to people, businesses and ecology, must be considered within the timescale and context of availability and vacant possession. The proposed relocations may be a significant and very real constraint and may be perceived as potentially negative.

Arcadis understands that it is difficult to capture the real impacts of these process on people, flora, fauna, infrastructure and the environment however, it is apparent that much thought has gone into how the construction process can be incorporated into this live environment.

The development requires the removal or relocation of some key utilities to the west of the existing boundary. These are indicated as early works and will pave the way for the construction of the new M25 route. The indicated sequence of works shows these works being undertaken prior to gaining approval for the overall development via the DCO process.

HAL will also require early engagement with the utility companies and will therefore incur costs before the approval for the scheme has been achieved.

The sequencing proposed by HAL will also require front end design and procurement for key replacement facilities that are required to be vacated to deliver the proposed earthworks strategy. These include the following:

- Energy from Waste facility;
- Harmondsworth Primary School; and
- Colnbrook Immigration Centre facility.

Arcadis understands that the Energy from Waste facility move will be subject to a separate Town and Country Planning Application. Arcadis has not seen any evidence that HAL has considered the risk to the delivery programme or any mitigation if this application is refused or challenged.

The proposed construction phasing indicates when the location of these facilities will be developed, and the detailed programme gives an indication for when the replacement facility will be constructed and made operational

The outer boundary indicated on Figure 9 is the extent of the construction works for **Step 0**. This is the work envelope for all works associated with the HAL Masterplan and includes areas outside of the current and future airport boundary.

Arcadis understands that prior to DCO approval HAL has identified a number of enabling works that they could start which are restricted to utilities and linked to environmental issues. HAL has proposed the phasing for these early works begins in the first half of 2020 with the relocation of utilities in the path of the realigned M25. This is followed by ecological works in the first half of 2021.

HAL has indicated that, upon DCO approval the following works will begin in early 2022:

- Utilities diversions;
- River diversions;
- Local road diversions;
- M25 diversion;

- Earthworks; and
- Establishment of the Construction Consolidation Site.

These elements of work are critical features of **Step 0** and require to be progressed in advance of the airfield works. The schedule issued to Arcadis for review indicated timescales for these activities, some of which occur prior to DCO approval. However, the sequence and timings are built around the needs of vacant possession of key areas to facilitate construction activities associated with the new runway development.

Arcadis considers that this approach to deliverability developed by HAL is sequenced logically. The programme set out by HAL indicates that the utility works will begin shortly after DCO approval, followed thereafter by the other infrastructure listed above. This culminates in construction of the airfield infrastructure starting in mid-2023.

### 3.2.3 Procurement

HAL has created a delivery procurement strategy that has been reviewed by the airline community. The high-level mission statement seeks to “Create a Heathrow Expansion Procurement Strategy that motivates productivity, drives value for money to create a new UK benchmark for the way infrastructure is sustainably procured that delivers the programme.”

This has then been further clarified by HAL who list 5 statements on how this will be achieved. These

## HEP – DELIVERY & SCHEDULE TO FIRST FLIGHT - DEFINITION OF DELIVERY - CHALLENGES

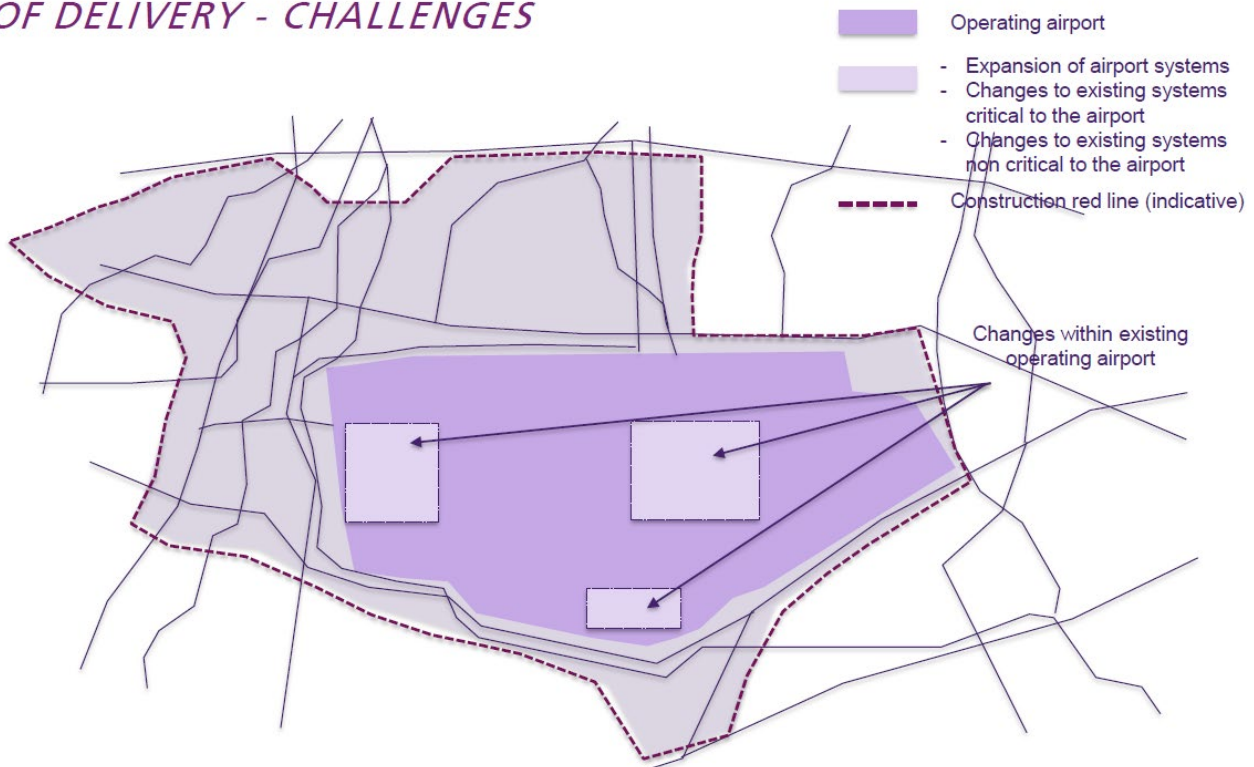


Figure 9 Extent of Expansion Works  
Source: [REDACTED] - HAL 2019)



are extracts from a report created by HAL and offered as part of the review process.

### **1. Establishing HAL as a UK Client of Choice**

There is a strong pipeline of infrastructure work in the UK over the next 10+ years. Heathrow's total spend accounts for 4%, with the remainder lying largely with the government. To attract the supplier market, it is critical that HAL positions itself as a client of choice. HAL will be placed front and centre in the programme as the owner and will define long-term value.

### **2. Mobilising the UK supply chain for successful delivery of an expanded Heathrow**

Delivering a programme that will enable an aircraft to take off from the new northern runway will be an enormous construction delivery challenge. It is vital that HAL sets the supply chain up for success and utilises different procurement engagement models to harness the value created in the supply chain by being a capable owner that will build relationships.

### **3. Creating the right environment that motivates the supply chain to be successful to deliver the programme**

Once the supply chain is mobilised onto the programme, it is essential that commercial and contracting environment motivates productivity and value for money. Heathrow will form long-term enterprises through the creation of an inclusive ecosystem (supply chain) environment that stimulates value creation and focuses on outcomes. Additionally, HAL will need to create the environment that helps people and the supply chain fulfil their potential and work together to deliver with energy and pride.

### **4. Supporting the operation, the passenger and the local community**

Construction will be delivered against the backdrop of a live airport environment, busy road network and bustling local communities. It is of paramount importance that any potential impacts by construction activities are managed and mitigated and communicated with the operation and airlines. Heathrow will optimise the use of off-site hubs to increase productivity and predictability, improve quality, health and safety thereby significantly reducing the number of workers on site.

### **5. An alert and agile Procurement Strategy that is aware of market dynamics and forces**

The programme will be spanning numerous years. During this time, Britain will be exiting the European Union and numerous market movements and changes will take place. Therefore, the procurement strategy needs to be agile to manage challenges and optimise opportunities.

Arcadis understands that HAL has undertaken a deep review of the procurement process that they wish to use to engage with the required supply chain. HAL has set out to engage the whole of the UK into the development giving opportunities to

other parts of the UK and not just the South East construction market.

This strategy seems to be targeted to spread the manufacturing process across a large an area as possible. The manifestation of this strategy will most likely be a benefit during the latter stages of the development when the development moves to a more terminal and passenger process facilities delivery. During the early stages the works are mainly around works in the ground and demolition and clearance of existing space.

The approach for expansion demonstrates HAL has learnt lessons from their previous experience of T5 and T2A developments. This learning has been brought into the strategy procurement plan.

In discussions with HAL during this review process the key themes that are to be targeted involve identification of the interface between work packages. Examples were discussed around how the key earthworks packages should be phased to minimise the risk of disruptions and delays across the geography of Heathrow. This proactive approach should provide dividends when applied to key packages, however there are multiple interfaces across the planned works, and this will require a significant input from HAL.

As part of the document review, it should be noted that there was no detailed procurement timeline, or a detailed design development programme available however, this would not be unusual for a development at this stage.

Success in the next stages will require careful and detailed design development and procurement to ensure works are brought at the appropriate time and with the right level of commercial tension built into the process.

Some of the key early works packages may require to be procured under the OJEU guidance process. This adds time to the overall period due to the rules governing notification and assessment of a large pool of potential contractors. HAL are seeking clarification of the need to follow OJEU processes. At the point of review this had not been clarified.

The early utilities reconfiguration (SSE power lines) require the works to be procured via the utility companies own contractual arrangement prior to the DCO approval. HAL will need to work closely with the existing supply chain to achieve the goal of clearing the existing pylons and substations by the required date to facilitate the M25 works. Also, within these early works will the need to instigate the replacement of the Lakeside Energy from Waste (EfW) facility. The procurement of this facility will be undertaken by a third party on behalf of HAL. This will add risk into the programme that HAL can only attempt to influence but not control.

HAL has also identified other key assets that will require separate procurement strategies. These include the replacement Colnbrook Immigration Centre facility and Harmondsworth Primary School. HAL identified these as likely to be design and build contracts with a modularization delivery strategy.

These projects may undergo a re-evaluation as HAL works through the detailed design development programme.

In line with statement 2 listed above, HAL is cognisant that the magnitude of HEP will require a wide range of suppliers and contractors to deliver the programme successfully. In particular, it is key that HAL engage early with the supply chain to allow potential suppliers to understand the pipeline of opportunities associated with HEP.

This will be a key factor in ensuring that the supply chain have the capacity to respond to the aggregate demand of HEP. From our interactions with HAL, it is clear that they have initiated engagement with the supply chain in specific areas, such as earthworks contractors where capacity may be a particular concern. HAL also plan to undertake market-wide supplier engagement, commencing with the "Heathrow Expansion Supplier Event" in September 2019.

The key to any procurement strategy is to choose the most appropriate to the needs of the projects, no one solution fits all situations. The strategy of supply chain engagement and a non-confrontational strategy will require detailed assessment over the next few months to establish the requirements.

### 3.2.4 Pre-Construction

The key to any development is to gain the required statutory approvals for the scheme. With the development at Heathrow this will primarily be gained by using the systems designed for Nationally Significant Infrastructure Projects (NSIP) also known as the Development Consent Order (DCO) process. This process was created by the Planning Act of 2008.

As part of the process defined by the Act, there are various defined processes that must be achieved within prescribed timescales. To fulfil all the requirements of the process the developer (in this case HAL) must create a design the sets out and defines the extent of the proposed development. HAL has created a series of drawings and plans the defines the 3R Masterplan which establishes the extent of the proposed works. These plans have been used as the basis of the assessments as required by the DCO process.

Whilst Arcadis has not undertaken a detailed assessment of the quality of the design outputs HAL has created, it should be assumed they will be fit for purpose. HAL has set a target to achieve the required public and specialist consultations by the end of 2019 to enable the completion of the pre-submission process in early 2020. The target submission date for the DCO documentation is [REDACTED] 2020.

The Planning Act of 2008 set out a prescribed process that will be followed submission. These includes set timescales for each section of the process. Therefore, the period from submission to expected delivery of the approval by the Secretary of State for transport is set at between [REDACTED] to [REDACTED] months. HAL has allowed a period of [REDACTED] months

within their proposed programme. Which translates into an average of 520 calendar days.

The HAL programme for the development process gives a clear indication of the timelines for pre-submission and post submission as set out by HAL. It also shows some of the early works required to be processed while the DCO process is being undertaken, to maintain the programme. These activities are to be progressed at risk and are required to underwrite the 2026 runway opening date, **Step 0**.

Arcadis has compared HAL's timescales compared with other development that have used the DCO process and there are examples where the timings to achieve consent have been extended.

The HAL programme is dependent upon having an undisputed submission that will pass through the pre-examination and examination process without dispute. To underwrite this aspiration the original documentation will have to achieve total and full compliance with the DCO requirements.

Whilst there is little doubt that HAL is planning to achieve a 100% compliant submission there are always external influencers that could cause the planned timescale to be extended beyond the planned 17-month period.

Although none of these examples are a direct comparator to Heathrow Expansion, as can be seen from the graph in Figure 10 the process does not always follow the prescribed timescales. One third of all the applications that have been through this process having exceeded the number of days HAL are planning that their application will take, with two going to Judicial Review.

The impacts of any delay will have a significant influence on the overall development at Heathrow. The current plan is to follow the achievement of the DCO approval in November 2021 with the start of earthworks in the spring of 2022.

The approval will also grant approvals for various key activities such as ecology mitigation works in the winter of 2021 and spring 2022, The approval also triggers the following key activities:

- River diversions;
- Demolition of properties;
- Establishment of construction consolidation sites;
- Utility diversion; and
- Construction of the trunk roads diversions.

The period between delivery of the DCO approval and the start of the key earthworks is only four months which also includes the Christmas period. HAL has indicated that they are confident that they will be able to set up the team to deliver this.

This period would have to include for the finalisation of the contract conditions and the mobilisation of key staff and equipment for an activity that is key to the success of the opening of the new runway in 2026.

Any prolongation of the strict timescales will have a detrimental impact on the early works of the development.

HAL will also have to consider any constraints placed upon the development by the planning process. Whilst detailed consultation with the public, local authorities and the key consent granting bodies will help to clarify and draw out any imposed constraints; until the planning process has completed its full course these will not be fully known, and the impacts assessed. Which may impose restrictions on the planned early works.

A key part of the development phasing proposed by HAL will be to gain access to key areas to deliver the programme. HAL has identified key Vacant Possession (VP) dates, which have been derived from a detailed phasing strategy. To manage the impacts of and plan to minimise the influence of the key VP dates HAL has undertaken extensive negotiations with the relevant owners and interested parties.

While these are commercial agreements which have not been open to review, the principle is to negotiate key VP dates and not rely on legislation that would be granted as part of the DCO process. The normal convention would be to seek Compulsory Purchase Orders (CPO) powers over all the required land identified in the Preferred Masterplan. However, this process can take up to 9 months to deliver the required access, which would have a detrimental impact on the planned timescales.

No information was offered as to the likely success of this strategy and it remains a key constraint on the development. In discussions with HAL, the current strategy is underwritten by the main

earthworks being sequenced to commence in an area not requiring VP of property and in an area already agreed with the landowners. However, some of the early works associated with ecology and river diversions require access to significant parcels of land around the western side of Heathrow.

The current plan as declared by HAL will be to obtain key VP of land as soon as the DCO has been declared. There are at least [redacted] VP's required to be obtained by mid November 2021. These relate to setting up of the construction logistics and the early earthworks. HAL assume that these will be obtained, and the work commenced as envisaged. The impact of no availability of the vacant possession dates will require assessment if the dates slip. The worst-case scenario would be to delay the development; however, it may only involve a re-sequence of the works until the possession dates are achieved.

A development of such a size as the expansion at Heathrow requires a significant amount of design input to feed into the procurement process. The schedule issued to Arcadis to review did not contain a detailed design programme.

When questioned, HAL indicated that the design programme would be developed during the next stages of the programme. This would be in keeping with a development at this stage in the process. There will therefore be a need by HAL to work up the design to a suitable stage to allow for a meaningful procurement process.

This will be a balance between the commercial decision to commit funds to designing a development that has not gained planning approval. However, the expansion at Heathrow has been

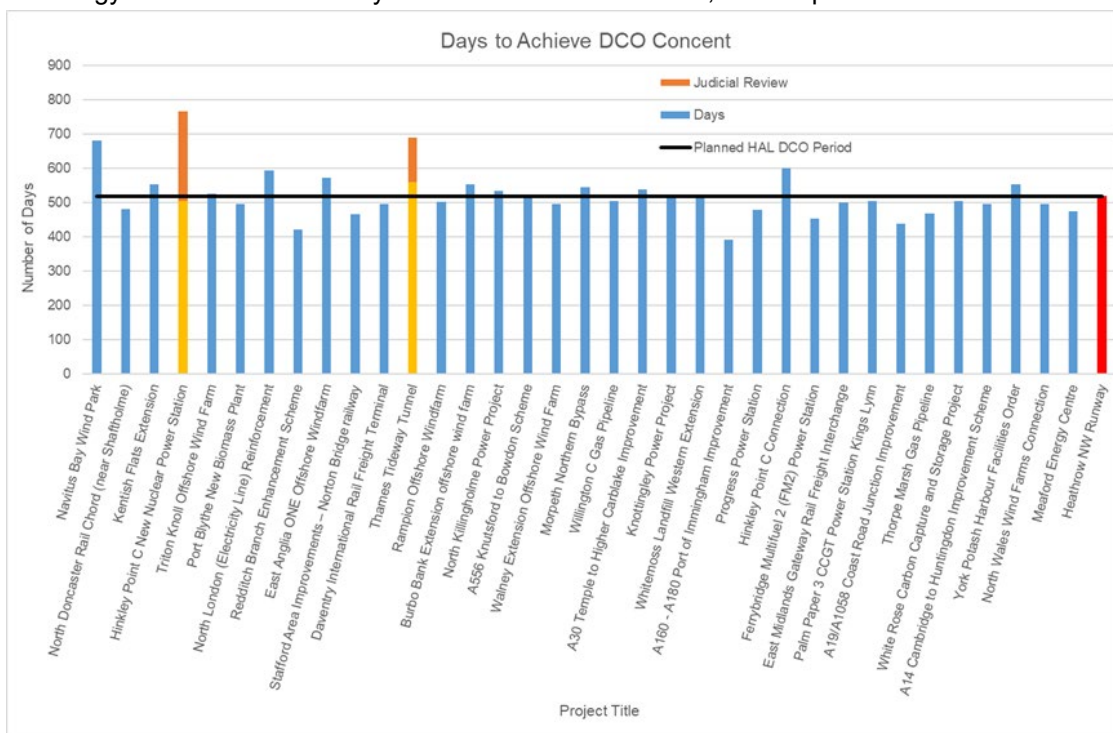


Figure 10 Graph Presenting the Days to Achieve DCO Consent  
Source: (Bircham Dyson Bell-DCO Applications 2014)



sanctioned by the government and parliament so it is more a question of undertaking the design at the most appropriate stage in the development balanced against incurring costs in advance of official approval.

However the front end of this development is aggressive in its need to commence works four months after formal approval and the design will need to be progressed over the next few months to ensure the procurement process can be developed to ensure the works packages are set up to deliver the works when required.

The key to delivering **Step 0** by 2026 requires the full DCO process to have been completed by the 4<sup>th</sup> quarter 2021. Thus, allowing HAL to mobilise the required early works contractors. Whilst HAL has planned the DCO timescale around the “normal” allocation of time, it does not allow for any contingencies in the timings. The Heathrow scheme has attracted a lot of public scrutiny over the years and there would be no reason to suggest that it will not be subject to intense scrutiny during the Development Consent Order process.

The proposed development programme requires that the earthworks proceed in the spring of 2022, and therefore any delays in the approval process will have a detrimental impact on the proposed start of works.

### 3.2.5 Land and Property Acquisition

Prior to the DCO application, HAL will need to have identified the extent of land and building acquisitions that will be necessary for expansion. It is understood that these acquisitions will be through a combination of agreed purchases followed by compulsory purchases.

The main period for this stage will be from [redacted] 2019 to [redacted] 2022 including the periods for acquisition by mutual agreement followed by compulsorily powers coming into effect. HAL has identified the stages as follows:

Timescale	Agreement
[redacted]	Create Bond subject to board approval
[redacted]	Agree relocation and options agreement
[redacted]	Bonds redeemed subject to board approval
[redacted]	Businesses start to relocate
[redacted]	Acquire homes
[redacted]	Compulsory Acquisition Powers

Table 14 Acquisition Timescales  
Source: [redacted]; HAL 2019)

HAL has provided the total number of bonds and agreements required for residential and commercial properties prior to the DCO submission. This is broken down into the completion requirements per month and day.

Arcadis has not seen any assessments from HAL regarding the level and complexity of these acquisitions so cannot determine whether HAL’s timescales or their ability to process the volumes of transactions set out below is feasible. It is however important to note that where HAL cannot secure acquisitions through agreement, the use of compulsory purchase powers may throw up additional complications that may impact on delivery.

Acquisition	Type	Requirement
Bonds	CPZ Residential Properties	[redacted] per month
Bonds	Wider Property Offer Zone (WPOZ)	TBC
Commercial Agreement	Business relocation	[redacted] agreements per week

Table 15 Acquisition Requirements  
Source: [redacted]; HAL 2019)

### 3.2.6 Early Works

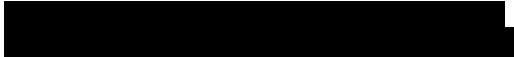
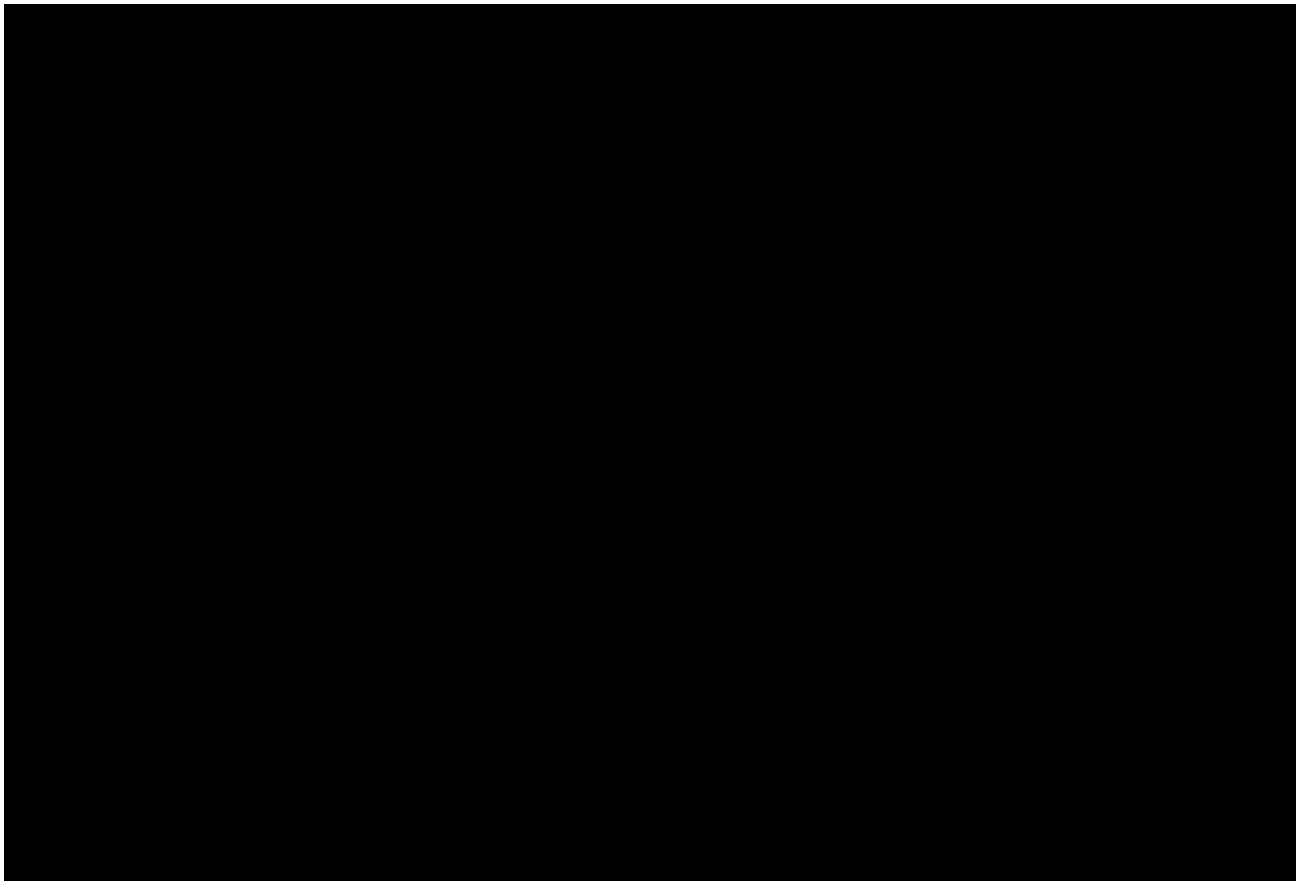
HAL has identified works that are required to commence prior to receiving full approval of the development via the DCO process. These are in addition to the main works design and procurement process that would naturally occur during the DCO timescale, in support of an earliest start on site of the main body of works.

The works revolve around the clearance of existing infrastructure that due to restrictive timescale are required to commence early to facilitate the relocation of the main M25 road re-alignment works. See the extract below from a presentation created by HAL to indicate these early works.

The image below shows the extent of these works to clear the area for the M25 reconfiguration. From the programme information and phasing slides produced by HAL it is apparent that these works are required to commence in early 2020. The assumption being that the utility company responsible for the assets will undertake these works under a local Town and Country Planning Application (TCPA). The risk to the programme would be that if this strategy is brought into question then the overall development would be significantly compromised.

As part of an overall Heathrow development HAL will be undertaking expansion works within the western campus. These works will be improvements to T5A and expansion of T5B and T5C. These works are listed as Business As Usual (BAU) investments and will contribute to the baseline growth at Heathrow. However, these will also support the additional passenger processing requirement to be in place when the new runway capacity is delivered.

The key to the expansion of Heathrow will be to remove the constraints in the way of the new airfield development. The M25 is a significant impediment to the expansion. Therefore, HAL propose to move it further west and build over the existing alignment. However, to undertake these works the proposal will require designing to the relevant standards imposed by Highways England. Currently HAL propose to



design and procure these works on behalf of Highways England and manage the delivery to achieve a transfer of the motorway across to the new alignment by 2025. This will require the design to be progressed sufficiently to allow for procurement of the main packages of motorway works to commence from the [redacted] of 2022. There will be a significant amount of design, approvals and procurement required over the next 2 years to ensure this target is achieved.

The risk to the HAL development timelines will be that some of these activities within this timescale are not under the direct control of HAL and are therefore susceptible to other organisation’s timescales. The procurement process associated with the M25 possibly required to follow the OJEU process which could add time and complications to the process. The HAL procurement department are actively investigating this risk. Until this has been clarified it remains a procurement timescale risk.

Other areas that are required to be replicated or replaced include the key Energy from Waste (EfW) facility as managed by Grundon. There is also a primary school to be replaced and a key immigration facility. HAL has worked hard to minimise the need to replace existing facilities, and when investigated as part of the Arcadis study, the response has been to consolidate functions within the impacted organisations existing facility or to agree a commercial agreement. This has helped to minimise the quantum of works that require re-provision and replacements. Of those identified to

be replaced HAL have a clear strategy to create replacement facilities. However, these replacement projects may require separate (TCPA) applications due to the need to gain vacant possession early in the overall programme.

Existing Facility	Vacant Possession Date	Programme Indicating Replacement
SSE Power Lines Relocated	[redacted]	[redacted]
Energy from Waste Facility	[redacted]	[redacted]
Immigration Centre	[redacted]	[redacted]
Harmondsworth Primary School	[redacted]	[redacted]
Heathrow Primary School	[redacted]	[redacted]
Heathrow Special Needs Farm	[redacted]	[redacted]

Table 16 Key Facilities that Need to be Replaced

Source: [redacted]

There will be a residual risk to the development timelines if these projects cannot gain the required planning approval by the required date.

It should be noted that there does not appear to be a timeline for replacement of the Heathrow Primary school or the Heathrow Special Needs Farm.

There is a significant amount of key activities that are positioned as early works within the proposed development timelines. While this is not unsurprising within the context of the volume of works required to be completed within a tight target to achieve a new runway by 2026. Some of the identified works will require separate approval routes to the main DCO, they will also require

commitment to placement of contracts to deliver replacement assets before the main works are let.

There is also a need to review the planned dates for some of the replacement assets as the school replacement projects are not harmonised with the school academic year.

### 3.2.7 Creating the Space

#### 3.2.7.1 Rivers

Water courses are a significant constraint to the development at Heathrow. Not only for flood risk mitigation but also because of their wider influence on the surrounding environment. It will be of interest to the Environmental Agency as to how HAL deals with the migration from the existing systems to the new. The following slide extracted for the HAL presentation gives an indication of the challenge.

Part of the early works will be to divert the existing rivers, creating new fluvial paths and infill existing ponds. The impact of these environmentally sensitive systems will require very careful management and will be seasonally influenced.

The proposed phasing and schedule identify the time periods for these works. There is a significant risk to the front end of the programme associated

with these works, due to the potential restrictions imposed by the consent granting body.

Prior to any earthworks to the west and north of the existing campus the river diversions are key to the release of the space. Due to the nature of river flows the system of temporary or permanent diversion are subject to key invert levels. HAL has created a strategy where these factors are considered.

The phasing diagrams provide evidence that HAL is working closely with the various bodies to provide a system that will maintain the river flows necessary to support aquatic life above and below the development zone.

Further work will be required to fully understand the risks associated with the fluvial flows around Heathrow. With reference to the protection measures to be put in place to protect these vulnerable environments. This will be particularly key during the earth work seasons where the potential to cause pollution damage to watercourses is at the highest.

The agreed code of construction practice would be the document that sets the criteria for working in and around any water courses at Heathrow. Although Arcadis has not been provided with specific monitoring or enforcement criteria that would be used to ensure compliance, the high-profile nature

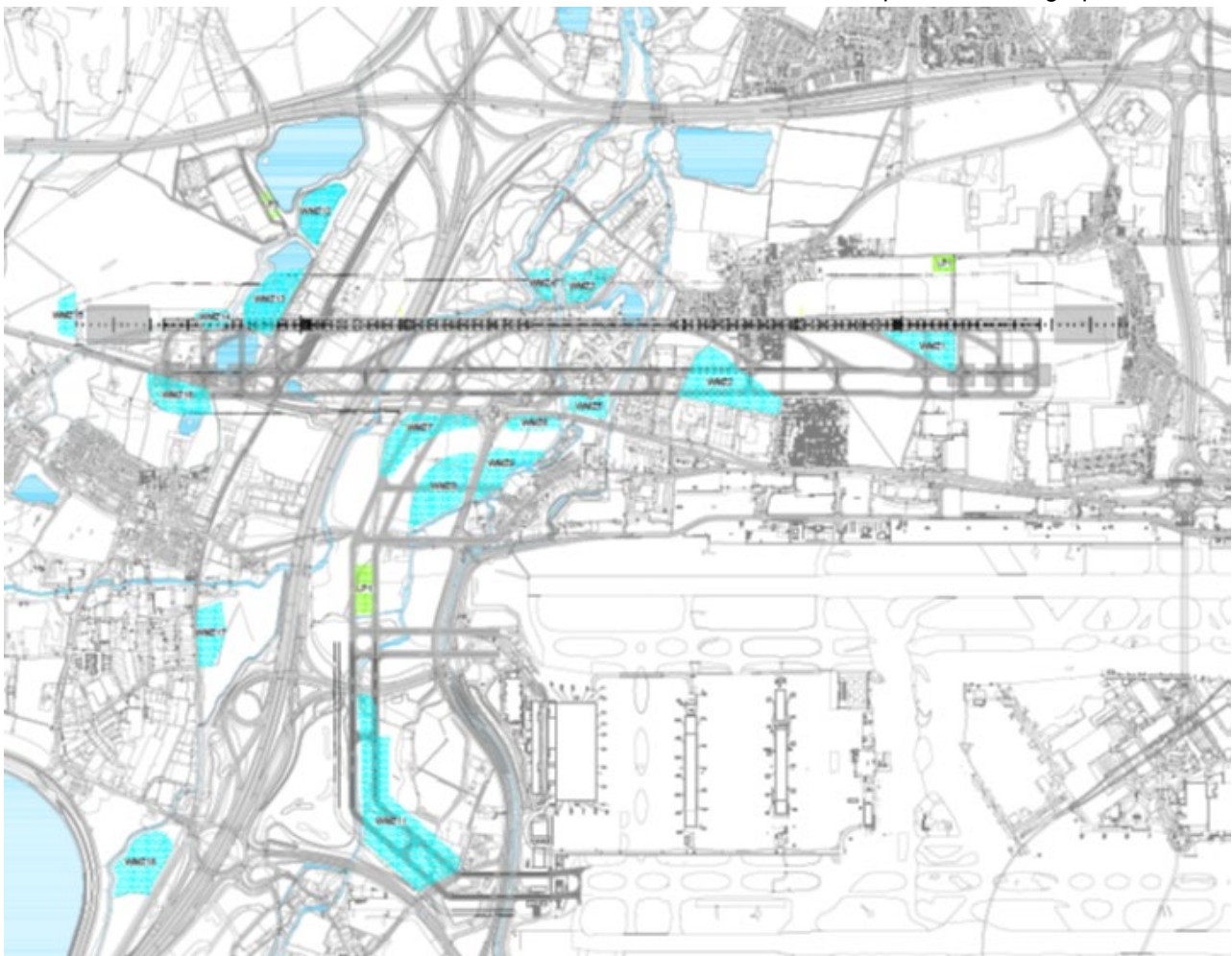


Figure 12 Waterways Impacted by Expansion Plans  
Source ( )

of the development should ensure the works are kept under scrutiny and any pollution or risk of pollution of water course will reflect badly on HAL and could cause a delay to the progression of the works.

The river diversions as required by the development place these environmentally sensitive areas in conflict with the timings and demands of the construction process. The consent granting body associated with these water courses has significant interest and powers over the scheme, which could lead to tensions in the approval process. Careful management of the changes to the water courses will be the route through these challenges. HAL will need to be aware of the seasonal nature of some of these works and draw up a plan accordingly. The existing rivers and water courses and the new routes play a significant role in the ecology and environment of the areas around Heathrow and are very susceptible to damage caused by the construction process.

### 3.2.7.2 Roads

Heathrow is surrounded by an extensive road system. Ranging from nationally significant roads system (M25) to major trunk roads and minor local roads. The planned development impacts this road system from the south of the airport around the western side and too the northern zone. Part of the early works will be to reconfigure these roads to create the space to deliver the Heathrow expansion as set out in the Preferred Masterplan.

To facilitate the expansion at Heathrow, major changes to the surrounding road network are required. This includes realignment of the M25 and A4. The schematic of the existing road network is shown in Figure 13 and the new road network is shown in Figure 14.

The A4 will be realigned and reconfigured to the north of the NWR. HAL has currently produced a number of alternative alignments due to the complexity of this work. The proposals will however enable offline construction prior to connecting to the existing road network. It is proposed that the A4 diversion works begin in [REDACTED] 2022 and conclude in [REDACTED] 2024.

HAL has built an extensive road development sequence that respects the need to maintain access for all around the airport as well as maintaining routes for staff and passengers into the airport. The road system are the main arteries for all the functions at the airport, and ensure it continues to function.

While much has been made of the relocation of the M25 to free up the runway development the re-provision of the existing A4 provides a much more challenging route and resolution and will directly influence the earthworks to the north of the existing runway.

The sequence published by HAL indicates the significant level of thinking that has gone into the works and indicates that the road design has also

been adjusted to provide the maximum space for the earthworks.

The impact of the works sequence associated with the relocation of the M25 is a significant strand through the main works programme. The re-provision of the HV infrastructure is planned to commence before the DCO approval has been achieved.

Once approval is given the space can be cleared for the new M25 route. This can be constructed "off-line" to minimise disruption. Once completed, the existing M25 can be transferred to the new route. The existing M25 can then be cleared and the area prepared for the earthworks and runway infrastructure construction.

This string of activities is key to the creation of the new runway and requires the early works to commence before the main approval of the Preferred Masterplan. This indicates the significant nature the road system will play in the development of the Heathrow scheme. Arcadis notes that the delivery of the road elements is crucial to the timeline risk associated with works commencing before the DCO process has delivered the required development approval.

The current scheme indicates that the relocation of the M25 infrastructure will be constructed adjacent to the existing route. This would be the preferred solution to creating the space required to deliver the runway. It also creates the opportunity to construct most of the new motorway "off-line" with minimal disruption to the existing traffic flows.

There are significant challenges associated with the motorway junctions as these will be re-modelled to provide access to the new road layout. These will be the areas of concern during the development because of the risk that these will be the cause of major disruption and delays to the free flow of traffic into the Heathrow campus.

There will be an area of the M25 / A4 development that will require careful co-ordination. This will be the construction of the new M25 route around the existing A4 overbridge. This bridge cannot be demolished and cleared until the alternative A4 route has facilitated the closure of the existing road.

This will place areas of the A4 road development as constraints on the creation of the alternative M25 route. This will require careful management and close co-ordination between two key packages of works. The phasing plans as presented by HAL indicates that the new A4 route will be opened in early 2024. With a target to complete the M25 works 1 year later.

In addition to the M25 realignment, the existing single J14 on the M25 will be removed and replaced with two junctions. Again, Arcadis understands that this will be constructed offline and then connected once complete.

Arcadis understands that the diversion of the A3044 is included within the local roads programme however the delivery programme does not state if the realignment will be constructed offline. It is

proposed that the construction of the A3044 diversion begins in [REDACTED] 2022 and concludes in [REDACTED] 2024.

Arcadis agrees with the principle that constructing the roads offline is the right approach as it should simplify and speed up the construction process, whilst minimising impact on the existing road network or airport operation.

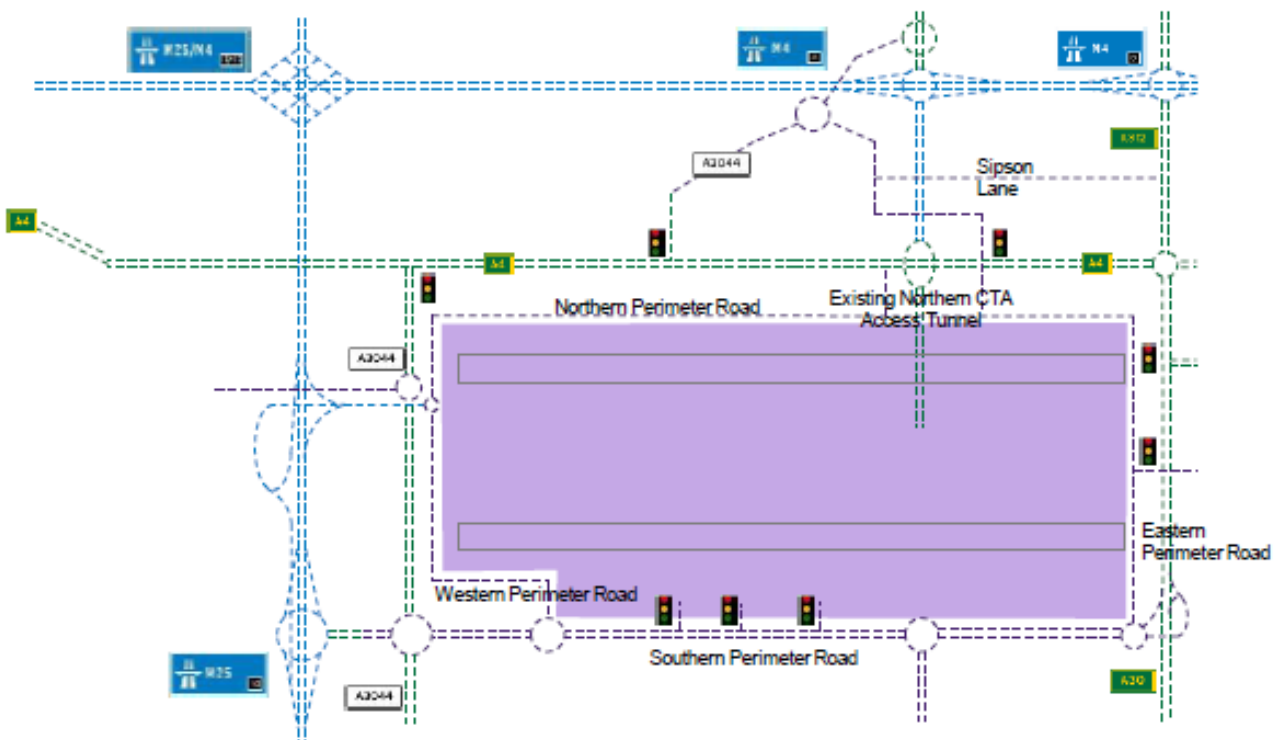


Figure 13 Existing Roads Layout  
Source: ([REDACTED])



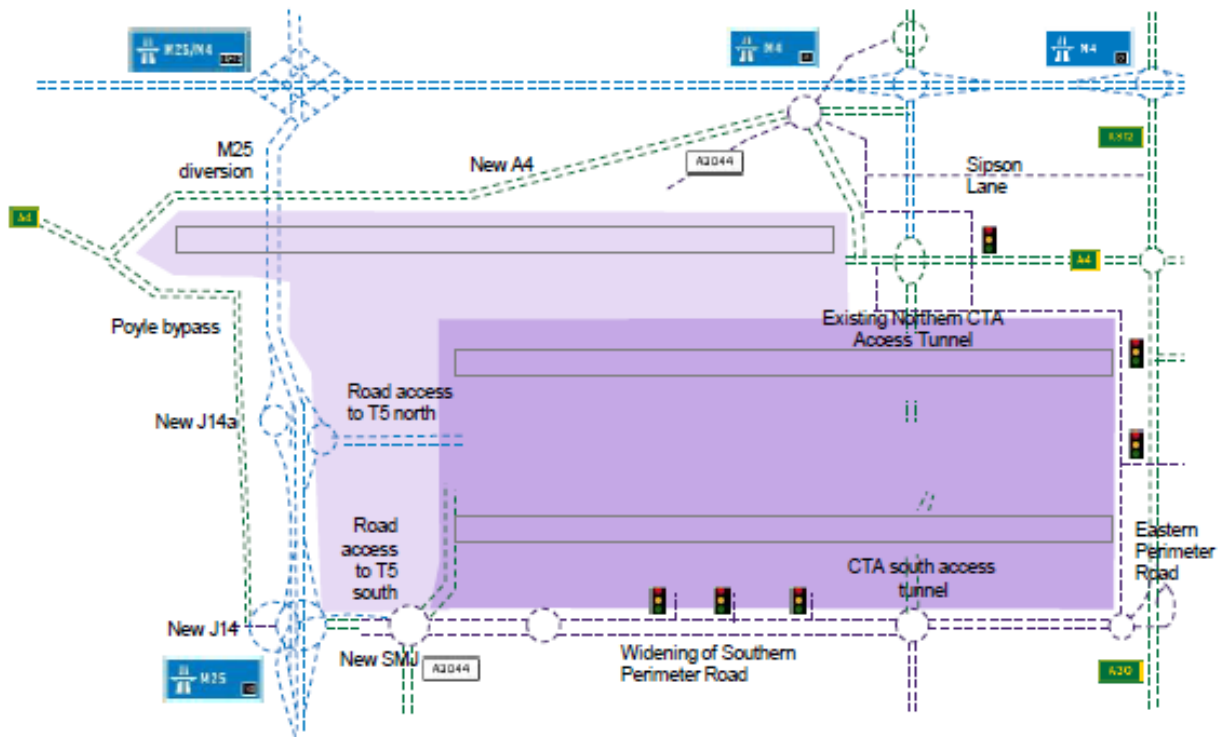


Figure 14 New Roads Layout

Source: ( [REDACTED] )

### 3.2.7.3 Rail for Construction

The non-passenger rail system will be enhanced with new freight, fuel and sidings facilities to the north-west of the new 3<sup>rd</sup> runway.

For operational purposes the primary use of the rail facilities is to provide and maintain the fuel supply

to the airport. However, HAL has indicated that the rail facilities are also planned to be used to transport construction materials to and from the site.

The railhead is scheduled to be completed in [REDACTED] 2023 – and so will not be available for the first year of construction which includes the construction of the A4, A3044 and M25, initial earthworks, river diversions, property demolition and utility diversions.

### 3.2.7.4 Utilities

The first major utility works is currently planned by HAL to commence prior to DCO approval. The works to the M25 are dependent on relocating the existing above ground electricity pylons. These are currently situated in the path of the realigned M25. The works to relocate these are scheduled for [REDACTED] 2020.

All utility works are scheduled for completion in [REDACTED] 2024.

### 3.2.7.5 Properties

HAL has indicated that demolition of properties will commence in [REDACTED] 2022 with the last demolition scheduled to be completed [REDACTED] 2024. This is consistent with the assumption that the acquisition process will have concluded by [REDACTED] 2022.

However, as indicated in the risk section below, there is a risk that the acquisition process takes longer than anticipated which may then impact upon the overall delivery timescales.

The acquisition of properties is controversial with any development. Arcadis has not seen any provision in the delivery timetable to take into account potential action by protestors that may slow down or hinder the delivery of this phase of the process.

### 3.2.8 Earthworks

HAL has placed a significant amount of work to resolve the earthworks strategy and when questioned provided a credible sequence of works.

The following extracts from a HAL presentation captures the strategic view of the early earthworks around the area of Harmondsworth, Sipsion and Longford villages.

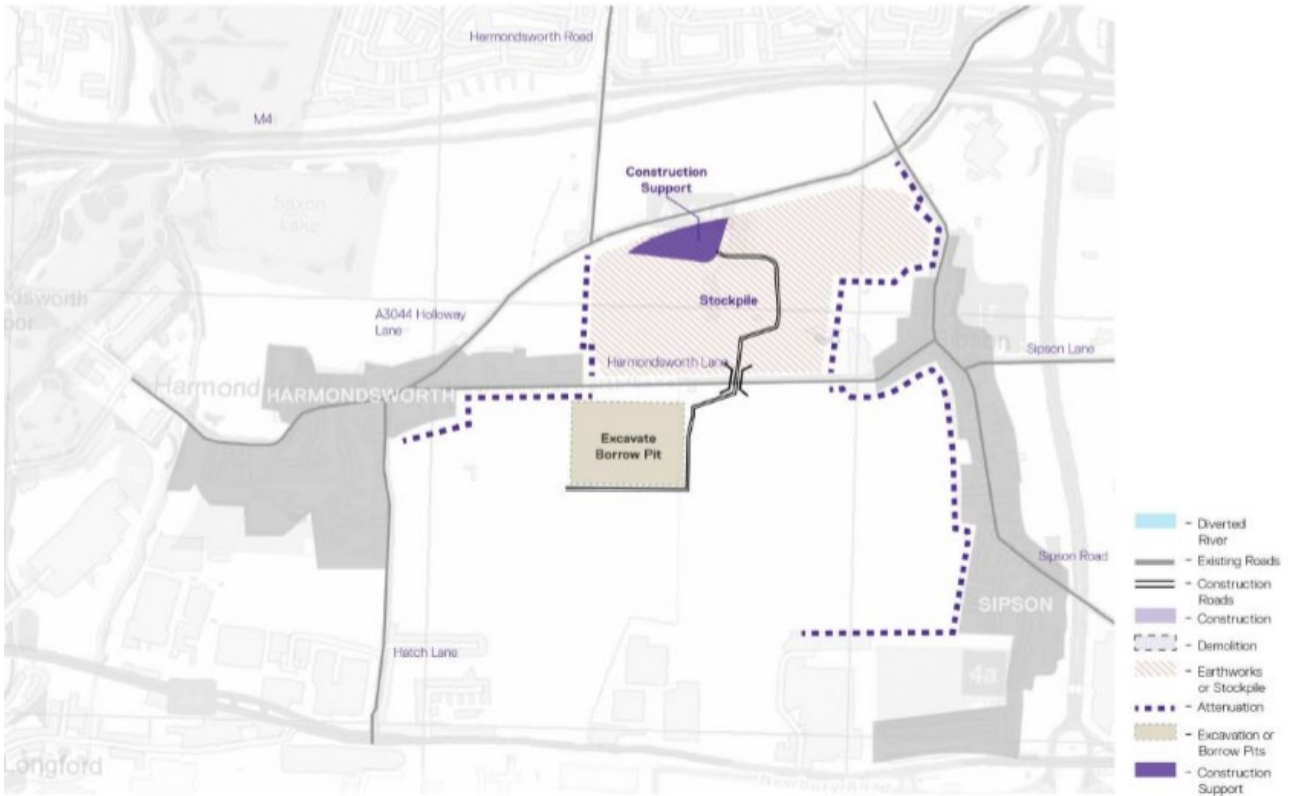


Figure 15 Earthwork Phasing – Stage 1  
 Source: ( [redacted] )

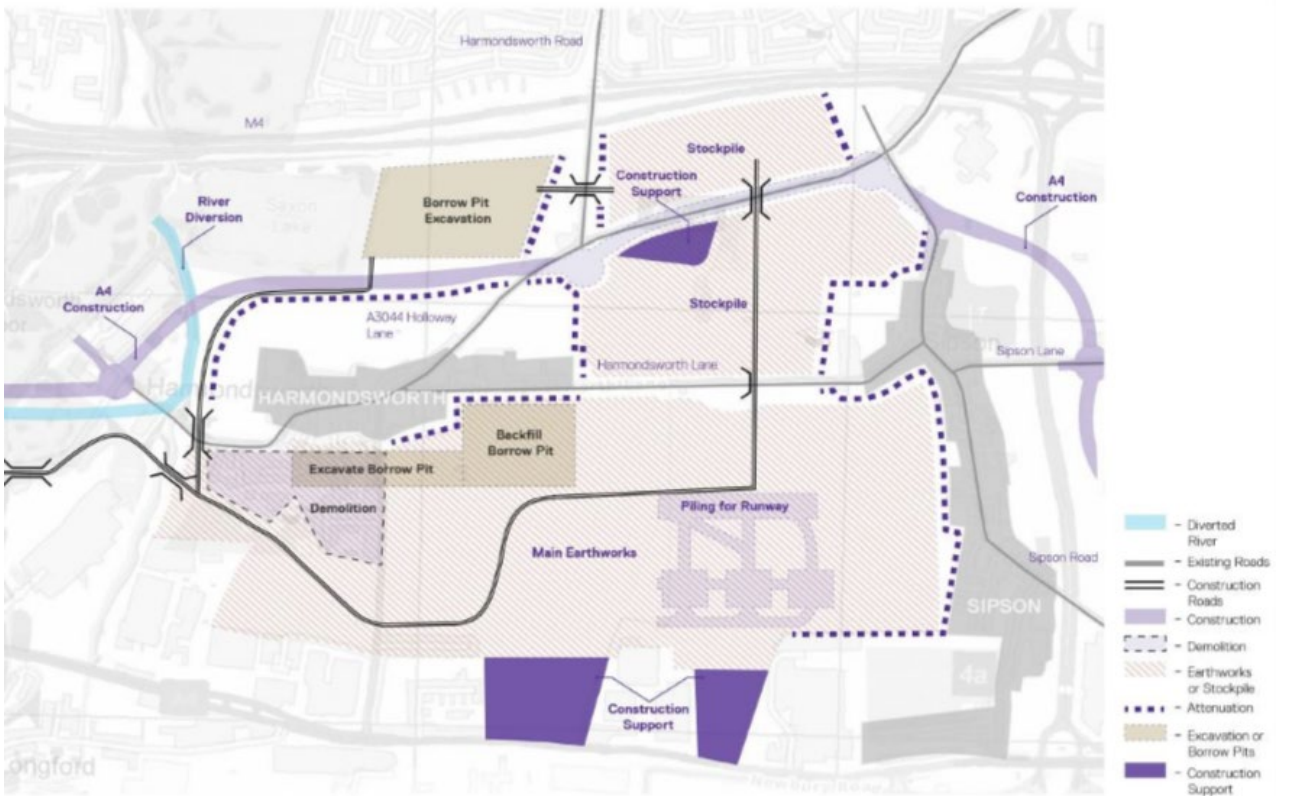


Figure 16 Earthwork Phasing – Stage 2  
 Source: ( [redacted] )

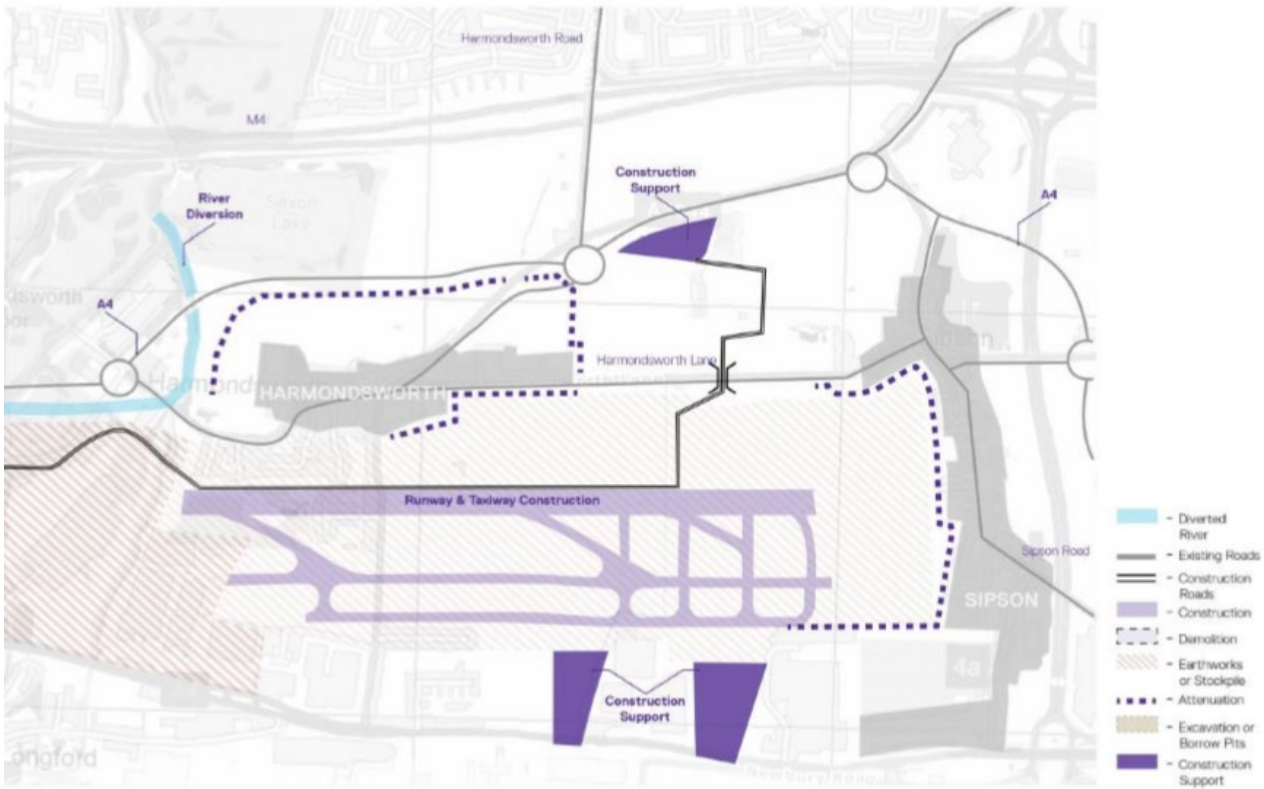


Figure 17 Earthworks Phasing – Stage 3  
 Source: ██████████

As can be seen from the high level slides the earthworks and reconfiguration of the road system are linked and create a delivery sequence.

The challenge to the earthworks will be the need to create borrow pits that provide clean fill and transfer any contaminated arisings into the borrow pits to mitigate any migration of spoil off site. This sequence is critical to the success of the earthworks strategy and relies heavily on integration between differing suppliers and the works commencing at the earliest opportunity in ██████████ 2022.

When asked for clarification HAL confirmed that they will require long working windows and multiple shifts during the first year to achieve the target of moving ██████████ material during the first year and approximately ██████████ the following year. This presents a very challenging target to be achieved by the supply chain and will require detailed engagement with existing contractors. When challenged HAL responded that they have had extensive dialogue with the supply chain and validated the targets against industry norms. However, it is a challenging target and could be easily de-railed by exceptionally inclement weather or curtailed by intervention by the local authorities if the impacts of the works become intolerable.

The success of the earthworks programme will rely heavily on a positive engagement with the specialist supply chain, as well as the contractors having access to the right equipment in enough volume to achieve the goals set. Procurement of the supply

chain will have to have progressed to the point of placement of the contracts due to the limited mobilisation period after approval has been granted. There are significant risks within the earthworks works packages due to the interfaces between each area. HAL is aware of this risk and intend to engage with the supply chain on a more collective responsibility contract.

With a limited earthwork season (spring to autumn) these targets are ambitious and will require multiple shifts per day and 6 days a week working. Which may cause conflicts with the local authorities due to detrimental impacts. Arcadis understands that HAL is working through these challenges to create a stable working regime that will help to achieve these goals.

### 3.2.9 Main Works

Once the space has been cleared by the early works and the reconfiguration of the road systems, the remain space will be developed to create the new runway. There are multiple areas of development that will be progressed upon completion of the DCO process. The constraints at the beginning are around the environmental mitigation measures that will be required to be instigated as soon as the DCO approval has been granted. The early stages are governed by the need to set up the construction support areas and logistic strategy.

Very quickly the whole area will be impacted by the development. With the earthworks dominating the northern sector. The early years are dominated by



the need to relocate and remove the existing occupiers of the areas under development. These include commercial properties, residential properties and a few key utility relocations. This is shown as taking 2022 and 2023 in the phasing plans. While the areas are being cleared of existing functions and facilities the existing airfield will be adapted to allow for connections into the new areas.

HAL has undertaken a detailed assessment of the main body of works to understand the required sequence, constraints and influencers on the works. They have created a high-level programme with the appropriate time periods to undertake the identified scope in the required sequence. It is the appropriate level of planning with the information available at this early stage in the development. Further work will be required to determine the next level down in detail to enable a guidance programme can be created to inform the procurement process. The programme has a series of key milestones that help to identify the targets to be achieved it also identifies the multiple level of projects that are to be delivered.

The development at Heathrow is complex in that it requires a significant number of projects to clear space and then change the function of that space. Which in a normal development would provide a clear and concise path through the development to enable the easy identification of the key or critical projects. The reconfiguration of Heathrow to facilitate additional airline capacity requires the redevelopment of entire sections of the surrounding areas. The consequence will be that any of these projects and sub-projects could have a detrimental impact on the overall development. It will be up to HAL to instigate a robust management and control plan to ensure close monitoring of all projects with the portfolio of development at Heathrow.

HAL has published a works delivery sequence in the form of time slices slides (Appendix A). These provide a pictorial representation of the main works over a period of 2020 to runway opening in 2026. It is clear to see from these slides that the area around Heathrow will be significantly impacted by construction activities. There will be concerns that the extra traffic needed to feed the construction sites will cause disruption to the normal operations at Heathrow. HAL is fully aware of this risk and in discussion have referenced the work done to identify remote parking, and remote manufacturing centres to move as much of the construction process away from the Heathrow site. There is bound to be a detrimental impact of the works on the day to day operations, with particular concern

around the changes to the roads systems. Further work will be required to fully understand these risks and impacts.

### 3.2.10 Risks

HAL has identified the top 15 Expansion Risks for the **Step 0**, as indicated in Figure 18. A number of these directly relate to Deliverability.

HAL has identified that the pre-DCO enabling works can begin prior to the main external works. The schedule indicates that this will include ecology related works beginning [REDACTED] in 2022. This will be ongoing whilst the DCO application is under consideration and awaiting a final decision. We do not consider this a risk to the delivery programme.

Arcadis considers the earliest risk to the delivery of **Step 0** comes from the DCO process, property acquisition and business relocation. These must be completed prior to the main **Step 0** construction programme.

The risks have been identified by HAL and mitigation measures are in place. The relevant Risk ID and Risk Titles are detailed in the HAL document, Risk Management – M4 and the summary of these risks are indicated below.

Arcadis has seen evidence that HAL has been working through the risks identified in this early phase of the process and is seeking to develop appropriate mitigation measures to minimise the impact of any risks.

HAL has undertaken a Quantitative Schedule Risk Analysis (QSRA) assessment of the proposed schedule, with respect to schedule integrity. This assessment resulted in a P value of [REDACTED], indicating a [REDACTED] likelihood of achieving the schedule. Arcadis recognises that this reflects a schedule that has been designed to deliver the new 3rd runway at the earliest possible opportunity. Arcadis has not reviewed the likelihood of any alternative runway opening dates as part of this review.

It should be acknowledged that such a major programme will have risks that HAL can mitigate as these are directly under HAL's control. However, there will be a number of risks that HAL does not have direct control over which could lead to delays in the programme that will impact on HAL's ability to deliver the timetable for **Step 0**.

### 3.3 Summary

Arcadis has assessed the key elements required for the delivery of the new runway from the existing airport operation to 2026, **Step 0**.

It is clear from the significant amount of work that HAL has undertaken that the sequencing and multiple elements of the scheme are presented in a logical and well thought out sequence.

Arcadis has seen evidence that HAL have sought to deliver the most efficient sequencing to aim to deliver the new runway by 2026. This efficiency has however created a programme that is both ambitious and optimistic with little margin for delays or risk.

Although it is not unfeasible that this programme and sequencing for the delivery of the required infrastructure could be achievable, this is reliant on the programme timings set out in the plan to be delivered.

Arcadis has identified a number of deliverability challenges that, although may be achievable to meet the ANPS target of 2030, could only be deliverable by 2026 if no significant delays take place in the programme.

The first challenge to delivering the new third runway by 2026 requires the full DCO process to have been completed by [REDACTED] 2021.

Whilst HAL has planned the DCO timescale around the "normal" allocation of time, it does not allow for any contingencies in the timings. The Heathrow scheme has attracted a lot of public scrutiny over the years and there would be no reason to suggest that it will not be subject to intense scrutiny during the DCO process.

The proposed development programme requires that the earthworks to proceed in [REDACTED] of 2022, and therefore any delays in the approval process will have a detrimental impact on the proposed start of works.

There is a significant amount of key activities that are positioned as early works within the proposed development timelines. While this is not unsurprising within the context of the volume of works required to be completed within a tight target to achieve a new runway by 2026, some of the identified works will require separate approval routes to the main DCO, they will also require commitment to placement of contracts to deliver replacement assets before the main works are let. There is also a need to review the planned dates for some of the replacement assets such as the school replacement projects that are not harmonised with the school academic year.

The river diversions are environmentally sensitive areas in conflict with the timings and demands of the construction process. The consent granting body associated with these water courses has significant interest and powers over the scheme, which could lead to tensions in the approval process.

Careful management of the changes to the water courses will be the route through these challenges. HAL will need to be aware of the seasonal nature of some of these works and draw up a plan accordingly.

The existing rivers and water courses and the new routes play a significant role in the ecology and environment of the areas around Heathrow and are very susceptible to damage caused by the construction process.

The road system amendments proposed by the scheme are a significant risk to the development due to the complex sequence of works required. There are many risks associated with the re-configuration of the road systems and as such the construction activities will present many challenges

The success of the earthworks programme will rely heavily on a positive engagement with the specialist supply chain, as well as the contractors having access to the right equipment in enough volume to achieve the goals set.

Procurement of the supply chain will have to have progressed to the point of placement of the contracts due to the limited mobilisation period after approval has been granted. There are significant

risks within the earthworks works packages due to the interfaces between each area.

The volume of earthwork required to be achieved in the first two years is significant. A limited earthwork season (spring to autumn) means these targets are ambitious and will require multiple shifts per day and 6 days a week working. Which may cause conflicts with the local authorities due to detrimental impacts.

HAL has published a works delivery sequence covering the main works over a period of 2020 to runway opening in 2026. It is clear to see that the area around Heathrow will be significantly impacted by construction activities. There will be concerns that the extra traffic needed to feed the construction sites will cause disruption to the normal operations at Heathrow.

HAL is fully aware of this risk and in discussion have referenced the work done to identify remote parking, and remote manufacturing centres to move as much of the construction process away from the Heathrow site.

There is likely to be a detrimental impact of the works on the day to day operations, with particular concern around the changes to the roads systems. Further work will be required to fully understand these risks and impacts.

# 4 TIMING

Arcadis has assessed whether the masterplan and plans for the **Step 0** period is timely. The review has considered whether the Preferred Masterplan and planned deliverables for **Step 0** can be provided in accordance with the specified duration in the programme and the dates and deadlines detailed.

Arcadis has considered the risks to providing the relevant deliverables in accordance with the current specified duration in the programme and on the dates and deadlines detailed in HAL's plans.

The review has analysed the impact of failing to provide for the relevant deliverables in accordance with the current specified duration in the programme and what strategies have been developed to mitigate risks and any subsequent impacts from failure to delivery in a timely manner, with consideration for interdependencies.

Arcadis's key findings are:

- HAL has developed a programme that has all the necessary steps needed to achieve the ANPS target for 2030 and there is no reason to suggest this date is not achievable;
- The current programme includes risk allowances for each component of the masterplan assessed on the basis of industry norms. There is no apparent programme-wide allowance for schedule risk; and
- With such a complex programme involving a significant range of interdependencies, many of which are out of the control of HAL, the objective to deliver an operational runway by 2026 carries a high level of risk.

## 4.1 Definition of Theme

This section of the report reviews whether the Preferred Masterplan can be delivered in a timely manner from the existing airport infrastructure to **Step 0**.

Arcadis has already reviewed the proposals to ensure that they follow a logical delivery sequence. This purpose of this section of the report is to assess the programme Work Breakdown Structure (WBS) and overall schedule resilience.

The WBS has been presented to Arcadis in a form of a detailed Gantt chart developed in recognised programme management software using benchmarked and as build data sources to develop the schedule. Table 17 sets out the key dates that are contained within the programme that HAL is seeking to achieve to be able to deliver the new runway by 2026, **Step 0**.

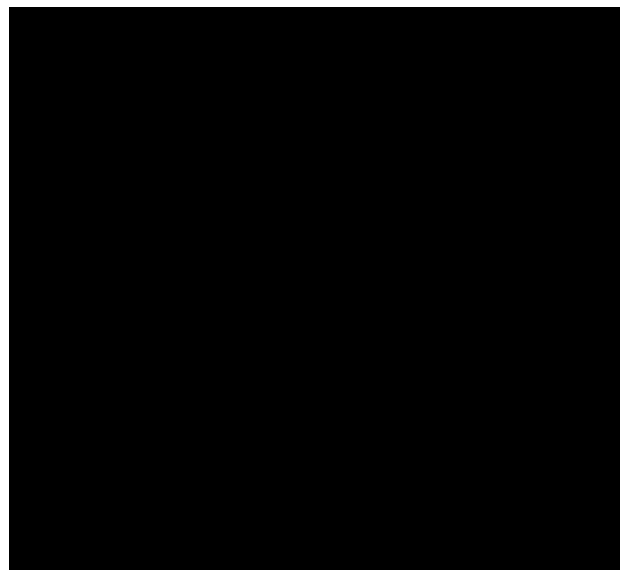


Table 17 List of Milestones  
Source: (Arcadis 2019)

## 4.2 Assessment

In order to undertake this review Arcadis has engaged with HAL attending presentations with HAL then providing the presentation slide decks.

In addition, Arcadis has undertaken sessions with the relevant Subject Matter Experts at HAL who have developed the programme schedule and have answered detailed questions regarding the information presented to Arcadis.

Arcadis has been provided with access to a detailed assessment of the schedule structure that was undertaken by Costain on behalf of the Department for Transport in June 2019. The report investigated the Work Breakdown Structure (WBS) and overall schedule resilience

The results of those investigations is published in a report *DfT Heathrow Expansion Programme, Assurance Review of Heathrow Airport Limited Delivery Schedule* dated 14th June 2019.

Arcadis' review has fundamentally considered the same information and approach that has already been assessed by Costain but for the purpose of this report has only considered the programme up to **Step 0**.

### 4.2.1 Pre-Construction

#### Development Consent Order

The expansion at Heathrow requires the developer to seek a DCO and there are clear steps that the developer will need to follow to comply with the process.

Arcadis has examined HAL's programme and the timings are dependent upon HAL having an unopposed submission that will pass through the pre-examination and examination process without dispute. The proposed DCO timescale does not allow for any deferral of the final approval date of the submission. To underwrite this aspiration the original documentation will have to achieve total and full compliance with the DCO requirements.

HAL is fully aware that there is opposition to their scheme and there have been legal challenges and attempts to seek multiple judicial reviews over time to seek to slow down or stop expansion at Heathrow. HAL has experience of working through complex planning submissions and are aware of the level of engagement required to gain approval.

As part of the DCO process, there is a requirement to create a body of information and evidence prior to formal submission. HAL has undertaken multiple formal consultations as well as many informal consultations. This has enabled them to capture a significant amount of responses and points of issue.

These consumer insights have been fed back into the design development process. This should give HAL the opportunity to balance their emerging design and associated mitigation with the needs of the scheme objectors.

Arcadis has not undertaken a comparison between the 3,000 responses received in the spring 2018 consultations and the emerging design agreed at the M4 gateway. HAL has confirmed that it has taken into account, and sought to address, the concerns raised during the public consultations.

Having also engaged with the relevant consent granting bodies, HAL has a clear understanding of the concerns and areas of objections likely to come from these sources.

In addition, HAL has also taken extra measures to ensure that they gain acceptance from a wider audience with the introduction of an inclusive procurement strategy and a draft construction management plan. The dedicated expansion website pages have extensive information and are designed to help engagement of all relevant parties.

Whilst there is little doubt that HAL is planning to achieve a 100% compliant submission there are always external influencers that could cause the planned timescale to be extended beyond the planned [redacted] month period. As can be seen from the graph (refer to Figure 10) the process does not always follow the prescribed timescales.

The period allowed by HAL from submission to approval of approximately [redacted] days. Arcadis has compared these timescales against other submissions and although some simpler developments are shorter, 1/3 of schemes that have gone through the DCO process have taken longer.

Arcadis considers that a vigorously pursued Judicial Review could cause enough delay to the approval process to cause the planned spring earthwork window being lost, delayed or compromised.

Arcadis considers the time allowance between DCO approval and start of works in [redacted] 2022 is ambitious with little or no contingency. It will rely on a period of effective and swift discharging of the planning conditions imposed on HAL after the DCO date.

It is likely that HAL will be aware of the planning conditions at the point of the Planning Inspectors recommendation to the Secretary of State. However, there will be a risk that more will be imposed during the final stages of the process.

#### Consent Deliverables.

Arcadis is aware HAL understands its requirement to map the environmental impacts of the planned works in detail. HAL has indicated an understanding of the seasonal variations for each species expected to be discovered within the development zone.

As part of its assessment Arcadis discussed with HAL how they would deal with contingencies if species were discovered in key earthwork zones. One example includes Badger Setts within the area of the early earthwork areas. There are known Badger Setts on the edge of some of the early earthwork zones. These will be of interest to the Environmental Agency and the means by which HAL will protect existing species.

As part of the Preliminary Environmental Impact Report (PEIR) a full field and desktop study of all the areas impacted by the scheme will need to be undertaken by HAL. Arcadis understands the scope of this study has been agreed with the relevant authorities. This will form the basis of all studies and environmental mitigation measures undertaken between pre-submission and the completion of all works.

HAL has indicated that they have created all documentation as required by the Development Consent Order (DCO) process as well as enquires by the relevant authorities. The published schedule indicates the time allowed for these studies. HAL is aware of the need to create the full information pack in support of the DCO submission prior to the review by PINS (Planning Inspectorate) as any failure to provide the full information will risk the rejection of the submission at the first hurdle.

#### 4.2.2 Design

The Preferred Masterplan schedule supplied by HAL has indicated a period for design development. HAL has indicated that there are several key design Consultants engaged to deliver the necessary detail, from concept guardians through to engineering specialists.

The design programme as indicated on the Preferred Masterplan schedule indicates the required time frame for the design and is at a level that would be in keeping with a pre-submission scheme. However, Arcadis considers that the complexity and potential impacts of the works would require a clearer statement of the design development process.

Arcadis has not been able to analyse the fully detailed design programme but HAL has indicated that this has been set up to feed into the procurement timescale. Arcadis considers that with a scheme of this complexity there will be a need to progress the design on many fronts to ensure visibility of the interfaces between works packages and systems to ensure compliance. HAL is aware of this constraint and are pursuing this strategy through the procurement process.

HAL is currently working through the design development to achieve the Preferred Masterplan milestone of M5. This is intended to pull in all the comments and issues raised during the consultation process to provide an updated design that will form the basis of the DCO submission in [REDACTED] 2020.

This should also provide the basis upon which the early works packages will be progressed into the procurement process. There are indications of the need to progress key areas of design early to feed the requirements of the early works and procurement of the large infrastructure works.

Arcadis were unable to review in detail the plan for elements such as the SSE high voltage works, the M25 infrastructure, the replacement of the Immigration Centre and Harmondsworth School facilities. These will require detailed work over the

next period to ensure full compliance prior to the works commencing on site.

Arcadis is aware that one of the key constraints to the development of the new runway construction will be the Energy from Waste facility. HAL are working with the owner of this asset to undertake a separate planning application to relocate this facility. There is a significant risk that by removing this facility from the DCO process that the Local Authority Planning Application could reject or defer this application and causing this project, and the DCO, to be delayed.

It is Arcadis' view that this could have a detrimental impact on the planned construction sequence and timings of the main runway works. Although HAL is aware of this risk, by transferring this to a separate developer they have diminished their close control of this risk and any opportunity to mitigate this.

#### 4.2.3 Procurement

HAL has created a delivery procurement strategy that has been reviewed by the airline community. The high-level mission statement to "Create a Heathrow Expansion Procurement Strategy that motivates productivity, drives value for money to create a new UK benchmark for the way infrastructure is sustainably procured that delivers the programme."

Arcadis has not been provided a detailed procurement plan built into the information supplied by HAL. Discussions with HAL indicates that it has been undertaking a review of the works packaging strategy and procurement methodology to ensure their stated aims (as listed above) will be achieved.

The focus to date has been to create the design and delivery strategy as required to meet the requirements of the DCO process. Whilst HAL has engaged the services of a professional construction adviser who has advised them on construction methodology, sequence, and timings, there is a lack of detail to the next level on procurement.

Arcadis has raised queries in discussion with HAL on the likelihood of the need to build the OJEU process into the time allowance for works, especially those relating to works outside of the airport boundary.

HAL has not yet clearly identified which packages of works may require OJEU. This may be a function of the unknown status of the UK post 31st October 2019 however any requirement to undertake OJEU procurement could extend the programme and therefore delay the implementation of works.

#### 4.2.4 Pre-DCO Works

Arcadis understands that, to achieve the required clearance of the development space there are certain projects that need to be undertaken prior to the full DCO approval has been achieved.

These are required to clear key areas to facilitate the works and are time critical. This is because of the long string of works that follow these key early works or the need to remove the constraint on the development early.

These projects include the relocation of a high voltage cables and associated substations, which are required to be cleared out of the way to make room for the construction of the new M25 alignment. This works sequence influences the requirement to demolish the existing M25 road to allow for construction of the new runway. Whilst it is not a constraint on the commencement of the runway works it is an influence on the middle section of the runway development.

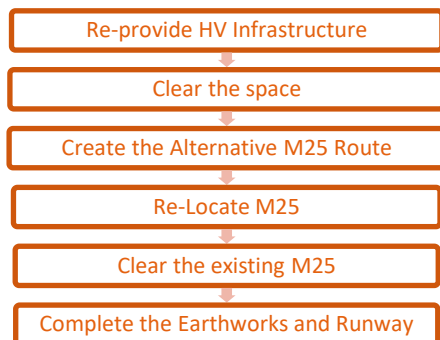
Other projects are pre DCO due to the need to re-provide the facilities to enable occupancy by the construction contractors to clear the areas and commence the earthwork as soon as possible. These projects include for the re-provision of the Harmondsworth Primary School, Immigration Centre, and Energy from Waste facility.

#### 4.2.5 Roads

The reconfiguration of the M25 and A4 are key to the release of a significant area of the development site, to the north and west of the existing Heathrow campus.

The M25 road amendment is constrained by two primary strings. The first will be the design and procurement processes that are required to deliver a Highways England compliant scheme. The second will be the need to clear high voltage surface cables from the development zone.

This sequence is shown below.



Source ( [REDACTED] )

Due to the timing of the works the HV infrastructure works will occur prior to the scheme DCO approval. These works will have a significant influence on the overall development timescale and any delays in this work stream will impact in HAL's ability to deliver the runway for 2026.

The current sequence and timings assume that all the works will commence at the earliest opportunity and the design and procurement and works to the SSE HV network will commence pre DCO approval. Arcadis understands that there are few opportunities to mitigate delays in this sequence, however it will not completely stop the commencement of the runway build but significantly influence the completion of the middle section.

The other key road system will be the relocation of the A4 trunk road. This again will influence the earthworks and development to the north west of the current campus. It is vital that traffic is routed

away from the main earthworks zones and an alternative route around the western perimeter is created, before the existing road system is shut down.

The significance of the A4 will also play into the relocation of the M25, as there is currently a significant bridge that takes the A4 over the M25. The impact of this can be seen by the following works sequence. Deliver the alternative A4 Route including a temporary bridge over the 'live' M25 and an enabling A4 bridge over the M25 diversion.



Source ( [REDACTED] )

The creation of the new A4 route will involve a significant bridge structure over the live M25 to allow traffic to pass from the west of Heathrow to the north.

These two areas will need to be worked up in detail with the supply chain to de-risk these very difficult scope of works. Whilst a period for these works has been allowed within the Preferred Masterplan programme schedule, Arcadis understands that it will be difficult for HAL to assess the certainty of the proposed timescale until further design work has been undertaken.

Although the existing construction delivery consultant will have undertaken a review of the sequence and timings to give a professional opinion on the likelihood of achieving the required dates, there is a risk that any delay to the A4 is again likely to impact on HAL being able to achieve the runway opening of 2026.

#### 4.2.6 Earthworks

HAL has developed a strategy around the DCO consent being delivered in [REDACTED] 2021, and the main earthwork commencing in [REDACTED] 2022.

The requirement is therefore for HAL to mobilise, set up the required logistics centres, clear any DCO conditions, achieve vacant possessions, and undertake environmental mitigation measures in order to achieve a meaningful start of the earthworks in [REDACTED] 2022.

The stated goal of the first year of earthworks is to move approximately [REDACTED] of material. To achieve this goal HAL is planning to work extended days and weeks during this first season. Whilst much thought



and investigation of the possible methodologies has been undertaken, HAL cannot finalise the actual methodology until the DCO process has delivered any imposed constraints.

Due to the tight timescales allowed in the programme, between the DCO approval and the start of works, any delays in the DCO approval process will have a direct impact on the ability of HAL to achieve the planned start of the works in the [REDACTED] 2022. The target of the [REDACTED] of material to be moved would then be compromised.

The HAL strategy requires large areas of land and existing facilities to be available under Vacant Possession at the beginning of the works. To achieve this, HAL has indicated that they will be negotiating agreements with the various landowners and vested interests prior to the DCO. These agreements are planned to come into force at the point of DCO approval with dates indicated within the programme for some of the key land acquisitions to become operational [REDACTED] after the issue of the DCO.

Arcadis is not able to accurately forecast whether the required parcels of land will be available on the required date, with the risk that the process may take longer than planned. This will also put pressure on the earthworks sequence and methodology leading to potential delays in the release of areas to following activities.

The earthwork periods are constrained by weather impacts, with the expectation that the majority of the work will be carried out from spring to autumn in 2022 and 2023. Seasonal variance and inclement weather could have a significant impact on the ability of HAL to deliver the required production targets.

Arcadis considers that with a limited earthwork season (spring to autumn) the programme targets are challenging and will require multiple shifts per day and 6 days a week working. Arcadis understands that HAL is working through these challenges to create a stable working regime that will seek to achieve these goals.

#### 4.2.7 Runway Opening

The runway delivery sequence as defined by HAL in the time slice presentation (images in Appendix A), seems to be in keeping with the known constraints around the campus at Heathrow.

Arcadis has seen a sequence that shows a clear strategy to deliver the works as and when required. It highlights the works necessary to be cleared in advance of the main runway delivery. It also shows the constrained method of delivery for the main runway works. The Preferred Masterplan programme schedule supplied by HAL indicates the proposed time periods for the works.

Arcadis has discussed the development of the programme with HAL. Arcadis notes that no separate allowance has been made for programme-wide schedule risk. HAL has clarified that programme allowances for individual work-

packages are based on industry benchmarks for completed work and accordingly include allowances for programme delay.

However, in our experience, a prudently designed masterplan schedule will include some allowance for programme risk, dealing for example with the interdependency of work items on the schedule.

Arcadis has analysed the document '[REDACTED] t' that was published on [REDACTED] 2019. HAL's report sets out information on the benchmark data used and the source of that data. Although this helps to validate the time periods allowed within the programme, it does not eliminate any schedule risk and only clarifies the periods used.

#### 4.2.8 Schedule Risk

Arcadis notes that, throughout the schedule and delivery sequence published, HAL has taken an optimistic approach to the interdependency of key components of the Masterplan. Whilst this outcome may indeed be delivered, it would be a prudent step by HAL to take greater account of a number of highly significant sequencing risks that we set out below:

##### Dependency on the Timing of the DCO.

HAL has been optimistic in achieving the key dates as set out above. HAL's Preferred Masterplan programme schedule assumes the ability to complete the DCO process within the proposed 17-month timescale.

##### Delivery of Enabling Infrastructure

The timescales to relocate the SSE High Voltage infrastructure, the M25 Motorway and the A4 Trunk road is again reliant on a smooth programme without delays or disruption. The A4 relocation must be completed for the site for runway construction to be made fully available.

##### Earthworks Schedule

Even once the site is available, the need to achieve [REDACTED] of earthworks in the first year, to the start of works within [REDACTED] of receiving the DCO is again ambitious, relying on additional consents to allow for extended working days.

##### Operational Readiness

HAL has not yet shared their plan for "day one operations". Arcadis has analysed the programme and has identified a period allowed for operational readiness. This period is indicated on the programme as 5 1/2 months, from [REDACTED] 2026 to [REDACTED] 2026.

Arcadis' assessment, based on other operational readiness activities that Arcadis has been involved with (including T5 and T2 at Heathrow) is that this duration is optimistic, as the new runway will require extensive integration into the existing Heathrow operations.

Arcadis understands that the new infrastructure will also require integration into a revised airspace plan.

Prior to this testing and proving period, there will be a need to update the airfield licence and operating procedures to accommodate changes to airspace.

These tasks are not highlighted on the master schedule received by Arcadis. The assumption being that these tasks will be undertaken in parallel with the construction delivery team and be ready and agreed prior to the operational testing period.

The date is driven by completion of the runway construction, which is shown as [REDACTED]. There is little or no contingency built into the start of this operational readiness period which we considered to be an optimistic position.

No information was provided on the detailed programme as to how the new runway capacity will be integrated into the existing Heathrow operations. Further work will be required to clarify all the conditions necessary to achieve a successful integration of the new assets.

Given the high reputational risk associated with handover and operational readiness, we expect that HAL would take a more conservative approach to their planning of handover timescales.

### 4.3 Summary

Arcadis considers that the overall Preferred Masterplan programme schedule is at the level of detail required for a programme of this scale at this stage of the development process.

HAL has developed a programme that has all the necessary steps needed to achieve the ANPS target for 2030 and there is no reason to suggest this date is not achievable.

HAL are aware of these risks. Figure 18 for example sets out HAL's assessment of the top 15 expansion risks, which include for example, the extension of the DCO period.

The programme has been developed from a sequence of discrete activities that each include

their own allowances for schedule risk based on industry norms. There is no apparent programme-wide allowance for schedule risk and, based on our understanding of the methodology adopted by HAL, no additional risk allowance for the particular challenges associated with the delivery of the works sequence in a constrained location.

The risks and the work HAL has undertaken to consider these to the delivery and therefore the timing is set out in 3.2.10 above. Arcadis has seen evidence that HAL is continually developing and refining its risk assessment to the programme.

Arcadis has no doubt that HAL has spent a significant amount of resource developing its plans and is confident that this approach would allow HAL to achieve the ANPS target for increased runway capacity by 2030.

However, there are a number of elements within the programme that HAL will not have full control over and therefore cannot fully mitigate the risks associated with these tasks being delivered. The lack of control on specific elements such as the DCO process, SSE HV works, the Waste to Energy facility and M25 works could lead to timings and key milestones not being achieved that will have a knock-on to the rest of the programme.

Although HAL has indicated that they could mitigate some of the potential delays through re-phasing and moving around work elements within the programme, the key consequence of delays to the delivery of the runway or re-scheduling of works is likely to be an increase in costs and potential failure to achieve the 2026 date.

The **Heathrow Expansion Programme, Assurance Review of Heathrow Airport Limited Delivery Schedule** report prepared for the DfT by Costain has also highlighted a similar set of risks associated with meeting the 2026 timescale but again agrees with Arcadis' view that the ANPS target of 2030 can be achieved.

# 5 COST ESTIMATE

Arcadis has assessed whether the Preferred Masterplan Capital Expenditure (CAPEX) for the **Step 0** period is reasonably and reliably costed. The review has considered the approach HAL has taken to build, further develop and update their cost estimate in accordance with the Preferred Masterplan.

Arcadis has examined HAL’s approach to developing the cost estimate any ‘Scope Gap’ and the certainty of the cost estimate based on the quantification of costs, pricing and confidence in costs, application of on-costs and HAL’s approach to risk and maturity.

Arcadis’s key findings are:

- HAL’s Cost Estimate for **Step 0** is reasonably and reliably costed;
- Arcadis’s comments from previous reports to the CAA have been taken on board by HAL and an all-encompassing baseline cost estimate has been produced by HAL;
- HAL’s approach to the structure and methodology of compiling the Cost Estimate reflects industry best practice;
- The level of quantification and benchmarking has increased since previous iterations of the Cost Estimate with analysis of benchmarks from other sectors incorporated leading to an increased level of cost certainty; and
- [REDACTED]

## 5.1 Definition of Theme

This section of the report reviews the Cost Estimate for **Step 0**. HAL’s Cost Estimate has already been reviewed and assured by the Independent Fund Surveyor (IFS). To understand the IFS’s approach Arcadis met with the IFS in May 2019. Arcadis consider that the IFS has undertaken a thorough and detailed review of the Cost Estimate and have therefore looked to build on and further the work already done by the IFS rather than duplicate.

reasonably and reliably costed. Arcadis has based their assessment on industry practice and Royal Institution of Chartered Surveyors (RICS) New Rules of Measurement (NRM).

An industry recognised approach to cost estimating is detailed below in Figure 19.

After compiling the Base Costs of the Cost Estimate Indirect costs are taken into consideration, these are detailed in Figure 20.

Arcadis has assessed whether the Preferred Masterplan Capital Expenditure (CAPEX) is



Figure 19 Approach to Cost Estimating, Direct Costs



Figure 20 Approach to Cost Estimating, Indirect Costs

Arcadis has considered the approach HAL has taken to build, further develop and update their Cost Estimate in accordance with the Preferred Masterplan. This consideration includes:

- HAL's approach to developing the Cost Estimate, process for development and future development, amendments to the Cost Estimate based on progress, assessment of progress and amendments to date; and
- Scope Gap review (Cost Estimate to design and delivery of Preferred Masterplan).

Arcadis has reviewed the certainty of the Cost Estimate that HAL has produced for the Preferred Masterplan. This review includes:

- Quantification of costs: Assessing the amount measured, the basis of the measurements and the extent of work where quantification has not yet been undertaken;
- Pricing and confidence in costs (total, measured, assessed, benchmarks);
- Application of on-costs; and
- Approach to risk.

Arcadis has assessed the observed level of maturity within the Cost Estimate. This has included assessing:

- The robustness of evidence provided by HAL in relation to its Preferred Masterplan and associated cost; and
- The integration of Cost Estimate with other elements of the Preferred Masterplan such as; design, procurement, programme, logistics, external and mitigating factors, project specifics.

## 5.2 Assessment

### 5.2.1 Information Reviewed

In order to undertake this review Arcadis has engaged with HAL attending presentations with HAL for each Task Order. These Task Orders reflect the packages of work that the Cost Estimate is broken down into and is likely to be reflective of the structure of the packages to be procured. Following the presentations HAL provided the slide decks. These presentations were:

Report Title	Report Source
[REDACTED]	HAL
[REDACTED]	HAL
[REDACTED]	HAL
[REDACTED]	HAL
[REDACTED]	HAL
[REDACTED]	HAL
[REDACTED]	HAL
[REDACTED]	HAL

Table 18 Presentations and Documentation Provided by HAL

Following these presentations, HAL provided their Cost Estimate; dated [REDACTED], which forms the main document for review under this section of this report. This document contains sections on scope, cost, schedule, risk & inflation. It has appendices containing:

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

This document collates all the elements of the Cost Estimate and as such addresses one of the concerns Arcadis previously noted in earlier reports to the CAA.

Task Order	Direct (£m)	Indirect (£m)	Sub-Total (£m)
Enabling works	█	█	█
Earthworks	█	█	█
Utilities	█	█	█
Rivers	█	█	█
Roads	█	█	█
Runways & Taxiways	█	█	█
Landscape	█	█	█
Programme Specifics	█	█	█
<b>Total:</b>			█

Table 19: Direct and Indirect breakdown of Cost Estimates  
Source: █

The largest section of the document is Appendix C: Cost Estimate. This contains cost reports at Task Order level, that reflect the different type of works being delivered as part of the programme.

Each Task Order outlines the scope, quantification, pricing, direct costs, indirect costs, assumptions & exclusions and benchmarking. In addition to the main document, Excel files were provided for the Cost Estimate element.

The Task Orders in the Cost Estimate cover all the works necessary for the Preferred Masterplan to be delivered. Arcadis has considered the following for review in **Step 0**:

- Earthworks;
- Utilities;
- Enabling Works;
- Rivers, Roads; and
- Runways & Taxiways and Landscaping.

In addition to the documents compiled by HAL Arcadis has also referred to the Independent Fund Surveyor's (IFS) report dated March 2019.

### 5.2.2 HAL Approach to Cost Estimate

HAL has set out their approach to the Cost Estimate in the following presentations and documents:



The Cost Estimate is based on the M4 Preferred Masterplan and is further derived from the steps of the Illustrative Masterplan, the 'Kit of Parts', which was developed by the IDT and describes the key elements of scope, and other design & scoping information.

The Cost Estimate is broken down at Task Order level into direct costs and indirect costs.

HAL's structure and approach is set out as follows:

#### Direct Costs

- Receive design documents, drawings, scope/specifications, assumptions;
- Quantify, measure, enumerate, understand assumptions, raise queries, prepare Cost Estimate. Quantities are based on data provided or confirmed by the HAL's Integrated Design Team (IDT) which have been spot checked by HAL;
- Assumptions & exclusions made at Task Order level;
- Price using either top down benchmarks, bottom up pricing, reach back to business, speak to supply chain. Rates based on facilities benchmarked or elemental/bottom up rates; and
- Finalise Direct Costs within Cost Estimate.

#### Indirect Costs (added to direct costs)

- Project Specifics – assess costs specific to location/operation of construction;
- Preliminaries – Percentage added to allow for cost of site establishment, contractor management and consumables during construction;
- Overheads & Profit – Percentage added to allow for margin made by Main Contractor;
- Design – Percentage added to allow for Architectural, Structural, Civil, M&E etc. fees;
- Leadership & Logistics – Percentage added to allow for Heathrow Management, Client PM/CM, Programme Logistics;
- Risk/Contingency – Percentage added to the base costs, project specifics, preliminaries, OH&P, L&L and design of each Task Order to allow for project and programme risks, supported by a cost risk analysis with derived probability confidence level; and
- Risk Reserve – Enhanced risk percentage added at Programme level.

Following the production of the Cost Estimate, HAL has then put in place the following assurance measures:

- Level 1 Assurance is defined as carried out by peers. The assurance is specific to the Task Order but includes the activities identified in the

HAL assurance check list this includes computation checks which Arcadis, in their previous reports, stated that HAL needed to address;

- Level 2 Assurance is a review undertaken by a Senior separate individual;
- Level 3 Assurance is Cost, Time and Scope review undertaken by the Development Director, supported by the Head of PMO and Head of Estimating and presented by the Task Order PM's (with Estimator and scheduling support);
- Each estimate is signed separately against the headings of prepared by, assured by, approved by and endorsed by. These signatories are the Estimator, Lead Estimator, Head of Estimating and HAL Project Manager respectively;
- External Review is undertaken by the IFS and a report has been provided – recommendations from the report are being worked through from HAL and the IFS to inform future estimates; and
- HAL held a series of engagement sessions with the IFS presenting the schedule and Cost Estimates.

This level of assurance should eliminate arithmetical errors, this was previously addressed and recommended by Arcadis when undertaking the review of the Purple Book which was HAL's previous iteration of the Cost Estimate.

Arcadis considers the structure, approach and assurance to be reasonable for the stage of the project.

## Inflation

All costs within HAL's Cost Estimates are based on Q3 2014 prices, which aligns to the reviews undertaken by the Airports Commission.

In the period between 2014 and the time of this review, there has been a net positive inflation rate for both construction and general price levels in the UK and in London. Therefore, when HAL adjust the estimate to take account of this inflation, the total of HAL's Cost Estimate will increase.

HAL's approach has been to track the costs of a number of indexes against RPI, shown in Figure 21, including:

- Indices produced by the Office for National Statistics:
  - Construction Output Price Index (COPI); and
  - Infrastructure Output Price Index (IOPI) Enabling works.
- The Building Cost Information Service's (BCIS) Tender Price Index (TPI); and
- Indices produced specifically for HAL:
  - Heathrow Price Index (HPI); and
  - Heathrow Cost Index (HCI).

Indices are produced by Professional Consultants from the construction market. Due to the diverse nature of the scope of the Heathrow Expansion Programme, HAL is currently undertaking a review of the scope to identify the most appropriate indices to apply to specific areas of scope. For example, it may be appropriate to apply Building Cost Indices to some aspects of scope and Infrastructure Indices to others.





Arcadis consider this a reasonable approach to analysing and applying inflation, however, would expect HAL to have provided their Cost Estimates in real terms at this stage, making clear their assumptions on the appropriate indices for use by scope area. Furthermore, HAL should consider the impact of inflation on prices throughout the duration of the programme.

### 5.2.3 Step 0 Review

The overall Cost Estimate and its component parts are approximately made up of:

- Direct costs: [REDACTED]
- Indirect costs: [REDACTED]
  - Project specifics;
  - Preliminaries;
  - Overheads & profit;
  - Design;
  - Leadership & logistics; and
  - Risk.
- Other costs: [REDACTED]
  - Programme specific costs; and
  - Management risk reserve.

Each of these component parts have been reviewed through this report. A detailed review of the individual Task Orders is contained within Appendix C of this report.

The direct costs and indirect costs are attributed to Task Orders in the Cost Estimate. The Task Orders are not fully contained in any of the Steps of the Preferred Masterplan.

However, for the purposes on the **Step 0** review, Arcadis has selected the Task Orders where most of the cost falls within the timescale of **Step 0**. The Programme Specific costs also mainly fall within **Step 0**, so they are also considered in this report.

HAL has reached the total of [REDACTED] for **Step 0** by time-slicing the costs, based on assets that are in operation to deliver an operational runway. The sum of the sections for review will not directly equal the total for **Step 0**. Arcadis has considered as part of this review whether the costs are reasonable and reliable.

Any Cost Estimate can only be based on the scope, design, programme and data that is available at the point in time that the estimate is carried out and any assumptions and exclusions that are made.

The Cost Estimate is integrated with the other elements of the masterplan.

Arcadis has assessed the approach to the Cost Estimate and the inputs and outputs used to develop the estimate and consider these to be reasonable and reliable. However, the outcome is still subject to multiple influences, some of which are

highlighted in the Deliverability & Timing sections of this report.

The planned construction methodology and sequencing have been incorporated into the Cost Estimate. If the plan changes or there are any issues with activities that have interdependencies with others there will be an impact on the Cost Estimate.

The provision for risk in the estimate is designed to build in cost for uncertainties and takes a benchmarked and probabilistic modelled approach to cover risk events. It covers most likely eventualities rather than all eventualities.

## 5.3 Direct Costs

### 5.3.1 Introduction

Direct costs are the labour, material, sub-contractor, plant and equipment costs that can be directly attributed to creating an asset. They are typically activities that are quantified and priced for which allowances can be made that are directly related to the project scope.

Within HAL's Cost Estimate the direct works Task Orders considered in the **Step 0** report are:

- Earthworks;
- Utilities;
- Enabling works;
- Rivers;
- Roads;
- Runways & taxiways; and
- Landscaping.

Whilst reviewing the direct costs Arcadis has looked at each Task Order individually and address the items listed in the table below.

Area Assessed	Assessment Undertaken
Scope vs priced activities	Relative to design & Cost Estimate maturity
Key quantities analysis	IDT vs HAL quants check
Key rates analysis	View on rates; benchmarks
Key quantities sensitivity	What could change; impact
Key rates sensitivity	What could change; impact

Table 20 Arcadis' Assessments Undertaken

The review of the individual Task Orders is contained in Appendix C of this report.

## 5.3.2 Direct Costs Step 0 Overview

### Scope vs Priced Activities

In general, Arcadis considers the priced activities are a reasonable reflection of the scope outlined.

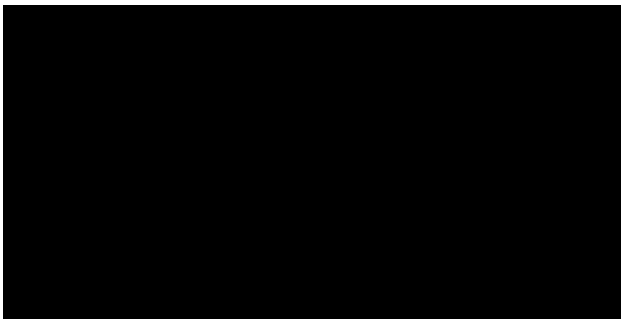
The level of detail varies across each of the Task Orders which is reflective of the level of design development and maturity. The level of maturity for individual Task Orders is aligned with DCO and programme requirements.

Earthworks, roads and runways & taxiways have a high level of quantification and benchmarking whereas for utilities and landscaping is considerably lower.

### Key Quantification Analysis

Across the Task Orders considered in this report, the overall level of quantified activities, by value of the direct costs, is [REDACTED]

The highest level is [REDACTED] for earthworks and the lowest level is [REDACTED] for utilities, which is reflective of the maturity of design. The levels of quantification are shown in the graph below.



The quantities used in the Task Order Cost Estimates come from several sources:

- Provided by the IDT;
- On screen quantification;
- Drawings;
- Design guidelines; and
- Google Earth.

The earthwork volumes have also been modelled by a leading earthworks contractor. This was stated by HAL at a presentation/review meeting on 6<sup>th</sup> June and adds to the level of assurance.

The level and methods of quantification are reasonable at this stage, however, could be improved significantly for utilities as the project develops. It would be better to have a higher level of quantification now, but it is not untypical for the level to be low at this stage as utilities are an 'open and see' item.

The reliability is good given that the quantities provided by the IDT have also been spot checked by HAL, Arcadis has not seen evidence of this but HAL has stated in meetings with Arcadis that spot checks have been carried out and the IFS report also states that HAL informed them the quantities have been spot checked. HAL's Level 1 Assurance requirements also includes major quantities checks for accuracy.

### Pricing and Key Rates

The Cost Estimate has been priced using a combination of benchmarking, market testing, bottom up elemental estimating, calculated rates, historic rates including Purple Book 0.63, previous Heathrow projects, other UK projects, estimators experience and allowances.

In our earlier reports Arcadis commented on the source of HAL's benchmarking where HAL had only analysed previous Heathrow projects. HAL has now addressed this and incorporated benchmark data from other sources, namely:

- Environment Agency;
- Highways England;
- London Underground;
- Rail sector;
- Water sector;
- Utilities;
- International airports;
- Consultant databases; and
- Heathrow, T5 and T2A.

Arcadis considers that this approach is reflective of industry best practice.

Across the Task Orders considered the overall level of benchmarked, market tested or calculated activities by value of the direct costs is [REDACTED]. The highest level is [REDACTED] for earthworks and runways & taxiways whilst the lowest level is [REDACTED] for enabling works.

Arcadis considers the level is too low for enabling and HAL needs to benchmark, or market test these work activities to increase cost certainty. Currently there is a risk regarding the cost assurance of this Task Order.

The levels of pricing are shown in Figure 23.



Arcadis considers that the extent and coverage of the pricing and benchmarking is generally reasonable at this stage, however It could be improved for enabling works, landscaping, utilities and rivers as more detail becomes available as the design develops.

**Cost Significant Items**

Across the Task Orders considered, 85% of the cost is in 23% of the items.

The level of quantification for Step 0 increases to 75%, compared to 72% of all the cost.

The largest contributors to the cost significant items are

- Earthworks ( [redacted] )
- Roads ( [redacted] )
- Utilities ( [redacted] ) and ( [redacted] )
- Runways & taxiways ( [redacted] )

Earthworks, roads and runways & taxiways all have a high level of quantification and benchmarking so the cost significant items can be considered reasonably and reliably quantified and priced. Utilities is the least developed in both quantification and benchmarking and Arcadis considers that this would benefit the most from an increased level of detail to price against. Arcadis has not had the benefit a presentation/review meeting on Utilities so the level of information available is not fully known.

**5.4 Indirect Costs**

**5.4.1 Project Specifics**

Project Specifics are extensions of direct costs that are specific to a location or operation of construction. As a result, they are generally priced on an individual Task Order basis.

HAL set out in their Assessment of Cost Estimate Adjustments that at M4 estimate stage masterplan relevant project specifics will be individually

assessed and priced and this is demonstrated in each of the Task Order Cost Estimates.

Project Specific allocations have been added as a percentage at line item level in the Cost Estimates to allow for costs that have not been included in the direct costs i.e. not covered in the benchmark cost, market cost or allowance. Where they have been added it is generally in groupings of line items within each Task Order.

The allocations may include allowances for airside working, site specific complexities, temporary works, phasing or night-time working assumptions. These are reflective of the programme and HAL’s proposed methods for delivering the works.

The percentages applied appear higher than the overall percentage of direct costs for each Task Order as they are only applied to selected direct cost items.

Table 21 details the percentage for Project Specifics applied to each Task Order, column A. However, for some of the Task Orders this percentage has not been applied to all of the line items forming the base construction cost, therefore column B shows the total value of project specifics included expressed as a percentage of the total base cost.

This table highlights that the project specifics for Task Orders such as Utilities and Rivers may be low.

Task Order	Project Specifics % applied (Col A)	Project Specifics expressed as a % of base cost (Col B)	Description
Earthworks	[redacted]	[redacted]	Night-time working
Utilities	[redacted]	[redacted]	Airside working
Enabling Works	[redacted]	[redacted]	Asbestos removal
Rivers	[redacted]	[redacted]	River diversions
Roads	[redacted]	[redacted]	Complexity, interfaces, modifications, temporary works
Runways/ Taxiways	[redacted]	[redacted]	Night working, phased working, disrupted shifts
Landscaping	[redacted]	[redacted]	Interfaces

Table 21 Summary of Project Specifics included in HAL Cost Estimate  
Source: [redacted]

## Task Orders

**Earthworks** – Project specifics have been applied to line items in the Cost Estimate where HAL's programme shows night-time working is required. These are generally cut & fill activities where it has been assumed that [REDACTED] of work will be done at night.

**Utilities** – Allowance applied to activities that are within the current airport boundary. Most of the utilities work is outside the current boundary and as such project specific items are not applicable.

**Enabling** – Allowance applied to items relating to building and properties demolition for asbestos removal which is the only area applicable to project specifics.

**Rivers** – Allowance applied to river diversions. This includes the requirement for temporary culverts under the A4, the requirement for temporary bridges at J14 & A4 and EA attendance during construction.

**Roads** – Multiple allowances have been applied at different locations to take account of airside working, traffic management, temporary works during construction and the complexity of works due to interfaces and modifications to existing road. The percentages that have been applied against line items in the Cost Estimate include:

- M25 alignment [REDACTED]
- Junction 14, [REDACTED]
- J14A [REDACTED]
- J14 Running Lanes [REDACTED]
- A4 Western [REDACTED]
- Emirates Junction [REDACTED]
- Western Perimeter Road [REDACTED]
- Northern Perimeter Road [REDACTED]
- Beacon Road Roundabout [REDACTED]
- Southern Access Tunnel [REDACTED] and
- Eastchurch Road & Southern Road [REDACTED]

**Runways & Taxiways** – Several separate allowances have been applied to active runway and taxiway safety zones. These include labour premiums for night working, allowances for phasing to align with runway alterations & operational restrictions and disrupted shifts. Percentages that have been applied include:

- Existing runway [REDACTED]
- Decommissioning [REDACTED]
- Taxiways 23.6% to [REDACTED]
- Relocation [REDACTED] and
- De-icing pads [REDACTED]

**Landscaping** – The airside working allowance is applied to cover possible interface of works required for the NE noise mitigation bund with other works.

## 5.4.2 Preliminaries

Preliminaries are added to the individual Task Order's direct costs and project specific costs to cover the cost required to deliver the works but not included in the rates, such as:

- Contractor's Project Management and Engineering team;
- Site accommodation;
- Scaffolding;
- Hoarding;
- Temporary services;
- Temporary works;
- Office equipment;
- Safety & security & environmental protection;
- Bonds, guarantees, warranties & insurances;
- Plant & equipment; and
- Maintenance of site records, completion and post-completion requirements.

Within HAL's Cost Estimate preliminaries have been applied at [REDACTED] for civils works and [REDACTED] for building works. Previously in the Purple Book HAL had applied a wider range of percentages with the majority of the works having between [REDACTED] applied to the equivalent **Step 0** Task Orders.

HAL's assessment of Cost Estimate adjustment states that at M4 stage there will be a review of preliminaries at an asset by asset level informed by clarity of project specifics. This is not how HAL has applied preliminaries within the Cost Estimate. Arcadis considers that this needs to be developed to assure the costs. This will be affected by the procurement strategy and how the works packages are structured. Arcadis consider that a bottom up estimate of the preliminaries needs to be undertaken for the next iteration of the Cost Estimate.

HAL has undertaken benchmark studies to review the percentages applied. They have reviewed 50 projects at Heathrow from the Q5 and Q6 programmes. The Q5 works at Heathrow were large scale projects with similar types of facilities to the Heathrow Expansion Programme. HAL has also reviewed 16 projects from rail, utilities, property sectors and other aviation projects.

The percentages applied in the M4 estimate are consistent with these benchmarks.

### Task Orders

The earthworks, utilities, rivers, runways & taxiways and landscaping Task Orders all have [REDACTED] preliminaries applied to all Cost Estimate line items, in line with the [REDACTED] provision for civils works.

Enabling Works has [REDACTED] preliminaries applied to all items except for ground investigations and surveys where the works are in progress, so no further provision is required. Consolidation Centre's included in the estimate are allowances that are

deemed to already include preliminaries, so no further provision has been added. The overall percentage for preliminaries for Enabling Works is therefore expressed as [REDACTED]

Roads has [REDACTED] preliminaries applied to all items except for the commuted sum relating to Highways England works where the preliminaries are deemed to be already included. The overall percentage for Roads is therefore expressed as [REDACTED]

Arcadis considers the current percentage allowances to be reasonable.

### 5.4.3 Overheads & Profit

Overheads & Profit are added to the direct costs, project specific costs and preliminaries. Overheads & Profit reflect the operating expenses (or head office administrative costs) of running the main contractor companies that will implement the projects and the profit margin to be made by the main contractors after accounting for all costs and expenses.

Overheads & profit have been applied [REDACTED] in the HAL Cost Estimate.

HAL has undertaken benchmark studies to review the percentage applied. HAL has reviewed at least 49 projects at Heathrow from Q5 and Q6. HAL has also reviewed 37 projects from other sectors. The projects from rail, commercial, infrastructure, schools, facilities management & retail sectors. Whilst Arcadis has seen the results of this review we have not interrogated these results.

The percentage applied in the Cost Estimate falls in line with the average of all the benchmarks.

The benchmark for the Q5 works and the other sectors exceed the average. As the Q5 works is comparable with the Heathrow Expansion Programme it could be considered appropriate to apply a higher percentage for overheads & profit i.e. [REDACTED]. However, the Q6 works are more recent and are lower than the average, which could be indicative of the Heathrow market trend.

Arcadis considers that as Overheads & Profit are at company level rather than site level it would be more pragmatic to use a blend of the Q5 and Q6 data.

Previously HAL had generally applied a percentage of [REDACTED] however they did apply [REDACTED] to demolitions and earthworks.

### Task Orders

The earthworks, utilities, rivers, runways & taxiways and landscaping Task Orders all have [REDACTED] overheads & profit applied to all Cost Estimate line items.

Enabling Works [REDACTED] overheads & profit applied to all items except for ground investigations and surveys where the works are in progress, so no further provision is required. Consolidation Centre's included in the estimate are allowances that are deemed to already include overheads & profit, so no further provision has been added. The overall

percentage for overheads & profit for Enabling Works is therefore expressed as [REDACTED]

Roads has [REDACTED] overheads & profit applied to all items except for the commuted sum relating to Highways England works where the overheads & profit is deemed to be already included. The overall percentage for Roads is therefore expressed as 7.2%.

### 5.4.4 Leadership & Logistics

Leadership and Logistics costs cover HAL's programme/project delivery management and programme wide logistics and overhead requirements.

HAL's definition of Leadership costs include:

- Central charges for accommodation;
- Utilities;
- Control posts;
- Staff costs for development;
- IT;
- Central resource;
- Insurance charges; and
- Commercial & control consultancy – including project management, cost management, project controls & risk management; delivery integration services – integration services including early construction/build advice & scheduling; programme design integration services – coordinating integrated schedule across the programme and commercial audit – across the programme.

Logistics costs include:

- Site security;
- Site accommodation for operatives;
- Waste management;
- Car parking and bussing;
- Catering; and
- Delivery strategy & escorting and traffic management.

HAL provides these services to contractors instead of the contractors providing them, with the costs coming through the preliminaries. This gives HAL the opportunity to benefit from economies of scale as well as guaranteeing consistency and compliance with security requirements.

Leadership & Logistics costs are added to the direct costs, project specific, preliminaries and overheads & profit at [REDACTED]. HAL has based this percentage on the Q6 model which was derived from Q5. The approximate split in the Q6 model is [REDACTED] leadership and [REDACTED] logistics.

The Assessment of Cost Estimate Adjustments states that at M4 stage there will be a review of Leadership & Logistics and improved understanding of Preliminaries to ensure no overlap in costs.



Arcadis has not seen any evidence that this has been undertaken and would expect to see this when bottom estimates for preliminaries and Leadership and Logistics are undertaken. We would expect to see this at M5.

A review of the Leadership & Logistics costs has not been incorporated into the M4 estimate but HAL plan to carry out a review and test the model for the M5 estimate. It would be ideal for a review to be incorporated in the current Cost Estimate, but it is still a reasonable allowance and it should not adversely affect the outcome.

The IFS conducted a benchmarking study for Leadership & Logistics in Q6 and found it to be comparable with other programmes.

### Task Orders

The earthworks, utilities, rivers, runways & taxiways and landscaping Task Orders all have [redacted] leadership & logistics applied to all Cost Estimate line items.

Enabling Works has [redacted] leadership & logistics applied to all items except for ground investigations and surveys where the works are in progress, so no further provision is required. Consolidation Centre's included in the estimate are allowances that are deemed to already include leadership & logistics, so no further provision has been added. The overall percentage for leadership & logistics for Enabling Works is therefore expressed as [redacted].

### 5.4.5 Design

Design costs have been accounted for within the estimate and include for architectural, structural, civil engineering, mechanical & electrical design and any other specialist design and consultancy fees required to deliver the HEP programme.

Design costs have been applied [redacted] in the Cost Estimate, this percentage has been applied to the direct costs, project specific costs, preliminaries and overheads & profit. The application of this percentage is consistent with industry standard best practice as recommended in the NRM2 which sets out guidelines for production of estimates.

HAL's Assessment of Cost Estimate Adjustments states that at M4 stage the design costs will be based on benchmarked percentages in accordance with the complexity of the works for all assets.

HAL has undertaken benchmark studies to review the percentage applied. HAL has reviewed 36 projects at Heathrow from Q5 and Q6 programmes. They have also reviewed 503 projects from other sectors.

The Q5 works at Heathrow is considered comparable with the HEP as it consisted of large high value and high-profile buildings such as T2A. The Q6 works were smaller scale projects, split between new build and refurbishment works. The projects from other sectors include water, rail, middle eastern airports, laboratory building and office building. The other sectors may not be directly

applicable, but they provide a useful sample for reference.

The percentage applied in the M4 estimate falls in between the Q5 benchmark and other sectors/Q6 benchmarks. This is representative of the location and type of works being carried out and takes account of all the benchmarks.

Arcadis consider that this might be slightly low as there will be other consultancy services associated with the DCO process and land acquisition which would probably not have been required in the Q5 or Q6 programmes.

### Task Orders

The earthworks, utilities, rivers, runways & taxiways and landscaping Task Orders all have [redacted] design applied to all Cost Estimate line items.

Enabling Works has [redacted] design applied to all items except for ground investigations and surveys where the works are in progress, so no further provision is required. Consolidation Centre's included in the estimate are allowances that are deemed to already include design, so no further provision has been added. The overall percentage for design for Enabling Works is therefore expressed [redacted].

Roads has [redacted] design applied to all items except for the commuted sum relating to Highways England works where the design is deemed to be already included. The overall percentage for Roads is therefore expressed as [redacted]. Within this Task Order these are an allowance so Arcadis are unable to verify this.

### 5.4.6 Risk

Risk is added to the direct costs, project specific costs, prelims, overheads & profit, design and leadership & logistics to cover the cost of unforeseen circumstances or uncertainties in the project. It covers the cost of events that might happen but are not certain to happen.

Risk contingency has been applied at [redacted] to all Cost Estimate line items which is the same as the M3c estimate. This includes [redacted] for costs, uplifted by [redacted] for scheduling/finance.

Overall the M4 Cost Estimate includes [redacted] risk, as a risk reserve has been added. Between M3c and M4 significant scope re-assessment took place reducing the programmatic flexibility in execution, so further risk contingency was required which has been defined as Risk Reserve.

Risk Reserve has been added at a programme level and is therefore not directly seen in the Task Orders within the Cost Estimate. It is calculated by replacing the [redacted] provision at line item level with [redacted] for off airport infrastructure, [redacted] for on airport infrastructure and [redacted] for property.

The IFS M3c report quotes that the risk range applicable to this stage would be [redacted]. As the risk is now [redacted] this meets the IFS recommendation and is in line with industry benchmarks.



The Assessment of Cost Estimate Adjustments states that at M4 stage there will be a programme specific Quantitative Schedule Risk Analysis (QSRA) / Quantitative Cost Risk Analysis (QCRA).

HAL undertook a Cost Risk Analysis (CRA) to provide a bottom up view of whether the applied contingencies percentages were appropriate for this stage. This did not directly inform the contingencies applied in the estimate, but it does provide a countermeasure.

### **CRA Basis**

The risk was modelled against the 142mppa scheme to Step 8 (inclusive of Step 0 and Step 3).

The risks were evaluated collaboratively by risk managers, project managers and commercial managers.

There were [redacted] risks and opportunities considered. Of these [redacted] risks & [redacted] opportunities were modelled discretely in the cost risk model. The risks and opportunities included in the CRA were derived from the programme level risk register, red risks from the task orders and risks and opportunities identified during interviews with the task order project managers and costs estimators i.e. programme wide employer risk and categories of risk by contract/area.

Some example risk drivers, applicable to Step 0 include:

- Property market forces;
- Southern Road tunnel construction;
- Impacts on airfield operations;
- Insufficient time given for businesses to relocate could result in extinguishment;
- Acceleration of compulsory property purchases;
- Increased Wider Property Offer Zone scope;
- 3<sup>rd</sup> party service diversions for utilities works;
- Ground slab required for M25 tunnel; and
- Reuse topsoil/aggregates on site.

Uncertainty ranges were derived from benchmarks or programme experts and used on direct costs at Cost Breakdown Structure (CBS) level 2 (approximately [redacted] items) for rates, quantities and design maturity. Going forward, design maturity will not be used when scheme progresses to M5 as the scheme will be more developed.

The risk contingency and risk reserve included in the M4 estimate were replaced by quantified uncertainties, risks and opportunities and a risk analysis was carried out using Monte Carlo analysis in MS Excel using @Risk to model the risks.

The CRA shows that [redacted] level of confidence aligns with the [redacted] risk provision in the M4 estimate. This means a [redacted] probability of completing the programme within the total Cost Estimate.

Historically, typical or standard probabilities used in programmes and projects are P50 and P80. [redacted] is a reasonable mid-point of these probabilities. If a

higher level of confidence is required, the risk contingency in the Cost Estimate would need to be increased.

At the M5 stage HAL is looking to increase the probability rating through improved development and knowledge of design, scope, quantities and/or rates without reducing the risk and contingency allowances.

Optimism Bias has not been included in the Cost Risk Analysis. If it had been the risk provision and overall Cost Estimate would increase, so the additional assurance it would give would come at a premium.

### **Stage Observations**

The risk analysis was carried out for the whole programme and is not split between stages.

However, it can be derived from the M4 P50 contribution to total cost above base cost that the top 3 category contributors are Terminals, Piers & Satellites (Step 3), Property (Step 0) and Baggage (Step 8).

It is also possible to derive that just under half of the cost by category can be attributed to Step 0 and that there is a high number of low to medium cost categories in Step 0.

From the P90 percentage risk by CBS scope it can be derived that categories in Step 0 are typically lower than the overall average.

This could be in part due to the design for Step 0 categories being more developed than the later stages and more cost being in the base cost.

## **5.5 Programme Specific Costs**

### **Introduction**

Programme specifics capture the programme level costs that facilitate the delivery of the Heathrow Expansion Programme that can't be directly attributed to the Task Orders.

The scope for programme specifics includes property acquisition, noise insulation, development consent order (DCO) CAT B costs, T5+, T1 baggage prolongation and other operational and community spends.

HAL has engaged with specialist property consultants and HAL finance department to inform their preparation of the Cost Estimate.

### **Scope vs Priced Activities**

The priced activities align with the scope summarised above and detailed in the Cost Estimate.

The Cost Estimate contains lump sums that are either calculated separately elsewhere or are allowances retained from Purple Book 0.63. Items calculated separately include the property cost forecasted and items within the Management Business Plan 2019.

Within the Programme Specific Costs HAL have included a section for Community mitigation scope which includes Section 106 payments and noise mitigation. Allowance for Community Infrastructure Levy (CIL) is also included. An assumption has been made that any additional community requirements will be funded from CIL and Section 106 payments. HAL have not made any specific inclusion or reference to an annual Communities Compensation Fund which was referenced as part of the National Policy Statement.

### Key Quantities

There are no quantities provided in the Cost Estimate to review.

However, HAL states that there is quantification in the Management Business Plan (MBP)19 provided by HAL and the property costs provided by the specialist property consultants.



It should be noted that HAL has engaged specialist professional property consultants to develop this element of the cost plan. Due to the sensitivity of this data Arcadis has not had sight of the build up to this element of the cost plan and are therefore unable to comment and conclude on HAL's approach to quantification of this element. However, the fact that specialist consultants have been engaged infers that HAL's approach is reasonable as these consultants should have access to reliable sources of data.

### Key Rates

There are no rates provided in the Cost Estimate to review due to the sensitivity of the data.

However, HAL states that [redacted] of the Cost Estimate has been market tested. This is mainly associated with property costs, noise insulation and DCO costs.

The remaining [redacted] of the Cost Estimate is based on allowances associated with T5+, T1 baggage prolongation and allowances retained from Purple Book 0.63.

[redacted] market testing would lead to good reliability in the Cost Estimate. Property costs are entirely dependent on the market so we can verify that the approach is reliable but can't verify the detail as we don't have the rates to review.

### Indirect Costs

Indirect costs have been considered on a line by line basis and applied where applicable, which is reasonable for this level of Cost Estimate.

Project specific costs have not been applied to any of the line items.

Preliminaries, OH&P, Design have only been applied to building works.

Leadership & Logistics have been applied to buildings, resource efficiency and airfield vehicles.

Risk has been applied to all items except noise insulation, T5+ and T1 baggage prolongation.

### Quantity/Rate Sensitivity

It is not possible to comment on individual quantities and rates as the detail is not included in the Cost Estimate.

The fact that cost forecasted data from specialist property consultants and HAL has been utilised by HAL increases confidence and should reduce sensitivity. Clearly any change in extent of provision or changes in market rates will impact the overall cost.

Items relating to programme specifics are included in the Cost Risk Analysis and risk allowance has been included in the indirect costs. There is not a direct correlation between the two but there is provision.

## 5.6 Summary

It is Arcadis' opinion that on balance, HAL's Cost Estimate for **Step 0** is reasonably and reliably costed.

HAL has taken on board Arcadis's comments, from earlier reports to the CAA reviewing the Purple Book, regarding the structure of the Cost Estimate and produced a comprehensive document capturing all the relevant Cost Estimate data in one singular document.



The above document also includes the detailed estimates for each individual Task Order. The build up to the estimate for each Task Order takes cognisance of the data provided by the IDT, HAL's programme and HAL's proposed methods of execution.

The structure of the Cost Estimate reflects industry best practice standards and forms a good baseline on which to move forward. This can now form the basis on which to monitor and implement a change control process.

The structure of the Cost Estimates for each Task Order provides a standard platform for approaching the estimate and reflects best practice with how HAL has approached the quantification and pricing of direct and indirect costs.

The level of quantification within the detailed estimates reflects the level of detail provided by the IDT. The extent of quantification has increased since the Purple Book and the reliance on

allowances reduced which leads to an increased level of certainty.

However, there are some Task Orders where the level of quantification is lower than we would expect at this stage. The most significant one being the utilities. This is partly reflective of the nature of the works and the reluctance for utility companies to engage on developments at such an early stage of the programme.

Arcadis considers that this could be progressed further and that this currently poses a risk to the Cost Estimate. There is also potential for this to impact the programme which would put further pressure on the Cost Estimate.

The level of benchmarked rates for **Step 0** accounts for an average of [REDACTED] which is a significant increase from Arcadis' review of the Purple Book, albeit that one would expect to see a higher level of benchmarking for **Step 0** as these works are the initial works in the programme and the design is more progressed for these Task Orders.

When analysing the Purple Book, the resultant [REDACTED] is the benchmarked percentage for the HEP as a whole. As previously recommended by Arcadis HAL has drawn on benchmark data from other large programmes of work in other sectors and brought this into their analysis with their own internal data.

Arcadis considers the [REDACTED] to be a reasonable percentage for the current stage however there are

two Task Orders, in particular where we would have expected the benchmarking to be further progressed, namely utilities and for enabling works, in particular the demolitions, hence these add a level of uncertainty to the Cost Estimate. These two elements account for [REDACTED] of the Step 0 total.

With regards to HAL's approach to indirect costs, this appears reasonable, however we would expect to see the assessments for preliminaries and project specifics moving away from benchmarked percentages and towards bottom up estimates. HAL has started to address this within the Project Specifics by reflecting specific items identified within the delivery reports.

HAL has applied a percentage for risk at Task Order level and at management reserve level, they have also undertaken a QCRA to verify this. Whilst this a reasonable iterative approach Arcadis would expect to see risk applied at TO level based on a fully managed risk structure with a further risk reserve being held at management level reflecting the outputs of a fully managed risk approach.

Whilst HAL has reflected schedule risks in their risk models Arcadis believes that due to the level of control HAL has on some of these elements, as discussed in Sections 3 and 4 of this report, there remains further risk on programme which will have an inherent risk on the Cost Estimate.

# 6 INTEREST OF CONSUMERS

Although not explicitly considered as part of the Step 0 report, Arcadis has continued to see examples where the interests of consumers are being tested through the development of the Preferred Masterplan.

This view has mainly been formed through and building upon a previous Arcadis report submitted in December 2018, *'An initial review of consumer interests in the development of the HAL Masterplan'*.

Arcadis's key findings are:

- HAL is seeking to ensure that the existing airport operation can function whilst this phase of construction is taking place;
- HAL is seeking to increase the flexibility of the airport and ensure there is sufficient resilience available to cope with operational challenges;
- HAL is seeking to minimise disruption for both consumers and the local community; and
- HAL has spent a significant amount of effort to develop its delivery programme in a logical sequence to reduce the impact the works will have on both these groups.

'Consumers' are defined as both passengers and cargo operators of the airport for the purpose of this report.

To review HAL's Preferred Masterplan with regards to the interest of consumers Arcadis has considered how HAL has acquired consumer insight and how well HAL has incorporated consumer insight into their masterplan development process.

Step 0 does not necessarily deliver infrastructure that consumers will directly identify with as assets as much of the work is enabling and 'making the space' for the construction of the 3<sup>rd</sup> Runway.

In Step 0, there are no direct infrastructure improvements being proposed to support cargo operations. However, there is evidence that HAL is

actively engaging with the cargo community to develop improvements that will be delivered in future steps of the masterplan.

The majority of infrastructure improvements will benefit the passenger consumers at Heathrow. The increase in runway capacity and on-going capacity improvements should contribute to delivering a scheme that is in the interest of consumers.

Our discussions with HAL have indicated that the interest of consumers is now embedded into their masterplanning thought processes and HAL can point to examples where the interests of consumers has informed the evaluation process and option appraisal choices for a number of different components of the Scheme.

## APPENDIX A Layouts

The Airport layouts images below set out the main infrastructure changes that will be in place through the three Steps that Arcadis has been asked to review the Preferred Masterplan. The HEP construction phasing images set out the time slices in 6 monthly increments from DCO through to 2026.

### AIRPORT LAYOUT AT STEP 0





## AIRPORT LAYOUT AT STEP 3





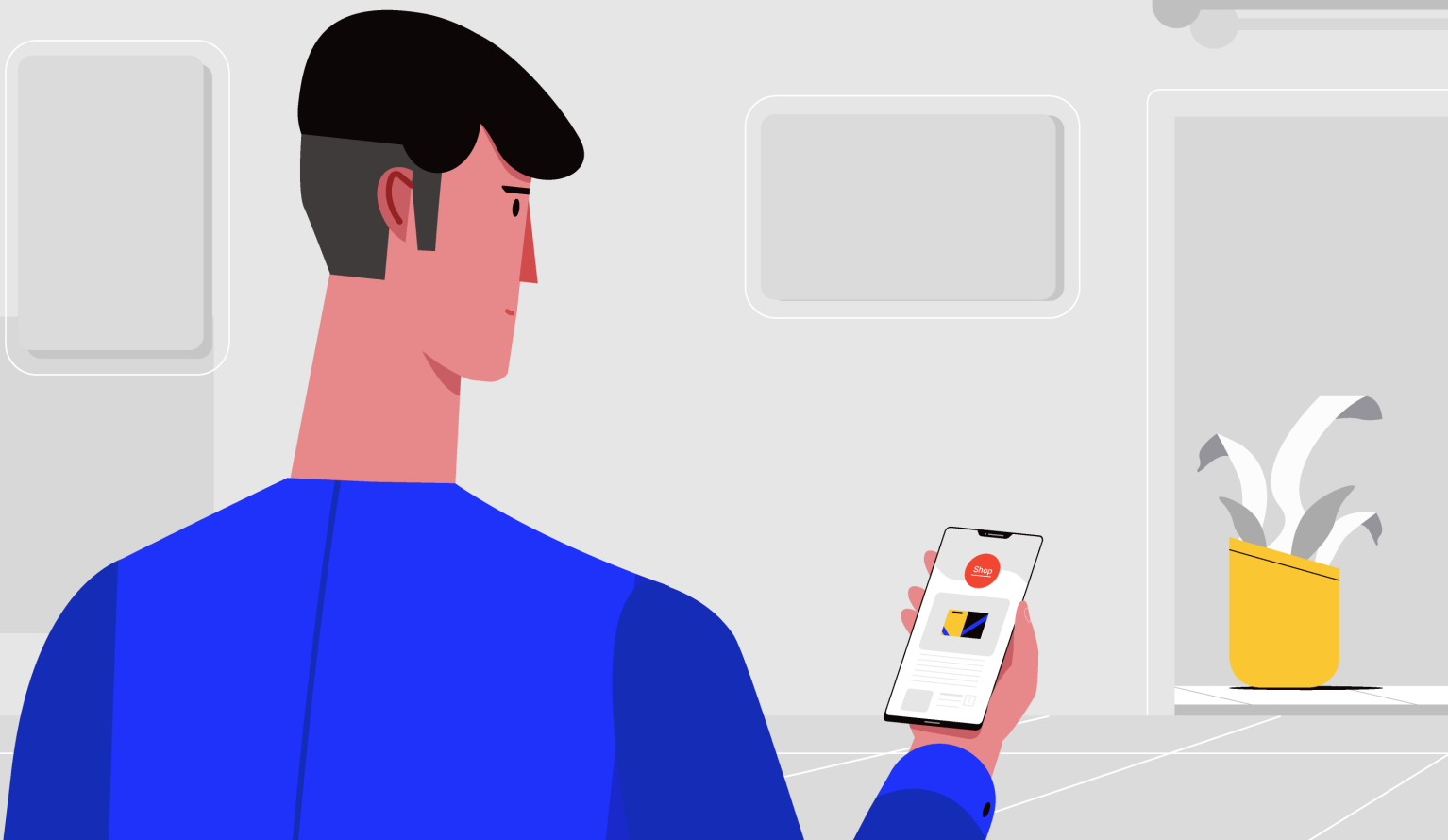
## AIRPORT LAYOUT AT STEP 8





White Paper

# Air cargo and e-commerce enabling global trade





# Air cargo and e-commerce enabling global trade

## Digital technologies are revolutionizing trade

Our industry is set to double in size by 2035. IATA's role is to facilitate the growth of civil aviation and cut airline costs by creating a better regulatory and business environment for our member airlines, and the stakeholders of the air cargo industry.

**20%**  
growth  
per year

IATA enables airlines, the broader value chain, and consumers to connect safely, securely, sustainably, and efficiently to all parts of the network, through global standards. We must add value for our members and enhance air transport, by providing services where we have a clear mandate and a distinctive capability.

IATA's member airlines, together with their partners, must prepare for the future growth of e-Commerce in the air cargo industry by transforming into a modern service provider and anticipating consumers' expectations. The global economy is increasingly turning to e-commerce: whether for online shopping between consumers and businesses, from consumer to consumer, or business to business. Traditional and digital worlds are also tightly integrated with omnichannel solutions and business models mixing offline, online, and even virtual experiences.

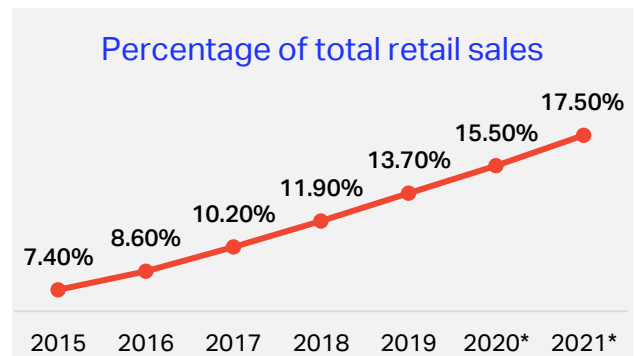
Consumers in stores use more and more digital devices (their own or the ones provided by the retailer) to virtually try clothes and customize the goods they will then order, buy products that are either out of stock or not sold in stores, scan product labels to check availabilities, and arrange delivery and returns.

## A not-to-be-missed opportunity

Since 2005, global internet retail sales have grown above 20% a year on average, according to Euromonitor International, much faster than traditional store-based sales. The International Post Corporation (IPC) even suggests that this percentage has now reached 25%.

In addition to rising domestic volumes sent by large and small e-retailers, the fast-growing cross-border e-commerce market remains a key growth driver. IPC expects cross-border e-Commerce to account for 22% of global online commerce (nearly twice the growth rate for domestic trade). They predict that between 2016 and 2021, e-commerce sales will grow by 141% and reach a forecasted global sales value of USD 4.8 trillion.

Despite these impressive figures, online retail is still relatively immature as it accounts for only 12% of total retail sales in 2018, according to IPC. Those figures show the vast potential of e-commerce in the near future.



E-commerce is a future growth driver for the air cargo industry, as online shopping boosts demand for parcel delivery services worldwide. On aggregation, the industry's parcel volume more than doubled over the last decade, growing at a rate far above economic growth.

# \$4,800,000,000,000

## value of global e-commerce forecast for 2021

## Cross-border e-commerce

Online shoppers are now buying more and more often, and cross-border e-commerce volumes are growing. According to IPC, in January 2019, 75% of online shoppers buy online at least once a month. Customers' expectations are no different for domestic and cross-border e-commerce. They want speed, predictability of delivery times, and visibility. Network coverage, frequency of flights, tracking capabilities, and flexible and varied final mile delivery solutions are therefore critical to serving e-commerce customers.

**75%**  
of online shoppers buy online at least once a month

**20%**  
buy online at least once a week

The same study also shows that currently, cross-border e-commerce is predominantly for low cost and light-weight products: 84% are below 2 kg, 40% cost less than 25 euros, and 8% are returned. It is therefore relevant to revisit the business models of the air cargo players, pricing structures, chargeable principles and align border regulations impacting traditional airlines, integrators and postal operators to ensure fair competition and interoperable solutions.

Another interesting fact is that footwear, apparel, and consumer electronics represent more than 52% of all online shopping, excluding services such as travel, entertainment, and financial products.

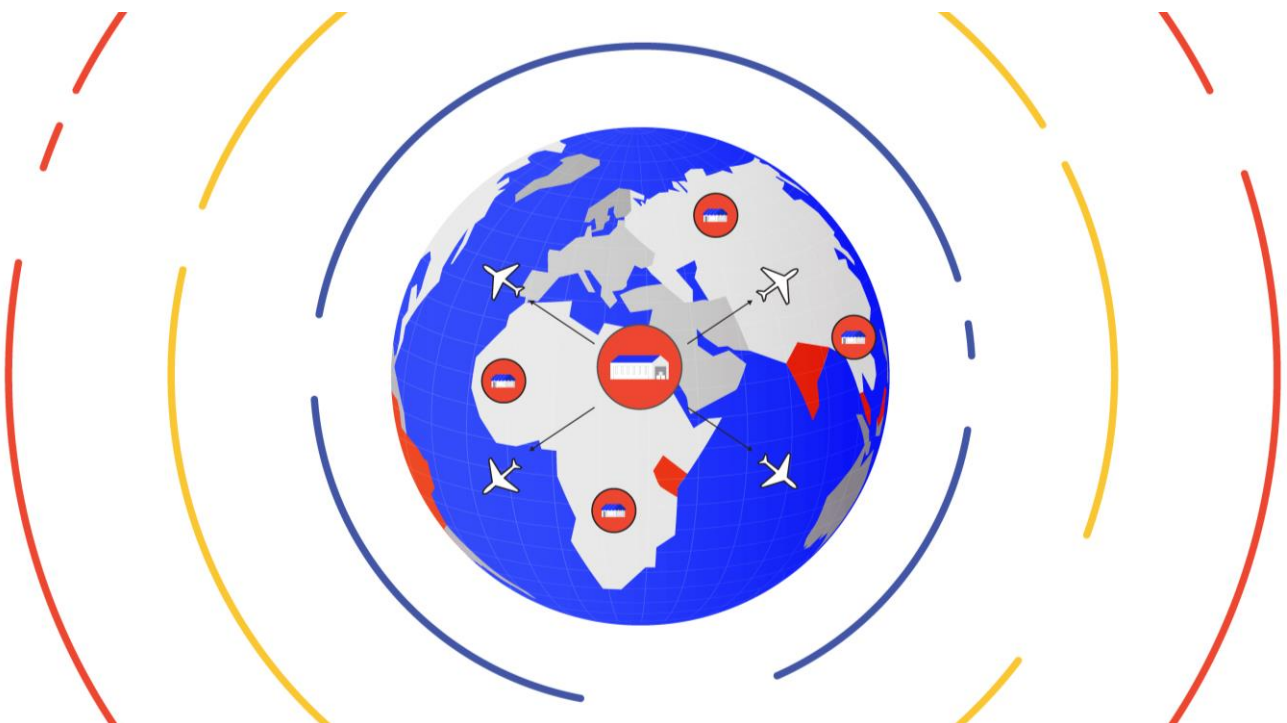
Educating online retailers will be essential to ensure safe packing, correct labeling and declaration of shipments with dangerous goods (specifically lithium battery shipments) and other regulatory compliance obligations.

## New players, new rules!

Today's and tomorrow's e-commerce players expect innovation from their partners, and therefore, the complexity and out-of-date processes that are still in place in the logistics industry must evolve to meet their needs.

- They offer simplicity, smooth, and smart digital user experience to their own customers: they expect similar treatment from their logistics providers.
- They continuously innovate to survive the ever-growing competition and are therefore compelled to work with innovative partners.
- They embrace customer-centricity, often via instant comments on social media, and have to respond quickly to any deviation: they need reactivity from their supply chain partners.
- They invent new business models, create new rules: they are ready to be their own logistics provider if existing ones are not addressing their needs.

In the consumer to consumer scenario, there are no more traditional traders nor logistics experts. This means the air cargo logistics providers need to adapt to these individuals who do not necessarily have adequate expertise in trade and logistics.



## Linking what the online consumers want and what air cargo can deliver

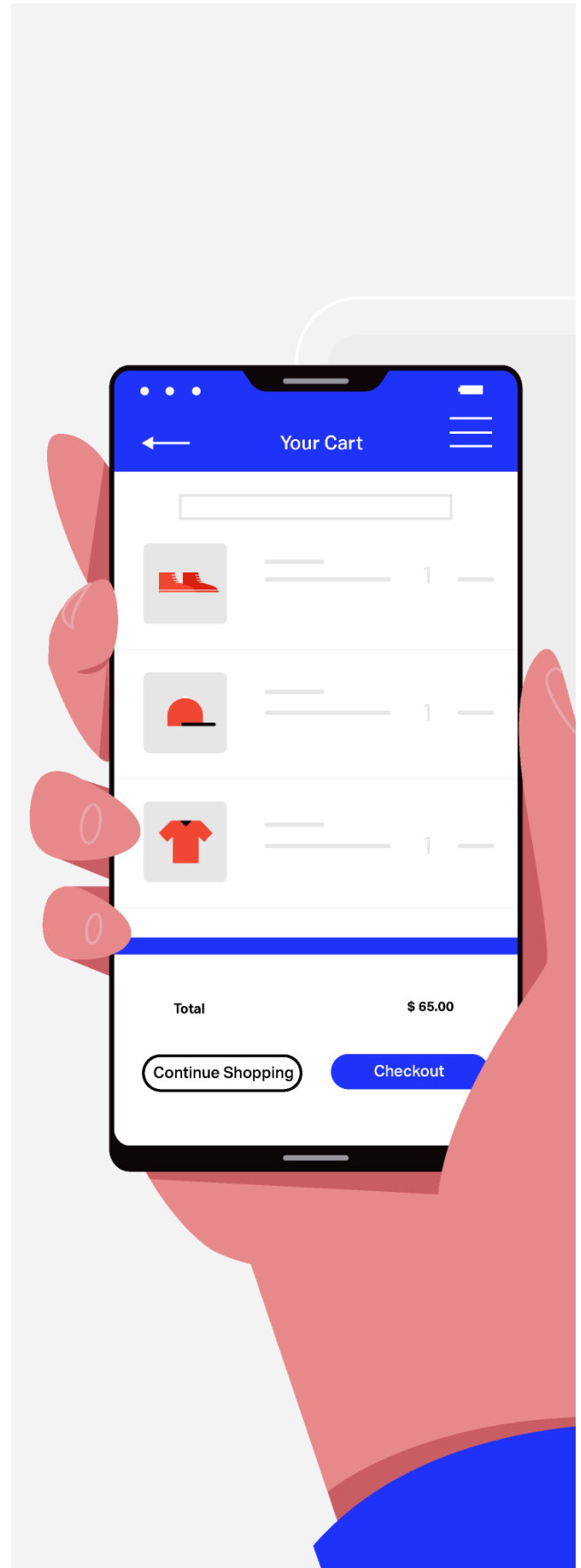
The online marketplace offers visibility of inventory status and expected delivery dates, a variety of shipping options including free, tracking options, and easy returns are demanded by digital shoppers. To be able to offer free shipping, retailers need to get low-cost solutions from their logistics providers. Equally, to be able to propose fast, including same-day delivery options to their consumers, retailers need high-priority and totally reliable logistics services.

<p><b>High priority</b></p> <ul style="list-style-type: none"> <li>• Faster delivery</li> <li>• Expedited Customs clearance</li> <li>• Customized final mile / delivery</li> </ul>	<p><b>High visibility</b></p> <ul style="list-style-type: none"> <li>• End-to-end tracking</li> <li>• Instant notification</li> <li>• Disruption alerts</li> </ul>
<p><b>Normal</b></p> <ul style="list-style-type: none"> <li>• Regular air cargo service</li> <li>• Basic final mile</li> </ul>	<p><b>Low cost</b></p> <ul style="list-style-type: none"> <li>• Deferred delivery</li> <li>• Low touch final mile</li> </ul>

## The increasing need for speed, visibility, and easy returns profoundly impacts the logistics chain

The significant growth of e-commerce has already had a profound effect on retailers and manufacturers' logistics needs as they seek to reach their customer as quickly and cost-effectively as possible while providing supply chain transparency. On top of the speedy and free delivery, facilitating quick, easy and often free returns has become an important criterion for online consumers and a high cost for retailers to handle unwanted used or damaged goods each year.

Shipping items can become very expensive, and managing supply chains, logistics, and reverse logistics involved in e-commerce is often tricky. E-commerce is a challenge for logistics providers who need to understand the newly emerging trends and patterns, better anticipate expectations and volumes, and adapt their network coverage, products, and service level agreements accordingly.



## Is the air cargo industry ready to offer the right logistics solutions for the e-commerce retail industry supporting their business growth?

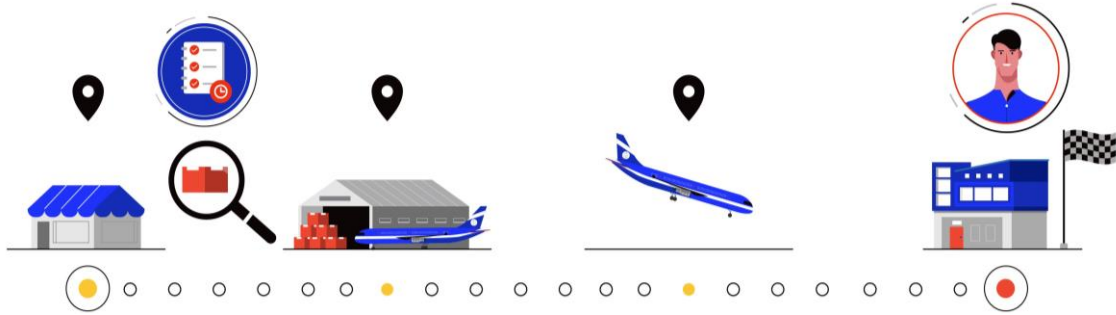
The global scale of the Internet means that online retailing can reach more prospective customers than brick and mortar, based competitors. To deliver to their customers, e-commerce players can choose a variety of logistics options: surface transport (such as road, rail, and sea) and air transport. As the world is their marketplace, air cargo is well-positioned to serve their needs and deliver their goods globally with speed, efficiency, and reliability.

Logistics by air are provided by the traditional model (freight forwarders, ground handlers, and airlines), integrators, and postal operators.

	Traditional air cargo	Integrators	Postal operators
Strengths	<ul style="list-style-type: none"> <li>All type of cargo</li> <li>Security</li> <li>Safety</li> <li>Identification of dangerous goods</li> <li>Airlines' network and schedule</li> <li>Specialized supply chain partners</li> </ul>	<ul style="list-style-type: none"> <li>Integrated supply chain solutions</li> <li>Customs pre-clearance / speed</li> <li>Security</li> <li>Safety</li> <li>Participants in trusted trader programs</li> <li>Identification of dangerous goods</li> <li>End-to-end tracking</li> <li>First and last mile</li> <li>Investments in new technologies</li> <li>Airlines' network and schedule</li> </ul>	<ul style="list-style-type: none"> <li>First and last mile</li> <li>Pricing structure / chargeable principles (flat-rate convention from UPU)</li> <li>Tracking on ground</li> <li>Direct access to shippers and e-tailers</li> </ul>
Weaknesses	<ul style="list-style-type: none"> <li>Fragmented</li> <li>No end-to-end tracking</li> <li>Slow adoption of digital</li> <li>Limited investments in new technologies</li> <li>No direct access to shippers and e-tailers</li> <li>Undeveloped first-mile collection</li> </ul>	<ul style="list-style-type: none"> <li>Costs</li> <li>Reliant on traditional air cargo carriers for their enhanced network</li> </ul>	<ul style="list-style-type: none"> <li>Fragmented</li> <li>Security issues in airmail</li> <li>Safety issues in airmail</li> <li>Slow adoption of digital</li> <li>No air/rail/sea network</li> </ul>
Opportunities	<ul style="list-style-type: none"> <li>Airmail and cargo IT systems alignment</li> <li>End-to-end optimization</li> <li>Customs pre-clearance</li> <li>End-to-end tracking and interactive cargo</li> <li>Business diversification</li> <li>Drones</li> <li>Revised value model</li> <li>Cooperation with other modes</li> <li>Flexible final mile solutions</li> <li>Inter-modality for blended supply chains</li> </ul>	<ul style="list-style-type: none"> <li>Drones and other autonomous vehicles and robotics</li> <li>Decrease in the taxation for online trade</li> </ul>	<ul style="list-style-type: none"> <li>Alarm resolution concept</li> <li>ACI &amp; e-CSD for airmail</li> <li>Airmail and cargo IT systems alignment</li> <li>End-to-end tracking and interactive cargo</li> <li>Drones and other autonomous vehicles</li> </ul>
Threats	<ul style="list-style-type: none"> <li>Competition from integrators and postal operators</li> <li>E-tailers becoming their own logistics providers (Amazon)</li> <li>Future competition from drones operators</li> <li>Innovations in surface modes of transport</li> <li>Too slow to adapt to necessary changes</li> <li>Inefficient and cumbersome regulations increasing costs and/or release times</li> </ul>	<ul style="list-style-type: none"> <li>Postal operators pricing model</li> <li>E-tailers becoming their own logistics providers (Amazon)</li> <li>Future competition from drones operators</li> <li>Innovations in surface modes of transport</li> <li>Inefficient and cumbersome regulations increasing costs and/or release times</li> </ul>	<ul style="list-style-type: none"> <li>Competition from integrators/express carriers</li> <li>E-tailers becoming their own logistics providers (Amazon)</li> <li>Future competition from drones operators</li> <li>Lithium batteries in airmail</li> <li>Too slow to adapt to necessary changes</li> <li>Lack of control of what is being transported</li> <li>Inefficient and cumbersome regulations increasing costs and/or release times</li> </ul>



# Air cargo responding to the e-commerce challenge: the industry action plan



## Strengthen safety and security for air cargo and airmail

Safety and security must be further enhanced with stronger collaboration and compliance with programs related to training, trusted partner identification, and compliance with regulations and best practices. The e-commerce industry will benefit from these initiatives in terms of image and also in terms of efficiency and non-rejections of goods.

## Simplify processes, optimize flows and speed up the transaction, introducing industry best practices

“We sell speed – we need to protect that speed.”  
Strengthening the value proposition will be crucial for airlines, forwarders, and ground handlers to support and capitalize on e-commerce growth. What can the industry do to minimize stationary freight pre & post flight or to make the reasons for these temporary events more transparent?

## Embrace new technologies that will ensure greater visibility, transparency, and efficiency

Accelerating digitization, developing real-time interaction, testing drones and robots, implementing sensors and data loggers, making sense of Big Data, developing new screening technologies... will enable the air cargo industry to adapt, respond, and anticipate e-commerce needs!

## Engage with e-commerce players to align understanding of air cargo safety and security matters

Stronger collaboration between commercial partners will benefit all! Interactive dialogue to transmit information like predictive and effective volumes, bookings, and allocations can help optimize capacity, load factors, routes, physical flows, and environmental footprint.

## Challenge the status quo and reinvent business models

Evaluate and consider re-purposing excess capacity of the cargo warehouses into modular e-commerce logistics centers and distribution facilities. Forwarders and Ground handlers to consider entering the first and last-mile business with innovative solutions and new age vehicles such as drop boxes, multi-purpose lockers, or drones.

## Call for and promote stronger industry coordination

An association of e-commerce vendors would facilitate discussions with international organizations representing airlines (IATA), freight forwarders (FIATA), postal operators (UPU), customs (WCO), etc

# IATA's role in supporting air cargo capitalizing on e-commerce growth

IATA is the trade association representing approximately 275 commercial airlines worldwide, accounting for more than 83% of total air traffic. IATA's mission is to represent, lead, and serve the airline industry.

Air cargo represents more than 35% of global trade by value. When it comes to combined passenger and cargo airlines, the cargo business generates 9% of airline revenues on average, representing more than double the revenues from the first-class segment.

To support this critical business, IATA is committed to delivering enhanced value for the industry by driving a safe, secure, profitable, and sustainable air cargo supply chain.

IATA develops global standards and tools, offers financial services and industry solutions, drives transformation

projects, creates partnerships, and runs campaigns as well as advocacy and outreach activities.

IATA is driving change in the air cargo industry by simplifying the business and helping make air cargo easier, faster, and smarter.

## For e-commerce, our goals are to:

1. advise the industry and enhance understanding of the opportunities and challenges that exist and anticipate online consumer and e-tailer needs so airlines can capitalize on e-commerce growth;
2. ensure the air cargo industry has the right regulations, standards, and global framework to offer the right logistics solutions for the e-commerce retail industry supporting their business growth.



# IATA's pipeline of initiatives supporting e-commerce

## SAFETY AND SECURITY

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### Mail Safety Guidelines

Implementing Mail Safety Guidelines developed by IATA and the Universal Postal Union for airlines and posts to ensure that no dangerous goods and prohibited items are accepted in airmail.

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### e-CSD

Developing and implementing flexible solutions for the electronic exchange of security (e-CSD) related data for cargo and mail to comply with regulatory requirements in an efficient and automated way without disrupting the flow of goods.

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### Innovative screening technologies

Encouraging the development of new cost-efficient equipment and methodologies to automatically screen all types and all sizes of goods, including dangerous goods, which are simple to build into operation and complying with regulatory certification.

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## DIGITALIZATION

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### Cargo and mail IT systems mapping

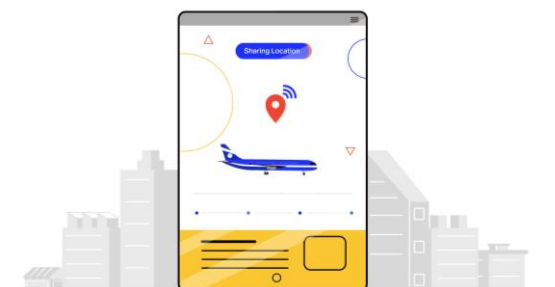
Bringing together the two different systems for mail and cargo to allow visibility through bookings and allocations, planning through volumetric information, tracking through compatible messages.

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### Interactive Cargo

Developing the relevant standards and guidelines (piece level tracking, real-time notification, and use of connected devices) to enable cargo to talk!

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### ONE Record

Developing the relevant standards and guidelines to replace all existing paper and electronic documents by only one digital shipment record, including border formalities.

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## OPERATIONAL EFFICIENCY

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### Smart Facility

Driving excellence in air cargo handling by developing high-quality standards in cargo facilities, ensuring safe, secure, efficient and transparent cargo & mail handling. This will be verified through globally-accepted assessments and reinforced by identifying best-in-class cargo facilities using IATA's cargo handling standards

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### Cargo Facility of the Future

Developing a set of recommendations to modernize existing or build future facilities by making the best use of technologies, processes, and architectural developments.

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### Fast Cargo

Improving speed on the ground through smart regulations, efficient operations, and modern technologies

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## DATA

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### WCO Measurement and analysis

Big Data, review of work currently being undertaken by international bodies, research and analysis of various e-Commerce business models, measuring e-Commerce flows and economic benefits, capacity building, awareness and education

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### Cargo iQ

Shipment planning and performance monitoring for air cargo based on standard business processes and milestones. As part of that system, the Master Operating Plan (MOP) describes the standard end-to-end process of transporting cargo. Cargo iQ recently launched a strategic transformation to increase its value, positioning itself as the principal provider of quality standards and metrics for the air cargo industry.

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## STAKEHOLDER ENGAGEMENT

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### Trusted trader programs for e-commerce players

Promoting the use of existing trusted trader programs to recognize and differentiate the e-commerce players who are educated, trained, and compliant in the areas of safety and security.

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### Collaboration

Develop partnerships and joint programs to enhance understanding of the requirements from various parties (UPU, IPC, Cainiao, JD...)

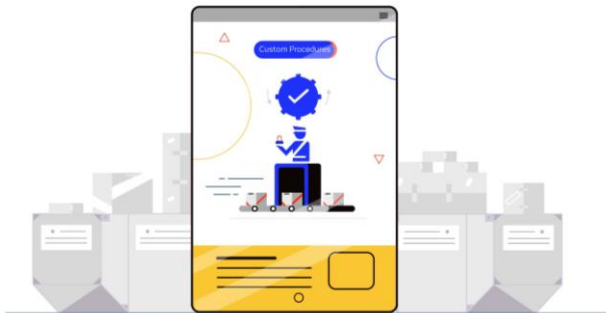
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## BORDER PROCEDURES

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### Advanced cargo and mail information

Developing and implementing flexible solutions for pre-departure and pre-arrival risk assessments by customs for cargo & mail to comply with regulatory requirements.



### Border efficiency

Lobby governments and national customs to collaborate in border efficiency to allow for faster clearance and delivery of e-Commerce goods.

## SUSTAINABILITY

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### Seal of quality for e-commerce platforms

Developing a certification mechanism or a code of good practice for e-commerce platforms that sell lithium battery products to identify the trained ones complying with agreed sets of standards and safety programs.

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### Illegal Wildlife Trade

Collaborate with e-Commerce platforms and Logistics providers to raise awareness on the responsibility to be aware of endangered species and the necessity to train employees to combat illegal wildlife trade.

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### Environment

Strongly advocate the requirement to develop appropriate business models that will not impair the environment by taking care of waste, thinking of packaging efficiency and reverse logistics.

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## NEW BUSINESS ENHANCEMENTS

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### Drones for tomorrow's air cargo

Developing the relevant standards, guidelines, and partnership for the safe integration of this new branch of civil aviation into the commercial air space to open new opportunities for the air cargo industry.

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### PASS

Collaborate with the industry to develop an automated system allowing postal operators and airlines to speed up the billing and settlement process using a unique global platform

## **Call for action: What next for UK air freight in a post-Brexit world?**

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### **Summary of policy recommendations arising from a joint webinar conducted in February 2021, with Logistics UK and AIPUT.**

#### **Foreword**

Air freight currently accounts for 40% of UK imports and exports by value and is vital for the UK economy. UK airport capacity is a limiting factor for UK importers and exporters, air freight operators and the wider economy. Logistics UK and the Airport Industrial Property Unit Trust (AIPUT) are working closely with Government, members of our Air Council and other stakeholders to support sustainable growth for air freight while promoting a balanced approach to environmental issues.

Logistics UK is one of the UK's leading business groups, representing logistics businesses that are vital to keeping the UK trading, and more than seven million people directly employed in the making, selling and moving of goods. With COVID-19, Brexit, new technology and other disruptive forces driving change in the way goods move across borders and through the supply chain, logistics has never been more important to UK plc. Logistics UK supports, shapes and stands up for safe and efficient logistics, and it is the only business group that represents the whole industry, with members from the road, rail, sea and air industries, as well as the buyers of freight services such as retailers and manufacturers whose businesses depend on the efficient movement of goods.

AIPUT is an award-winning, long-term investor specialising in industrial property on or near the UK's major airports. Managed by Aberdeen Standard Investments, AIPUT is the only specialist airport-focused industrial fund in the UK for institutional investors. It currently holds 19 assets, including 2.1m sq ft at Heathrow Airport, making AIPUT one of the largest landlords serving the UK's global air freight hub. AIPUT aims to deliver a positive Environmental, Social and Corporate Governance (ESG) performance impact throughout its portfolio, with a strategic target to achieve carbon neutrality by 2025. The fund has successfully achieved GRESB Green Star status in each of the last five years.

#### **Introduction**

Aviation is vital for new opportunities and growth post-Brexit, and to the UK's economic recovery from the COVID-19 pandemic. Our air links, not least those with our largest trading partners including the US, are not a frivolous luxury. They connect Britain with the world and link British products and expertise with billions of potential buyers overseas. Pre-pandemic, some 49% of the total value of UK exports outside of the EU travelled by air, across a combination of dedicated freighters and onboard passenger flights.

In February 2021, Logistics UK together with AIPUT hosted a policy roundtable to discuss the future of air freight with representatives from across the aviation industry, including the warehousing sector, airlines, ground handlers, shippers and airports. Expert panellists included Nick Smith (AIPUT), Elizabeth de Jong (Logistics UK), Peter O'Broin (International Air Transport Association) and Stephen Harvey (Manchester Airports Group).

Inevitably, recovery from the pandemic is just as important an issue as ensuring the industry is well-positioned to make the best of Brexit. Throughout the pandemic and since the end of the Brexit transition period, air freight has contributed invaluable support to the economy and lives of everyone across the UK, facilitating both the rise in e-commerce and the movements of vital pharmaceuticals.

Despite questions remaining over the future of night flight provision, decarbonisation and the growth of aviation, air freight remains a cornerstone of the UK economy. It is vital that the Government and industry commit to a long-term partnership to support both investment and green growth. This paper outlines the steps that need to be taken to ensure the future of air freight in a post-Brexit world.

## Fact and figures

- Air freight services contribute £7.2 billion to the UK economy and support 151,000 jobs<sup>1</sup>.
- Across all sectors of the economy, £87.3 billion of UK gross value added (GVA) is currently dependent on air freight exports, including a very significant proportion of the GVA of some key industries and their supply chains:
  - Pharmaceuticals - £13.9 billion – of all pharmaceutical products produced in the UK, 41% are exported, 30% are for the UK market and the remainder (28%) are substances that are used in the production of other pharmaceutical products<sup>2</sup>.
  - Computer, electronic and optical - £8.3 billion.
  - Creative arts and entertainment - £5.3 billion.
- In 2017, air freight represented 49% of the UK's non-EU exports by value (£91.5 billion) and 35% of non-EU imports (£89.9 billion) – over 40% of total trade by value but under 1% by volume of goods shipped<sup>3</sup>.
- 60% of the UK's air freight travels via Heathrow, is the UK's hub airport.
- During the global pandemic, freight tonnage at Stansted was up by 30% year on year with East Midlands Airport seeing an increase of 18.7%<sup>4</sup>.
- Germany ships just 25% of its non-EU export value by air, and most other major EU economies ship between 20% and 40%. Only Ireland ships a greater share of its non-EU exports by air than the UK.
- 9% of GVA in the North West (worth £14.9bn) is dependent on air freight service. Figures are 8.6% in Wales, 7.6% in the East Midlands and 6.8% in the South West.

## Case study

*A supplier of diagnostic and therapeutic medical products relies on air freight for their vital operations.*

As a leading supplier of pharmaceutical products in the UK, a supplier of diagnostic and therapeutic medical products are heavily reliant on air freight operations and a comprehensive network of air routes from multiple origin points in Europe into the UK in order to service their customers across Great Britain and Northern Ireland.

They receive around 18,000 orders per annum from customers in the UK for short-lived pharmaceutical products which are used in the diagnosis of disease and treatments for patients. In many cases, owing to the short life of the products, delivery is required to hospitals in the UK on a next-day basis, with delays or longer transit times rendering them unusable and leaving clinicians frustrated and patients distressed. Many patients will have had long-standing courses of treatment suspended pending administration of the shipper's products, and failure to deliver within the prescribed time merely serves to cause added distress to the patients and create increased costs for the hospitals.

It is therefore essential that, for reasons of both timescale and capacity, adequate flights and connectivity into East Midlands, Birmingham and Belfast airports, remain unhindered and unrestricted. Without these services, it would be impossible to service the c.700 patients per day (175,000 per annum) in the UK, with a significant potential impact on healthcare across the UK as a result.

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<sup>1</sup> 'Assessment of the value of air freight services to the UK economy', October 2018

<sup>2</sup> 'The UK Pharmaceutical Sector, an overview', December 2019

<sup>3</sup> 'Assessment of the value of air freight services to the UK economy', October 2018

<sup>4</sup> Manchester Airports Group, May 2021



# Priorities

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## 1. Positive perception of aviation

Air freight and aviation is a key driver of economic growth, both in terms of financial contribution and employment. The Government needs to give a clearer signal that it is supportive of and values air freight as a sector of national strategic importance. It is important the narrative surrounding the industry is positive and supported by Government at every juncture. Aviation is critical to the Government's 'Global Britain' objectives – in 2019, 65% of UK trade with Australia travelled through Heathrow. Aviation has a strong reputation for innovation and has supported the UK throughout the COVID-19 pandemic – now is the time to consider it as a crucial component of a Global Britain.

## 2. Joined-up approach – passenger and freight

It is widely known that passenger and freight operations work in tandem: prior to the pandemic, 95% of cargo at Heathrow was carried in the belly hold of passenger planes. Capacity in the air freight network is key, with freighter operations working alongside and complementing capacity provided by passenger services. Any assistance and support from Government needs to be targeted at aviation in general, without emphasising help for passenger services above freight, or vice versa; both rise and fall together.

## 3. Infrastructure

The UK needs to facilitate the timely delivery of the highest quality transport and real estate infrastructure serving its leading airports in order to underpin the future growth of a vibrant, sustainable and globally competitive aviation and air freight sector able to make its fullest contribution to the success of UK plc.

## 4. Funding

Air Passenger Duty (APD) and business rate holidays would be welcomed by the sector both to reinforce its recovery and signal Government support for the sector as strategically important for UK plc.

## 5. Brexit

The industry is calling for accelerated negotiations with the EU on improving traffic rights to open key markets and routes following the UK's departure from the EU. This will build on the solid foundations laid out in the Trade and Cooperation Agreement (TCA) and help ensure that air cargo can continue moving and operating efficiently.

We are seeking two priority changes. First, UK carriers are not currently operating on a level playing field owing to the Department for Transport (DfT) and Civil Aviation Authority's (CAA) liberal view on approval of traffic rights for EU operators which are not currently reciprocated. We call on the EU to grant equivalent rights to UK operators.

Second, we are seeking additional traffic rights beyond the first four freedoms of the air agreed in the TCA. The fifth freedom is vital for air cargo, as it enables a plane to take off in the UK, land in an EU member state, unload cargo and continue its journey onto a second country with additional cargo. We ask for a long-term sustainable plan for traffic rights.

## 6. Consumer behaviour

A healthy air freight sector is an essential part of the new digital economy. The UK is one of the top three online shopping nations. Consumer behaviour over the course of the pandemic and recent years has led to an increase in e-commerce. Just-in-time and next day deliveries are no longer an ambition but an expectation. Express freight airlines operate a significant number of services which support e-commerce – such as moving goods between working days (overnight), which accounts for £4 billion to the economy and just under 6,000

jobs<sup>5</sup>. We must continue to innovate, supporting flexible freight movements throughout the day and, where possible, at night to support this vital sector and growing market.

## **7. Innovation**

Air cargo is a driver of innovation in logistics. Innovation can be seen in all aspects of the air cargo supply chain, from ground operations and aircraft technology, to warehousing solutions and security. The new generation of cargo warehouses, aircraft and equipment need to be fit for purpose, promoting safety and security, and designed to be as carbon neutral as possible, as well as future-proofed through the enabling of automation and digitisation. A long-term commitment to innovative solutions is the foundation of private investment and strategic planning for years to come. For its part, the industry must continue to drive innovation, strive to demonstrate its commitment to carbon reduction and its overall Environmental, Social and Governance (ESG) performance and enhance its 'licence to operate' with the communities it serves.

## **8. Freeports**

While the industry has welcomed the Government's Freeport proposals, they need to deliver enhanced new opportunities for the air freight sector, as well as the maritime sector, in a post-Brexit world. Freeports must be structured in a way that will attract inward investment and job creation. They represent a once-in-a-lifetime opportunity for airports, maritime and inland ports, and other transport modes to work together. Freeports should also aim to play a major role in driving wider regeneration and spreading those benefits across the UK, while realising enhanced global trade routes and growth prospects.

## **9. Regulatory relaxations**

For the air freight sector to succeed, the industry calls for targeted and appropriate regulatory relaxations in planning. Planning regulations are significant when planning for ambitious supply chains and connectivity. Appropriate planning flexibility at ports, for warehousing and connectivity infrastructure, will allow for continued investment and reactive supply chains in air freight. Specifically, we call for support for sustainable expansion at Heathrow and other regional airports where required.

## **10. Decarbonisation**

There is a strong willingness from the air freight and wider aviation sector to meet decarbonisation targets. Many businesses are taking necessary measures to decarbonise as quickly as possible. This is the case across aviation, from warehouses and aircraft to ground operations. Carbon is the enemy, not flying, and low carbon Sustainable Aviation Fuel (SAF) will be key to decarbonisation. In addition, we call for a commitment from Government to support research and development in aviation, leading to new technologies for electric and hydrogen aircraft that are fit for the future and cargo handling.

## **11. Air freight growth**

Alongside Government support, we need to put our vision into practice – leveraging our creative ideas, energy and innovation. Air Cargo should be a catalyst for growth. We need to be brave and more progressive, working with our competitors and working together rather than in silos. The trajectory of progress needs to accelerate and be driven by the challenges and opportunities we face. Air freight is a growing industry and will recover from the impacts of COVID-19 and Brexit, contributing millions to the UK economy and its position as a trading nation. However, the industry needs to know now more than ever that the Government is fully behind the sustainable growth of UK air freight.

## **Conclusion**

Logistics UK and AIPUT would welcome the Government's commitment to the eleven priorities listed in this paper while working together with industry to realise the potential for UK air freight. New opportunities from Brexit, and recovery from COVID-19, present an unmistakable opportunity to consider the next steps for air

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<sup>5</sup> Figures are for goods moved during the night-time Noise Quota Period. Source: 'The Economic Impact of Air Cargo – Night Flying', December 2016

freight. It is vital that a long-term partnership with the industry is developed and strengthened over time as we consider how best to enhance the UK's position as a global trading partner.



Air Transport Movements 2019  
Comparison with Previous Year (a)

Table 6

	<-----2019----->			<-----2018----->			<-----Percentage Change----->		
	Total	Passenger Aircraft	Cargo Aircraft	Total	Passenger Aircraft	Cargo Aircraft	Total	Passenger Aircraft	Cargo Aircraft
London Area Airports									
GATWICK	282,896	282,848	48	283,186	283,186	-	-	-	..
HEATHROW	479,811	477,083	2,728	480,339	477,367	2,972	-	-	-8
LONDON CITY	80,931	80,931	-	78,037	78,037	-	4	4	..
LUTON	112,745	110,628	2,117	106,666	105,081	1,585	6	5	34
SOUTHEND	19,162	19,162	-	17,088	17,088	-	12	12	..
STANTIED	183,147	172,939	10,208	185,077	175,599	9,478	-1	-2	8
Total London Area Airports	1,158,692	1,143,591	15,101	1,150,393	1,136,358	14,035	1	1	8
Other UK Airports									
ABERDEEN	78,209	76,549	1,660	81,552	79,943	1,609	-4	-4	3
BARRA	1,366	1,365	1	1,390	1,389	1	-2	-2	-
BELFAST CITY (GEORGE BEST)	34,625	34,625	-	35,845	35,845	-	-3	-3	..
BELFAST INTERNATIONAL	47,230	42,984	4,246	46,115	42,747	3,368	2	1	26
BENBECULA	1,974	1,917	57	1,960	1,960	-	1	-2	..
BIGGIN HILL	325	325	-	202	202	-	61	61	..
BIRMINGHAM	102,515	100,288	2,227	104,553	101,829	2,724	-2	-2	-18
BLACKPOOL	4,014	4,014	-	4,724	4,724	-	-15	-15	..
BOURNEMOUTH	4,973	4,973	-	4,096	4,096	-	21	21	..
BRISTOL	62,556	62,556	-	66,147	66,147	-	-5	-5	..
CAMPBELLTOWN	1,064	1,063	1	1,069	1,069	-	-	-1	..
CARDIFF WALES	16,688	16,687	1	17,009	17,008	1	-2	-2	-
CITY OF DERRY (EGLINTON)	3,063	3,063	-	2,324	2,324	-	32	32	..
DONCASTER SHEFFIELD	9,520	9,270	250	8,797	8,650	147	8	7	70
DUNDEE	1,212	1,212	-	1,215	1,215	-	-	-	..
EAST MIDLANDS INTERNATIONAL	56,053	32,851	23,202	56,947	34,728	22,219	-2	-5	4
EDINBURGH	127,335	122,219	5,116	125,426	120,395	5,031	2	2	2
EXETER	14,528	14,032	496	13,512	13,020	492	8	8	1
GLASGOW	79,276	78,607	669	85,877	85,191	686	-8	-8	-2
HUMBERSIDE	7,340	7,215	125	7,618	7,481	137	-4	-4	-9
INVERNESS	12,733	12,473	260	12,007	11,896	111	6	5	134
ISLAY	2,021	2,021	-	1,832	1,831	1	10	10	..
ISLES OF SCILLY (ST.MARYS)	10,692	9,782	910	10,587	9,771	816	1	-	12
KIRKWALL	11,256	11,212	44	11,840	11,782	58	-5	-5	-24



**Carbon Offsetting and Reduction Scheme  
for International Aviation (CORSA)**

**— Frequently Asked Questions (FAQs) —**

*(updated as of 31 December 2020)*

**C**  **RSIA**



Note:

The information included in the responses to the selected “Frequently Asked Questions” makes reference to the following documents:

- *Assembly Resolution A40-19: Consolidated statement of continuing ICAO policies and practices related to environmental protection - Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)<sup>1</sup>, adopted by the 40th Session of the ICAO Assembly (24 September – 4 October 2019);*
- *First edition of Annex 16 — Environmental Protection, Volume IV – Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), adopted by the ICAO Council at its 214th Session (11 - 29 June 2018)<sup>2</sup>;*
- *Second edition of the Environmental Technical Manual (Doc 9501), Volume IV, — Procedures for demonstrating compliance with the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)<sup>3</sup>; and*
- *The five ICAO CORSIA Implementation Elements as reflected in 14 ICAO documents approved by the ICAO Council for publication<sup>4</sup>. These ICAO documents are directly referenced in Annex 16, Volume IV and are essential for the implementation of the CORSIA.*

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<sup>1</sup> [https://www.icao.int/environmental-protection/Documents/Assembly/Resolution\\_A40-19\\_CORSIA.pdf](https://www.icao.int/environmental-protection/Documents/Assembly/Resolution_A40-19_CORSIA.pdf)

<sup>2</sup> <https://www.icao.int/environmental-protection/CORSIA/Pages/SARPs-Annex-16-Volume-IV.aspx>

<sup>3</sup> <https://www.icao.int/environmental-protection/CORSIA/Pages/ETM-V-IV.aspx>

<sup>4</sup> <https://www.icao.int/environmental-protection/CORSIA/Pages/implementation-elements.aspx>

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## Carbon Offsetting and Reduction Scheme for International Aviation (CORSA)

### Frequently Asked Questions (FAQs)

<b>1.</b>	<b>General questions about a market-based measure (MBM) and CORSIA</b>
1.1	<p>What is a market-based measure (MBM)?</p> <p>A market-based measure (MBM) is a policy tool that is designed to achieve environmental goals at a lower cost and in a more flexible manner than traditional regulatory measures. Examples of MBMs include levies, emissions trading systems, and carbon offsetting.</p>
1.2	<p>What is the contribution of aviation to global greenhouse gas emissions?</p> <p>According to the Intergovernmental Panel on Climate Change IPCC (<a href="#">AR4 Climate Change 2007: Mitigation of Climate Change</a>, pp 49; also see the <a href="#">IPCC Special Report on Aviation and the Global Atmosphere</a>, pp 6), aviation (domestic and international) accounts for approximately 2 per cent of global CO<sub>2</sub> emissions produced by human activity. In 2015, approximately 65 per cent of global aviation fuel consumption was from international aviation (see <a href="#">ICAO 2019 Environmental Report</a>); applying this share to CO<sub>2</sub> emissions, international aviation is responsible for approximately 1.3 per cent of global CO<sub>2</sub> emissions.</p>
1.3	<p>Why does the Paris Agreement not include international aviation emissions?</p> <p>The Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC) is an international treaty that was agreed in December 2015 and entered into force in November 2016 to enhance the implementation of the UNFCCC. Its aim is “to strengthen the global response to the threat of climate change” by establishing specific goals for “holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C”.</p> <p>The Paris Agreement, adopted under the UNFCCC, addresses sectors and related greenhouse gas emissions following an approach similar to that of its overarching Convention. While all domestic GHG emissions are dealt with under the UNFCCC, GHG emissions associated with international aviation and maritime transport are to be dealt with under ICAO and International Maritime Organization (IMO), respectively. This approach is consistent with similar UNFCCC decisions that also apply to the Kyoto Protocol.</p> <p>In this regard, GHG emissions from domestic aviation, as per other domestic sources, are calculated as part of the UNFCCC national GHG inventories and are included in national totals (part of the Nationally Determined Contributions (NDCs) of the Paris Agreement), while GHG emissions from international aviation are reported separately and are not included in NDCs.</p> <p>ICAO, as a specialized UN agency to address all matters related to international civil aviation, including environmental protection, has been diligently addressing GHG emissions from international aviation. The ICAO agreement on carbon neutral growth and CORSIA complements the ambition of the Paris Agreement and constitutes the most significant international climate-related agreement since its adoption.</p>
1.4	<p>Why did ICAO decide to develop a global MBM scheme for international aviation?</p> <p>The ICAO Assembly <a href="#">has resolved</a> that ICAO and its Member States, with relevant organizations, would work together to strive to achieve a collective medium term global aspirational goal of keeping the global net CO<sub>2</sub> emissions from international aviation from 2020 at the same level (so-called “carbon neutral growth from 2020”).</p>

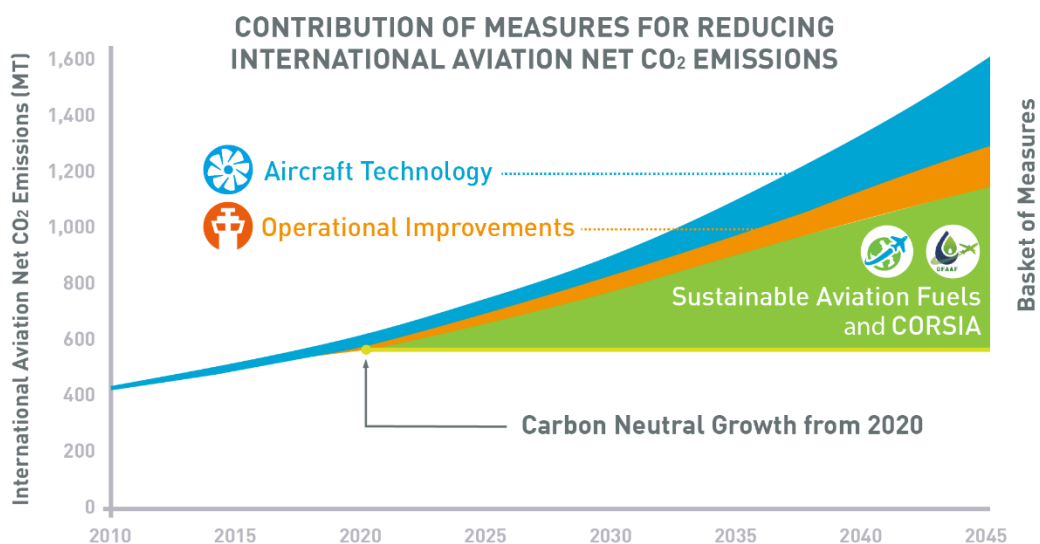
The Assembly also defined a basket of measures designed to help achieve the ICAO’s global aspirational goal. This basket includes aircraft technologies such as lighter airframes, higher engine performance and new certification standards, operational improvements (e.g., improved ground operations and air traffic management), sustainable aviation fuels, and market-based measures (MBMs).

Based on the environmental trend assessment by the ICAO Council’s Committee on Aviation Environmental Protection (CAEP), international aviation fuel consumption is estimated to grow somewhere between 2.2 to 3.1 times by 2045 compared to the 2015 levels (for further details on the CAEP assessment, please refer to [Assembly Working Paper A40-WP/54](#) presented to the 40th Session of the ICAO Assembly). The impact of COVID-19 on international aviation fuel consumption is being evaluated and will be reported to the 41st ICAO Assembly in 2022.

The aggregate environmental benefits achieved by non-MBM measures will not be sufficient for the international aviation sector to reach its aspirational goal. According to the CAEP analysis, international aviation emissions are forecasted to grow in the coming decades, as the projected annual improvements in aircraft fuel efficiency of around 1 to 2 per cent (as result of technological and operational measures), and the reductions from the use of sustainable aviation fuels in the short- to medium-term are expected to be largely surpassed by the forecasted traffic growth of around 5 per cent per year.

A global MBM scheme can help fill the emissions reductions gap, while further advancements in key technologies (e.g., engines, fuels) may result in further CO<sub>2</sub> emissions reductions in the future. The global MBM scheme is the preferred approach compared to having a patchwork of regional and local measures.

The Figure below illustrates the contribution of different measures for reducing international aviation CO<sub>2</sub> emissions.



1.5 What ICAO process was followed to develop CORSIA?

Discussions on the application of MBMs as a means to limit or reduce CO<sub>2</sub> emissions from international civil aviation had taken place prior to the 37th Session of the Assembly in 2010, which adopted Assembly Resolution A37-19: *Consolidated*



*statement of continuing ICAO policies and practices related to environmental protection — Climate change.* Assembly Resolution A37-19 requested the Council, with the support of Member States and international organizations, to continue to explore the feasibility of a global MBM scheme by undertaking further studies on the technical aspects, environmental benefits, economic impacts and the modalities of such a scheme, taking into account the outcome of the negotiations under the United Nations Framework Convention on Climate Change (UNFCCC) and other international developments, as appropriate, and report the progress for consideration by the 38th Session of the ICAO Assembly in 2013.

The 37th Session of the Assembly also adopted global aspirational goals for the international aviation sector of annual average fuel efficiency improvement of 2 per cent, and keeping the global net carbon emissions from 2020 at the same level (also referred to as carbon neutral growth from 2020).

The work requested by Resolution A37-19 focused on the qualitative and quantitative assessments of potential options for a global MBM scheme for international aviation. Building on this work, the 38th Session of the ICAO Assembly in 2013, through Resolution A38-18: *Consolidated statement of continuing ICAO policies and practices related to environmental protection — Climate change*, decided to develop a global MBM scheme for international aviation, and requested the Council, with the support of Member States, to finalize the work on the technical aspects, environmental and economic impacts and modalities of the possible options for a global MBM scheme, including on its feasibility and practicability, taking into account the need for development of international aviation, the proposal of the aviation industry and other international developments, as appropriate, and without prejudice to the negotiations under the UNFCCC.

Assembly Resolution A38-18 further requested the Council to identify the major issues and problems, including those for Member States, and make a recommendation on a global MBM scheme that appropriately addresses them and key design elements, including a means to take into account special circumstances and respective capabilities of ICAO Member States. The Council was also requested to identify the mechanisms for the implementation of the scheme from 2020 as part of a basket of measures that also include technologies, operational improvements and sustainable aviation fuels to achieve ICAO's global aspirational goals.

Following the 38th Session of the Assembly, the 200th Session of the Council in November 2013 supported that the Committee on Aviation Environmental Protection (CAEP) would continue to undertake technical tasks related to the development of a global MBM scheme, as requested by Resolution A38-18. The Council also decided upon the establishment of an Environment Advisory Group of the Council (EAG), which was mandated to oversee all the work related to the development of a global MBM scheme and make recommendations to the Council.

The EAG focused its work on a mandatory carbon offsetting approach as the basis for a global MBM scheme for international aviation. The EAG/15 meeting in January 2016 considered a draft Assembly Resolution text on a global MBM scheme, which was further refined throughout 2016 by two meetings of a High-level Group on a Global MBM Scheme in February and April 2016, a High-level Meeting on a Global MBM Scheme in May 2016 and a Friends of the President Informal Meeting in August 2016.

The Assembly, by adopting Resolution A39-3, agreed to implement a global MBM scheme in the form of CORSIA. It also requested the Council, with the technical contribution of CAEP, to develop the SARPs and related guidance material for the implementation of the Monitoring, Reporting and Verification (MRV) system under the CORSIA.

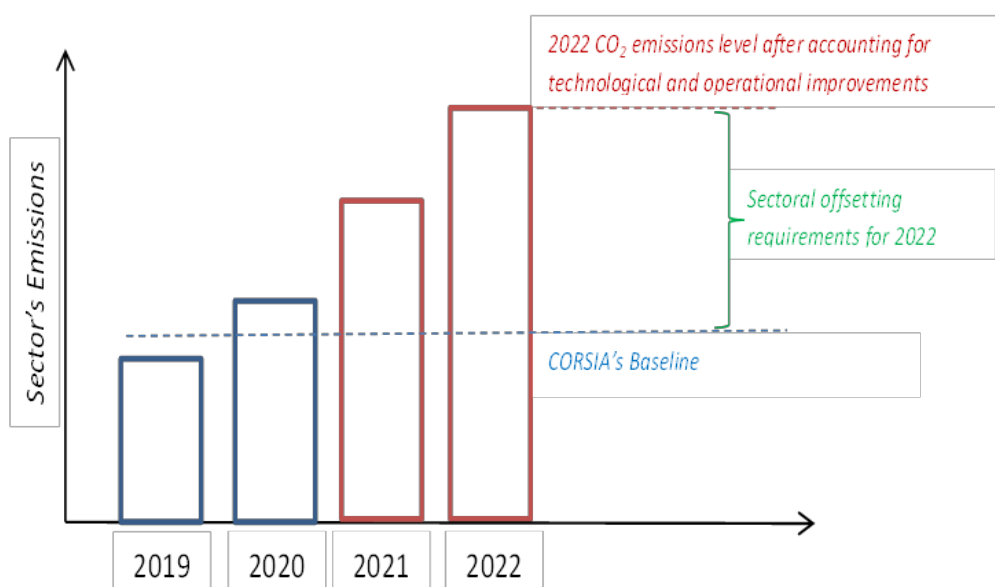
The CAEP developed SARPs for the CORSIA and, after amendment following the consultation with the Member States, Annex 16, Volume IV was adopted by the Council at its 214th Session (11 – 29 June 2018), and is applicable from 1 January 2019.

The 40th Session of the ICAO Assembly (25 September – 4 November 2019) adopted resolution A40-19 (Consolidated statement of continuing ICAO policies and practices related to environmental protection - Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)), which supersedes the previous Assembly Resolution A39-3.

1.6 What is CORSIA and how does it work, in general?


The CORSIA has been adopted as complementary to the broader package of measures to help ICAO achieve its aspirational goal of carbon-neutral growth from 2020 onwards. CORSIA relies on the use of emissions units from the carbon market to offset the amount of CO<sub>2</sub> emissions that cannot be reduced through the use of technological and operational improvements, and sustainable aviation fuels.

The approach for CORSIA is based on comparing the total CO<sub>2</sub> emissions for a year (from 2021 onwards) against a baseline level of CO<sub>2</sub> emissions, which is defined as the average of CO<sub>2</sub> emissions from international aviation covered by the CORSIA for the years 2019 and 2020 (see [question 2.17](#) for more details on CORSIA's baseline). In the following years, any international aviation CO<sub>2</sub> emissions covered by the CORSIA that exceed the baseline level represent the sector's offsetting requirements for that year (see graph below for an illustrative example for year 2022).



The sectoral offsetting requirements are shared among aeroplane operators participating in the CORSIA based on the sectoral growth factor and the individual

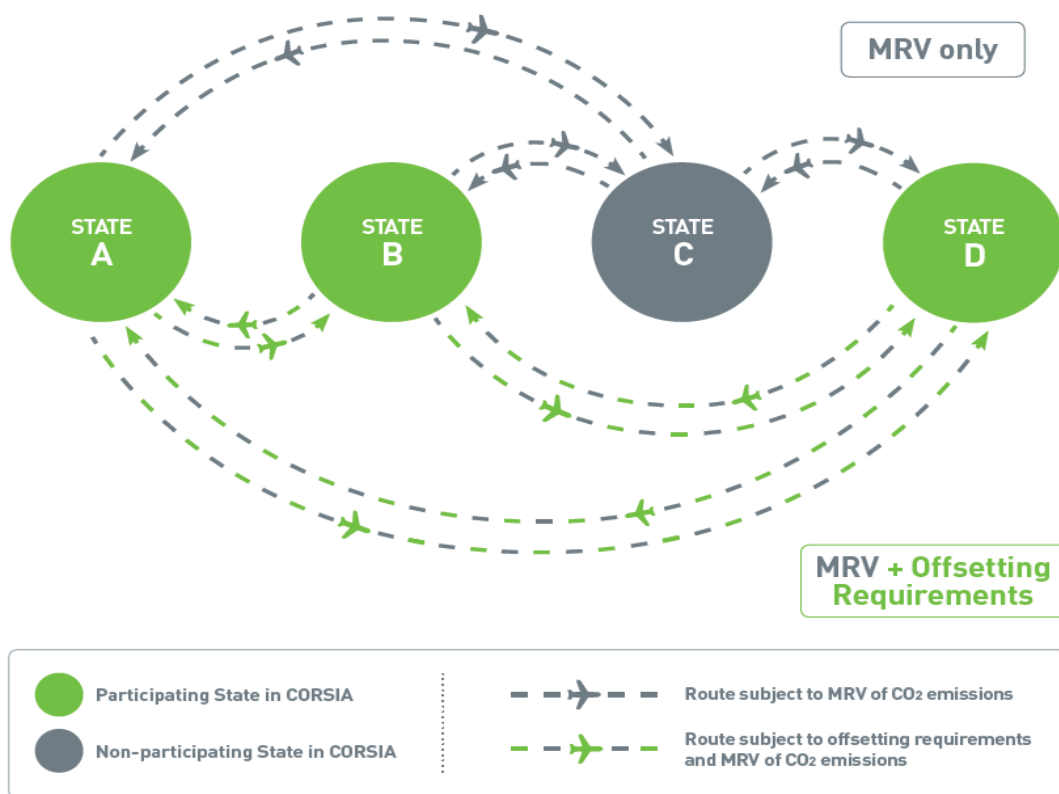
	<p>CO<sub>2</sub> emissions of the operators. For more details on calculating offsetting requirements, please see <a href="#">question 2.15</a>.</p> <p>The CORSIA will be implemented in three phases, starting with participation of States in the CORSIA offsetting on a voluntary basis (pilot phase and first phase), followed by participation of all States except the States exempted from offsetting requirements, as follows:</p> <ul style="list-style-type: none"> <li>• Pilot phase: from 2021 to 2023;</li> <li>• First phase: from 2024 to 2026; and</li> <li>• Second phase: from 2027 to 2035.</li> </ul> <p>See <a href="#">questions 2.1 – 2.6</a> for more information regarding the phased implementation of CORSIA, as well as on how to determine States’ participation in different phases.</p> <p>It is important to note that all States whose aeroplane operator undertakes international flights need to develop a monitoring, reporting and verification (MRV) system for CO<sub>2</sub> emissions from international flights starting from 1 January 2019. The requirement to monitor, report and verify CO<sub>2</sub> emissions from international aviation is independent from the offsetting requirements, and the data reported by States will be used for the calculation of the CORSIA’s baseline, as well as for the basis of calculating aeroplane operators offsetting requirements, where applicable. See <a href="#">section 3</a> of these FAQs for more information on CORSIA MRV system.</p>
<b>2.</b>	<b>Questions about CORSIA’s key design elements</b>
	<b>Key design element 1: Phased implementation of CORSIA</b>
2.1	<p>What is the rationale for the phased implementation of CORSIA?</p> <p>Paragraph 9 of the Assembly Resolution A40-19 determines the phased implementation of the CORSIA, and the participation of States in the CORSIA offsetting. According to this paragraph, phased implementation of CORSIA intends to accommodate “the special circumstances and respective capabilities of States, in particular developing States, while minimizing market distortion.”</p>
2.2	<p>What are the different phases?</p> <p>The CORSIA has three phases: a pilot phase (2021 – 2023); a first phase (2024 – 2026); and a second phase (2027 – 2035).</p> <p>The difference between the phases is that the participation of States in the CORSIA offsetting in the pilot phase and in the first phase is voluntary, whereas the second phase applies to all ICAO Member States (See also <a href="#">questions 2.3</a> and <a href="#">2.4</a> for details).</p> <p>States that voluntarily decide to participate in CORSIA offsetting may join the scheme from the beginning of a given year, and should notify ICAO of their decision to join by June 30 of the preceding year.</p> <p>The figure below illustrates the different phases of CORSIA.</p>

	 <ul style="list-style-type: none"> <li>• Participation of States in the pilot phase (2021 to 2023) and first phase (2024 to 2026) is voluntary.</li> <li>• For the second phase from 2027, all States with an individual share of international aviation activity in year 2018 above 0.5% of total activity or whose cumulative share reaches 90% of total activity, are included. Least Developed Countries, Small Island Developing States and Landlocked Developing Countries are exempt unless they volunteer to participate.</li> </ul>
2.3	<p>What is the difference between the pilot phase (from 2021 through 2023) and the first phase (from 2024 through 2026)?</p>
	<p>The requirements for the two phases are identical except for how the aeroplane operator’s offsetting requirements are determined by the State. Specifically:</p> <ul style="list-style-type: none"> <li>• For the pilot phase, States have two options to determine the basis of an aeroplane operator’s offsetting requirements: <ul style="list-style-type: none"> <li>○ Option 1: Use the aeroplane operator’s emissions covered by CORSIA in a given year (i.e. 2021, 2022 and 2023)</li> <li>○ Option 2: Use the aeroplane operator’s emissions for the year 2020<sup>1</sup>.</li> </ul> </li> <li>• For the first phase, the calculation to determine an aeroplane operator’s offsetting requirements is based on the emissions in a given year (i.e. 2024, 2025 and 2026).</li> </ul> <p>For more details on calculating offsetting requirements, please see <a href="#">question 2.15</a>.</p> <p><sup>1</sup> In order to safeguard against inappropriate economic burden on aeroplane operators due to the COVID-19 pandemic, the Council, at its 220th Session (June 2020), decided that <u>during the pilot phase</u>, 2019 emissions shall be used for 2020 emissions and published in all relevant ICAO documents referenced in Annex 16, Volume IV. There was no change for the provisions of Annex 16, Volume IV or Assembly Resolution A40-19 text.</p>
2.4	<p>Which criteria determine the participation or exemption of States from CORSIA offsetting in its second phase from 2027 to 2035?</p>
	<p>Unlike the voluntary participation of States in the CORSIA offsetting in the pilot and first phases from 2021 to 2026, the second phase of the CORSIA from 2027 to 2035 applies to all Member States. There are, however, two categories of exemptions based on aviation-related and socio-economic criteria. These criteria for the exemption of States from the CORSIA offsetting requirements in the second phase are defined in A40-19 paragraph 9 e).</p> <p>For aviation-related criteria, there are two thresholds:</p> <ul style="list-style-type: none"> <li>• States whose individual share of international aviation activities in Revenue Tonne Kilometers (RTKs) in year 2018 is below 0.5 per cent of total RTKs; and</li> <li>• States that are not part of the list of States that account for 90 per cent of total RTKs when sorted from the highest to the lowest amount of individual RTKs.</li> </ul>

	<p>For socio-economic criteria, States that are defined as Least Developed Countries (LDCs); Small Island Developing States (SIDS); and Landlocked Developing Countries (LLDCs), regardless of their level of international aviation RTK share, are exempted from offsetting requirements in the second phase of CORSIA. Nevertheless, these States can voluntarily participate in the second phase of the CORSIA.</p>
2.5	<p>What is a “RTK”?</p> <p>Revenue Tonne Kilometers or RTKs is the utilised (or sold) capacity for passengers and cargo expressed in metric tonnes, multiplied by the distance flown. In other words the RTK levels correspond to the volume of air transport activity. As an aeroplane operator carries more passengers and cargo over a longer distance, the RTK levels of the operator increase.</p> <p>A State’s RTK represents the total RTK levels of all aeroplane operators registered to that State. Annual RTK data is being reported from Member States to ICAO as part of the ICAO Statistics Programme, and published in the Annual Report of the ICAO Council.</p> <p>RTK data for the year 2018 will be used for the purposes of determining the participation of States in the second phase of the CORSIA (see <a href="#">question 2.4</a>).</p>
2.6	<p>How are RTK shares calculated?</p> <p><b>A State’s individual RTK share</b> is calculated by dividing the State’s RTKs by the total RTKs of all States.</p> <p><b>The cumulative RTK share</b> is calculated by sorting the individual RTK shares from the highest to lowest, then successively increasing the value by summing the RTK shares from highest to lowest until the value reaches 90%. The values of all States are considered for this calculation, regardless of whether a State is exempted or not from offsetting requirements under the CORSIA.</p>
	<p><b>Key design element 2: Route-based approach of CORSIA</b></p>
2.7	<p>What is the route-based approach of CORSIA?</p> <p>Paragraph 10 of the Assembly Resolution A40-19 defines the coverage of the CORSIA offsetting on the basis of routes between States, with a view to minimizing market distortions between aeroplane operators on the same routes. For this purpose, the approach is to provide equal treatment of all aeroplane operators on a given route. Specifically:</p> <ul style="list-style-type: none"> <li>• A route is covered by the CORSIA offsetting if both States connecting the route participate in the scheme.</li> <li>• A route is not covered by the CORSIA offsetting if one or both States connecting the route do not participate in the scheme.</li> </ul> <p>When an aeroplane operator calculates its CO<sub>2</sub> emissions covered by the CORSIA offsetting in a given year, it needs to take into consideration emissions from its operations on all the routes covered by the scheme, as outlined in paragraph 10 of the Assembly Resolution.</p> <p>It should be noted that the applicability of CORSIA offsetting requirements and the applicability of CORSIA monitoring, reporting and verification (MRV) requirements are not the same. Even if an international flight is not covered by the offsetting requirements, it is still covered by the MRV requirements. See <a href="#">question 3.19</a> for more information on the applicability of CORSIA MRV requirements.</p>

The figure below illustrates CORSIA’s route-based approach, and the applicability of MRV and offsetting requirements.

## CORSA ROUTE-BASED APPROACH



2.8	What does “participation of States to CORSIA offsetting” mean for the route-based approach?
	<p>The term “participation of States to CORSIA offsetting” means that if a State participates in CORSIA offsetting, then all routes between this State and all other States participating in CORSIA offsetting are covered by offsetting requirements.</p> <p>Please see <a href="#">questions 2.2</a> and <a href="#">2.4</a> for details on how the participation to CORSIA offsetting is being determined in different phases.</p>
2.9	Can the characterisation of a route as “covered” or “not covered” by the CORSIA offsetting change over time?
	<p>Paragraph 10 of the Assembly Resolution A40-19 determines the characterisation of a route as “covered” or “not covered” by the CORSIA offsetting requirements, on the basis of whether the States connecting the route participate in CORSIA offsetting.</p> <p>The voluntary participation of States in different phases of the CORSIA will determine the overall coverage of the scheme.</p> <p>To give certainty on the routes to be covered by the CORSIA offsetting requirements every year, the Assembly Resolution A40-19 sets a deadline by 30 June of the preceding year for States to notify ICAO of their intention to voluntarily participate in the scheme, or discontinue their participation, from 1 January of the following year.</p>
2.10	Do States and aeroplane operators that do not participate in the CORSIA offsetting have any requirements under the CORSIA?
	According to paragraph 10 of the Assembly Resolution A40-19, all international flights on the routes between States, both of which are not included in the CORSIA



	<p>offsetting, are exempted from the offsetting requirements of the CORSIA, while retaining simplified reporting requirements. The requirement to monitor, report and verify CO<sub>2</sub> emissions from international aviation is thus independent from the offsetting requirement.</p> <p>The data reported by States will be used for the calculation of the CORSIA baseline (see <a href="#">question 2.17</a> for more details on CORSIA’s baseline) as well as for the calculation of the aeroplane operators’ offsetting requirements, where applicable.</p>
2.11	<p>Can an aeroplane operator have offsetting requirements, even if its State of registration does not participate in CORSIA offsetting?</p>
	<p>Yes. Because of the CORSIA’s route-based approach, an operator operating on routes between participating States would be subject to the offsetting requirements under the CORSIA, no matter whether its State of registration participates in CORSIA offsetting or not.</p>
2.12	<p>What would happen to the CORSIA emissions coverage if an operator of a non-participating State flies on the routes between participating States (e.g. fifth-freedom traffic right)?</p>
	<p>Because of the CORSIA’s route-based approach, these routes between participating States would be subject to the coverage of emissions offsetting requirements under the CORSIA. Thus, an operator of a non-participating State would be subject to offsetting requirements if it had a flight between two participating States, and emissions from such flights would be added to the coverage of CORSIA’s offsetting requirements.</p>
2.13	<p>What would happen to the CORSIA emissions coverage if a State without an operator undertaking international flights decides to participate in the CORSIA offsetting?</p>
	<p>States without an operator flying international flights are encouraged to participate in all phases of the CORSIA. If such a State decides to participate, international flights to and from that State to other participating States are additionally included for the CORSIA’s offsetting requirements, due to the route-based approach. The total international emissions covered by CORSIA offsetting would ultimately increase.</p>
	<p><b>Key design element 3: CORSIA offsetting requirements and eligible emissions units</b></p>
2.14	<p>What is offsetting and how does it work, in general?</p>
	<p>In general, offsetting is done through the purchase and cancellation of emissions units (see <a href="#">question 4.20</a>), arising from different sources of emissions reductions achieved through mechanisms, programmes or projects. The buying and selling of eligible emissions units happens through the carbon market. The price of the emissions units in the carbon market is influenced by the law of supply (availability of emissions units) and demand (level of offsetting requirements).</p> <p>“Cancelling” means the permanent removal and single use of an emissions unit so that the same emissions unit cannot be used more than once. This is done after an aeroplane operator has purchased emissions units from the carbon market.</p> <p>For CORSIA, an aeroplane operator is required to meet its offsetting requirements by cancelling CORSIA Eligible Emissions Units in a quantity equal to its total final offsetting requirements for a given compliance period. CORSIA Eligible Emissions Units <u>are to be determined by the ICAO Council</u>, and up-to-date information on eligible units is made available on the ICAO CORSIA website (see <a href="#">question 4.21</a>).</p>
2.15	<p>How are an aeroplane operator’s offsetting requirements calculated?</p>
	<p>Paragraph 11 of the Assembly Resolution A40-19 addresses the distribution of the total amount of CO<sub>2</sub> emissions to be offset in a given year among individual aeroplane operators. This is accomplished by introducing a dynamic approach for the distribution</p>

of offsetting requirements, which takes into account:

- The Sector's Growth Factor: represents the international aviation sector's global average growth of emissions in a given year. It will be applied as a common factor for all individual operators participating in the scheme for the calculation of their offsetting requirements. ICAO will calculate the Sector's Growth Factor every year based on the reported CO<sub>2</sub> emissions data from States to ICAO; and
- The Individual Growth Factor: represents an individual operator's growth factor of emissions in a given year. This variable will start to be used from 2030 together with the Sector's Growth Factor. It will increase gradually to represent more of an operator's offsetting requirement.

Offsetting requirements will be calculated as follows:

- a) From 2021 through 2029 a 100 per cent sectoral approach (and 0 per cent individual approach) will be applied. This applies to the pilot phase, the first phase, and the first compliance period of the second phase.
- b) During the second compliance period of the second phase (2030 through 2032) at least 20 per cent of offsetting requirements would be calculated according to the "individual approach". From 2033 to 2035, at least 70 per cent of offsetting requirements would be calculated according to the "individual approach". In 2028, the Council will recommend to the Assembly whether and to what extent to adjust the individual percentage.

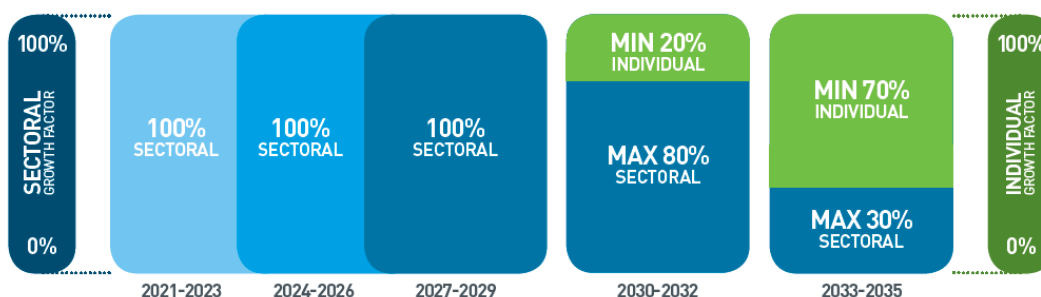
The sectoral/individual approach is applied from 2030, rather than from the start of the second implementation phase (2027), to provide for the equal treatment of the calculation of offsetting requirements between aeroplane operators participating in the first and second phase of the CORSIA.

Once the sector's (and individual operator's, if applicable) growth factor for a given year is being made available by ICAO, the State will calculate an operator's CO<sub>2</sub> offsetting requirements by multiplying the operator's annual emissions covered by CORSIA offsetting in the given year by the growth factor. Result of this calculation is the operator's offsetting requirements for a given year. For each compliance period (see [question 2.16](#)), the State will sum up the offsetting requirements for each year within that compliance period, and the result will be the operator's total offsetting requirement for that compliance period.

The figure below describes the calculation of an aeroplane operator's offsetting requirements.

**Operator's annual emissions X Growth Factor = CO<sub>2</sub> offset requirements**

The Growth Factor changes every year taking into account both the sectoral and the individual operator's emissions growth. The Growth Factor is the percent increase in the amount of emissions from the baseline to a given future year, and is calculated by ICAO.



2.16	<p>What are CORSIA’s compliance periods?</p> <p>Paragraph 15 of the Assembly Resolution A40-19 determines that CORSIA has three-years compliance cycles (also referred to as a compliance period), for which the operators need to reconcile their offsetting requirements. The compliance periods are:</p> <ul style="list-style-type: none"> <li>• Compliance period 1: years 2021 – 2023;</li> <li>• Compliance period 2: years 2024 – 2026;</li> <li>• Compliance period 3: years 2027 – 2029;</li> <li>• Compliance period 4: years 2030 – 2032;</li> <li>• Compliance period 5: years 2033 – 2035.</li> </ul> <p>It should be noted that an operator will report its CO<sub>2</sub> emissions on an annual basis, corresponding to calendar years. See <a href="#">question 3.68</a> for more information on the relationship between CORSIA’s compliance periods and reporting periods.</p>
2.17	<p>What are CORSIA’s baseline emissions?</p> <p>For the purposes of CORSIA, the sectoral baseline is defined as <u>the average of total CO<sub>2</sub> emissions for the years 2019 and 2020 on the routes covered by CORSIA offsetting in a given year from 2021 onwards.</u></p> <p>The Council, at its 220th Session (June 2020), made a series of decisions in order to safeguard against inappropriate economic burden on aeroplane operators due to the COVID-19 pandemic. Council’s decisions regarding the CORSIA baseline can be summarized as follows:</p> <ul style="list-style-type: none"> <li>• During the pilot phase, 2019 emissions shall be used for 2020 emissions and published in all relevant ICAO documents referenced in Annex 16, Volume IV. There was no change for the provisions of Annex 16, Volume IV or Assembly Resolution A40-19 text.</li> <li>• For future phases of CORSIA implementation beyond the pilot phase, the Council will examine the impact of COVID-19 on the CORSIA baseline, among various issues, when undertaking the 2022 CORSIA periodic review.</li> </ul> <p>Paragraph 11(g) of the Assembly Resolution A40-19 notes that the sectoral baseline will be re-calculated when the routes included in the CORSIA change. This can happen, for example, when new States volunteer to participate or States decide to withdraw their voluntary participation. The recalculation of the baseline will be done by ICAO at the start of each year.</p>
2.18	<p>What is the difference between the Sector’s Growth Factor used by the formula under the CORSIA and the generally-used term “emission growth rate”?</p> <p>In general, the term “emissions growth rate” refers to the percentage increase in the amount of emissions from the baseline to a given year from 2021, <u>compared to the baseline emissions.</u></p> <p>For the purposes of CORSIA, the Sector’s Growth Factor is defined as the percentage increase in the amount of emissions from the baseline to a given year from 2021, <u>compared to the emissions in that given year.</u></p>
2.19	<p>How are CORSIA Eligible Fuels accounted for in the calculation of offsetting requirements?</p> <p>From 2021 onwards, operators can reduce their CORSIA offsetting requirements by claiming emissions reductions from CORSIA Eligible Fuels. In order to do this, the operator will:</p>



# The Sixth Carbon Budget Aviation

*This document contains a summary of content for the aviation sector from the CCC's Sixth Carbon Budget Advice, Methodology and Policy reports.*

# Introduction

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The Committee is advising that the UK set its Sixth Carbon Budget (i.e. the legal limit for UK net emissions of greenhouse gases over the years 2033-37) to require a reduction in UK emissions of 78% by 2035 relative to 1990, a 63% reduction from 2019. This will be a world-leading commitment, placing the UK decisively on the path to Net Zero by 2050 at the latest, with a trajectory that is consistent with the Paris Agreement.

Our advice on the Sixth Carbon Budget, including emissions pathways, details on our analytical approach, and policy recommendations for the aviation sector is presented across three CCC reports, an accompanying dataset, and supporting evidence.

- **An Advice report:** *The Sixth Carbon Budget – The UK's path to Net Zero*, setting out our recommendations on the Sixth Carbon Budget (2033-37) and the UK's Nationally Determined Contribution (NDC) under the Paris Agreement. This report also presents the overall emissions pathways for the UK and the Devolved Administrations and for each sector of emissions, as well as analysis of the costs, benefits and wider impacts of our recommended pathway, and considerations relating to climate science and international progress towards the Paris Agreement. Section 7 of Chapter 3 of that report contains an overview of the emissions pathways for the aviation sector.
- **A Methodology Report:** *The Sixth Carbon Budget – Methodology Report*, setting out the approach and assumptions used to inform our advice. Chapter 8 of that report contains a detailed overview of how we conducted our analysis for the aviation sector.
- **A Policy Report:** *Policies for the Sixth Carbon Budget and Net zero*, setting out the changes to policy that could drive the changes necessary particularly over the 2020s. Chapter 8 of that report contains our policy recommendations for the aviation sector.
- **A dataset** for the Sixth Carbon Budget scenarios, which sets out more details and data on the pathways than can be included in this report.
- **Supporting evidence** including our public Call for Evidence, 10 new research projects, three expert advisory groups, and deep dives into the roles of local authorities and businesses.

All outputs are published on our website ([www.theccc.org.uk](http://www.theccc.org.uk)).

For ease, the relevant sections from the three reports for each sector (covering pathways, method and policy advice) are collated into self-standing documents for each sector. A full dataset including key charts is also available alongside this document. This is the self-standing document for the aviation sector. It is set out in three sections:

- 1) The approach to the Sixth Carbon Budget analysis for the aviation sector
- 2) Emissions pathways for the aviation sector
- 3) Policy recommendations for the aviation sector



## Chapter 1

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# The approach to the Sixth Carbon Budget analysis for the aviation sector

The following sections are taken directly from Chapter 8 of the CCC's Methodology Report for the Sixth Carbon Budget.<sup>1</sup>

## Introduction and key messages

This chapter sets out the method for the aviation sector's Sixth Carbon Budget pathways.

The scenario results of our costed pathways are set out in the accompanying *Advice report*. Policy implications are set out in the accompanying *Policy report*.

For ease, these sections covering pathways, method and policy advice for the aviation sector are collated in *The Sixth Carbon Budget – Aviation*. A full dataset including key charts is also available alongside this document.

The key messages from this chapter are:

- **Background.** Aviation emissions accounted for 7% of UK GHG emissions in 2018 and were 88% above 1990 levels. Emissions have been relatively flat from 2008-2018, with increasing international travel being offset by some improvements in efficiencies and by falling military and domestic aviation emissions. 2020 has likely seen a drop in GHG emissions of over 60% from 2019, due to the impact of COVID-19, with a return to pre-pandemic passenger levels not expected until 2024.<sup>2</sup>
- **Options for reducing emissions.** Mitigation options considered include demand management, improvements in aircraft efficiency (including use of hybrid electric aircraft), and use of sustainable aviation fuels (biofuels, biowaste to jet and synthetic jet fuels) to displace fossil jet fuel.
- **Analytical approach.** Our starting point for this analysis has been the 2019 *Net Zero* report, and the underlying DfT demand, efficiency and emissions modelling.
  - We have adapted and updated this analysis to fit to a new set of demand scenarios (consistent with those considered by the Climate Assembly), before introducing significantly higher shares of sustainable aviation fuels than previously considered.
  - This includes new evidence on the costs and emissions savings of sustainable aviation fuels, fitting with our Fuel Supply analysis, and the added capital costs of efficiency improvements.
- **Uncertainty.** We have used the scenario framework to test the impacts of uncertainties, to inform our balanced Net Zero Pathway. The key areas of uncertainty we test relate to sustainable aviation fuel supplies and costs of synthetic jet fuel, the mix of SAF options, the profile for expansion in passenger demand over time (with mid-term or no net expansion of airports), and whether there will be long-term structural change in the sector due to COVID-19. Out of all the CCC's sectors, Aviation has been most impacted by COVID-19, and continues to face the highest uncertainties about the future size of the sector.

We set out our analysis in the following sections:

1. Sector emissions
2. Options for reducing emissions
3. Approach to analysis for the Sixth Carbon Budget

# 1. Sector emissions

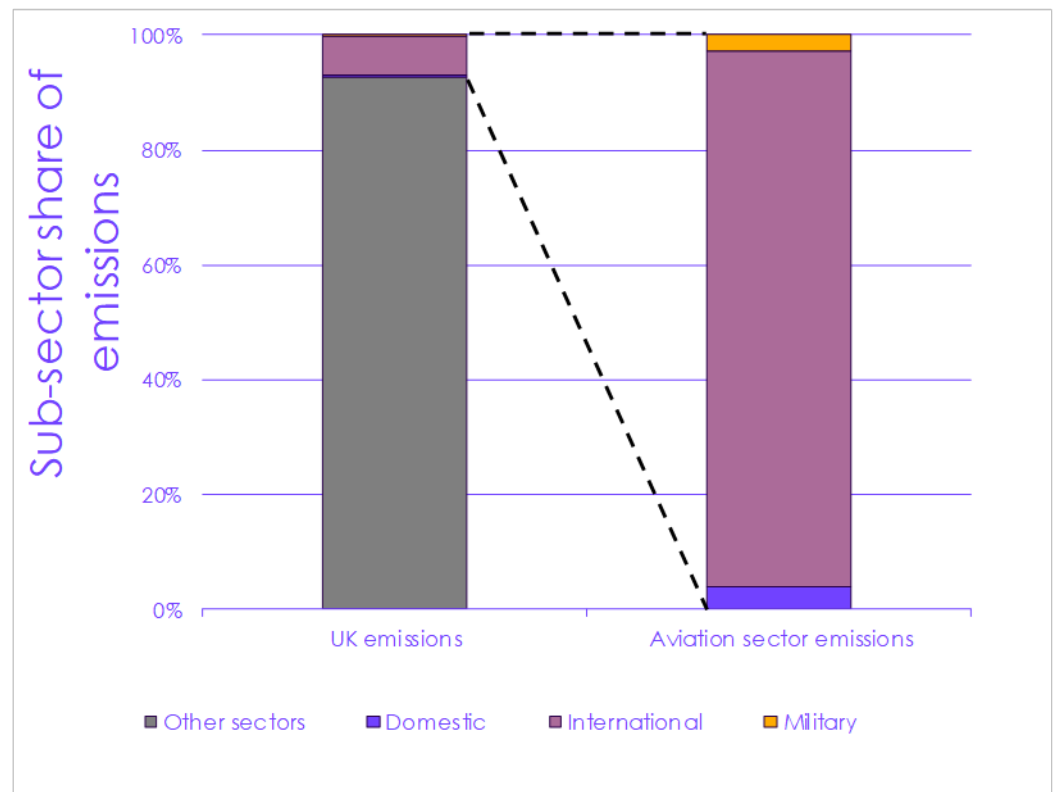
This section outlines the recent trends in aviation emissions and their sources. For more detail, see our 2020 Progress Report to Parliament.<sup>3</sup>

## a) Breakdown of current emissions

Based on the most recent official UK emissions data, total UK aviation emissions increased by 0.8% from 2017 levels to 39.3 MtCO<sub>2</sub>e/year in 2018. Within this, emissions from international flights increased by 1.1% to 36.7 MtCO<sub>2</sub>e/year, emissions from domestic flights fell by 5.9% to 1.5 MtCO<sub>2</sub>e/year, and emissions from military aviation fell 0.6% to 1.1 MtCO<sub>2</sub>e/year. Aviation therefore comprised 7% of UK GHG emissions in 2018, and within this international aviation dominates at 93% of UK aviation emissions (Figure M8.1).

To be consistent with other sectors and the Climate Change Act framework, these GHG emissions do not include non-CO<sub>2</sub> impacts of aviation, which are discussed in Chapter 8, section 4 of the main *Advice Report*.

Figure M8.1 Breakdown of aviation sector emissions (2018)



Source: BEIS (2020) *Final UK greenhouse gas emissions national statistics 2018*.

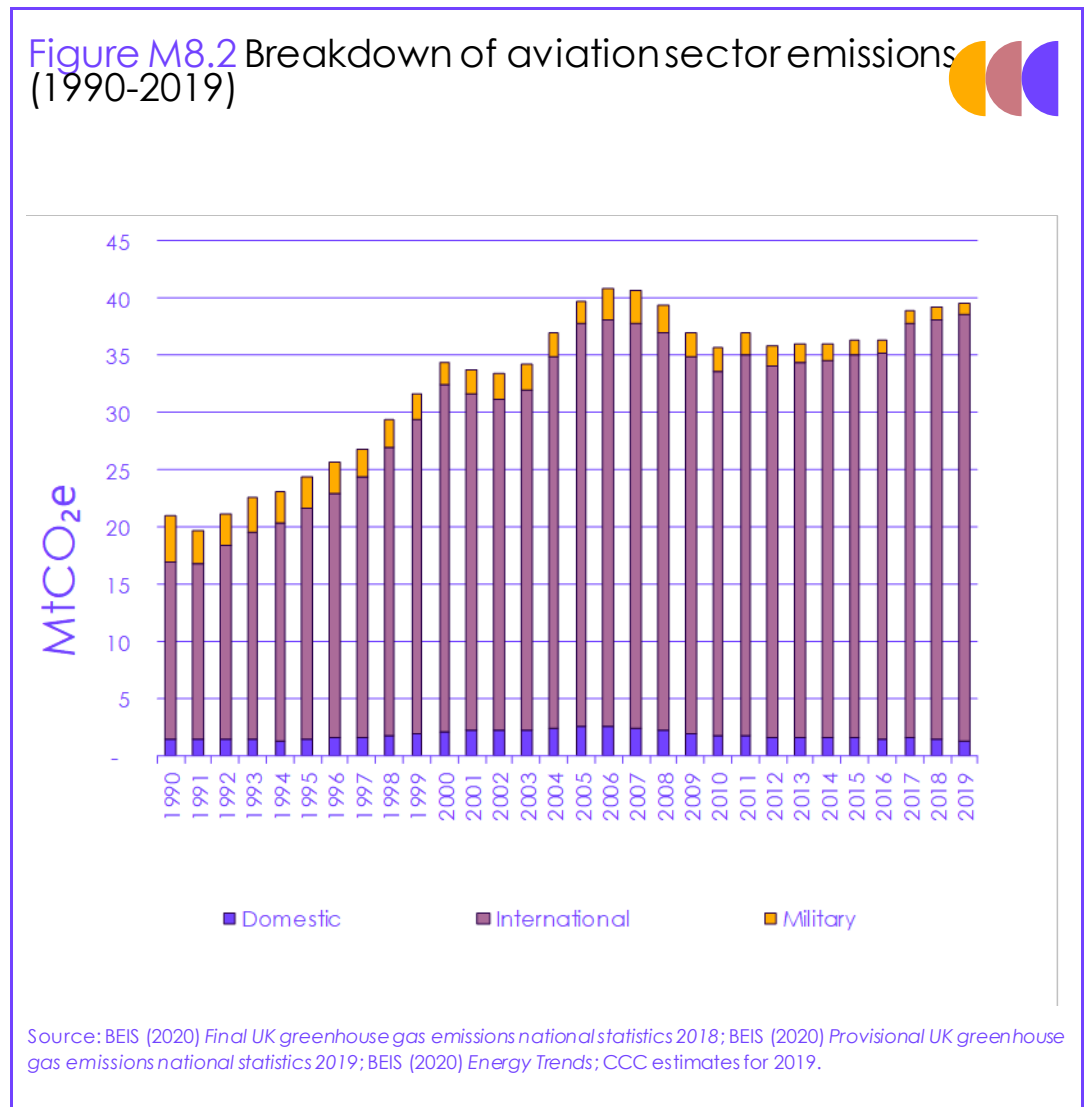
Notes: Total UK emissions in 2018 were 539 MtCO<sub>2</sub>e/yr (AR5 basis, peatland revisions and IAS included). UK aviation sector emissions in 2018 were 39.3 MtCO<sub>2</sub>e/yr.

We have also estimated UK aviation emissions for 2019 at 39.6 MtCO<sub>2</sub>e/year, a 0.9% increase on 2018 levels. This combines 11% falls in domestic and military emissions with a 1.7% increase in international aviation emissions.

However, given the COVID-19 pandemic and its impact on the aviation sector, and the need to reflect this in our analysis in the near-term, we have also estimated a fall in 2020 GHG emissions of over 60% from 2019 levels (and then a recovery to 2024), as detailed below in section 3(e). The emissions estimates from 2019 onwards will be revised once official BEIS final GHG emissions data is published.

## b) Emissions trends and drivers

The breakdown of aviation emissions since 1990 is shown in Figure M8.2. Overall, emissions from domestic and international aviation in 2018 were 124% above 1990 levels, and military aviation emissions have fallen 71% from 1990 levels.



Aviation emissions rose strongly throughout the 1990s and early-to-mid 2000s, due to increasing passenger demand, with only minor falls seen around 1990 and 2000 due to economic down-turns.

Emissions fell significantly during 2007-2010 due to the financial crisis, then stayed relatively flat in the early 2010s, but have been rising again in recent years.

UK aviation emissions in 2018 were therefore the same as in 2008, as falls in domestic and military aviation emissions have been balanced by a rise in UK international aviation emissions. Over the same 2008-2018 period, the total number of UK terminal passengers rose by 24% to reach 292 million in 2018, with a further 2% increase seen in 2019.

The increase in emissions has been more modest than growth in passengers due to increased plane loadings, decreases in average flight distance (due to faster growth in flights to the EU than other international destinations) and some improvements in fleet efficiency.

## 2. Options for reducing emissions

Several different emissions reduction options have been explored within the Aviation sector. These include:

- **Demand management.** A reduction in the annual number of passengers versus a counterfactual with unlimited passenger demand growth. Demand management policies could take several forms, either reducing passenger demand for flying through carbon pricing, a frequent flyer levy, fuel duty, VAT or reforms to Air Passenger Duty, and/or restricting the availability of flights through management of airport capacity. Our analysis only assumes a demand profile is achieved, and does not model the policies required to achieve these profiles.
- **Aircraft fleet-efficiency improvements,** achieved via a combination of airspace modernisation, operational optimisation, aircraft passenger loadings, aircraft design and new engine efficiency improvements, as well as introduction of hybrid electric aircraft (significant falls in jet use, but adding some use of electricity via on-board batteries and motors). Our analysis uses fleet fuel tCO<sub>2</sub>/passenger values from DfT modelling, and does not model individual improvements from the list above.
- **Sustainable aviation fuels (SAF).** These are “drop-in” replacements for fossil jet fuel, meeting international fuel specifications (and currently allowed to be blended at up to 50% by volume), and have nil accounting CO<sub>2</sub> emissions on combustion. SAF production routes considered include:
  - Biomass to Fischer-Tropsch (FT) biojet, with or without CCS;
  - Biogenic waste fats/oils to Hydroprocessed Esters and Fatty Acids (HEFA) biojet;
  - Biogenic fraction of waste\* to Fischer-Tropsch (FT) biojet, with or without CCS; and
  - Synthetic jet fuel produced via Direct Air Capture (DAC) of CO<sub>2</sub> and low-carbon H<sub>2</sub>.

Our analysis uses these four SAF options to displace fossil jet fuel, and each SAF option has its own deployment and cost profile, based on the availability of the feedstocks, efficiencies, input energy, capital and operating costs. Each route is discussed in more detail in the Fuel Supply chapter.

\* Note that the non-biogenic fraction of waste converted to FT jet will still have fossil accounting CO<sub>2</sub> emissions on combustion in aviation, and so is included within fossil jet fuel figures, not as SAF.



### 3. Approach to analysis for the Sixth Carbon Budget

#### a) Summary of scenario choices

As a reminder from Chapter 3, section 7 of the *Advice Report*, the measures discussed in section 2 above are combined into the different scenarios as set out in Table M8.1.

	Passenger demand growth by 2050 from 2018 levels	Average efficiency improvement 2018-2050 (%/year)	Use of biomass FT jet (TWh, % of liquid fuel demand in 2050)	Use of HEFA biojet (TWh, % of liquid fuel demand in 2050)	Use of bio-waste FT jet (TWh, % of liquid fuel demand in 2050)	Use of synthetic jet (TWh, % of liquid fuel demand in 2050)	Use of fossil jet (TWh, % of liquid fuel demand in 2050)
<b>Balanced Net Zero Pathway</b>	<b>+25%, with no net expansion</b>	<b>+1.4%</b>	<b>14 (11%)</b>	<b>8 (6%)</b>	-	<b>10 (8%)</b>	<b>94 (75%)</b>
<b>Headwinds</b>	+25%, with expansion	+1.4%	14 (11%)	11 (9%)	-	-	101 (80%)
<b>Widespread Engagement</b>	-15%, no expansion	+1.6%	14 (16%)	4 (4%)	5 (5%)	-	61 (74%)
<b>Widespread Innovation</b>	+50%, with expansion	+2.1%	23 (19%)	9 (7%)	-	30 (25%)	58 (49%)
<b>Tailwinds</b>	-15%, no expansion	+2.1%	23 (33%)	12 (18%)	-	30 (44%)	4 (5%)
<b>Baseline</b>	+64%, with expansion	+0.7%	-	-	-	-	205 (100%)

Our baseline is taken direct from DfT modelling, with high demand growth (64% growth in passenger number by 2050, from 2018 levels), low efficiency improvement (0.7%/year), no hybrid electric aircraft and no SAF deployment.

The exploratory scenarios use different mixes of the options set out in section 2 to reduce emissions below baseline emissions:

- **Headwinds** follows the approach in Net Zero 2019, with 25% passenger growth by 2050, 1.4%/year efficiency improvement (in-line with historical averages), and 14 TWh/year of biomass to FT jet. We have also added 11 TWh/year of HEFA biojet, as surface transport shifts to EVs, leaving waste fats/oils resources available to be converted into HEFA biojet instead of biodiesel.
- **Widespread Engagement** assumes a reduction in aviation demand of 15% from 2018 levels, based on the lowest of the Climate Assembly scenarios. This reflects a scenario in which people are willing to embrace greater changes to behaviour. Efficiencies are marginally higher than in Headwinds. Biomass to FT jet remains at the same level, whereas significantly lower livestock numbers and a phasing out of biofuel imports leads to lower HEFA biojet use. However, in this scenario, residual wastes are assumed to be increasingly diverted from energy-from-waste plants, with 70% of the UK's residual waste converted into 5 TWh/year of biojet (plus a similar fossil fraction) by 2050, thereby contributing an additional 5% of aviation fuel demand from waste biojet.

- **Widespread Innovation** assumes demand growth of 50% from 2018 levels, based on the highest demand amongst the preferred Climate Assembly scenarios. Efficiencies are much higher, based on the DfT scenario selected. More biomass is assumed to be diverted to FT biojet, along with HEFA biojet making up ~25% of supply, and the other 25% of the fuel mix is assumed to be made up of synthetic jet fuel. We did not increase the blending of synthetic jet fuel above 25% due to the high costs of synthetic jet fuel, and the high penetration of biomass to hydrogen in the Widespread Innovation scenario (where it would be more efficient to make biojet direct from the biomass, rather than via a hydrogen intermediary). However, the overall choices fit with the overall scenario design philosophy of maximal technical change.
- **Tailwinds** combines the most stretching of the scenarios above – a reduction in demand, high efficiency, and the maximal resource allocations for the biojet and synthetic jet fuel from the other scenarios. Waste to jet has not been included, as the remaining energy-from-waste (EfW) plants in our analysis all retrofit CCS before 2050, ensuring 95% capture of the fossil & biogenic carbon. However, putting the residual waste instead into new jet production plants with CCS would likely lead to a very similar outcome in terms of GHG emissions.\*

Our scenario for the Balanced Net Zero Pathway takes elements from each of the above pathways:

- **Demand growth:** Our demand growth by 2050 matches Headwinds at 25%, although the passenger growth profile is more gradual due to an assumption of no net capacity expansion at UK airports in this scenario. This arises as a function of 2050 passenger numbers (365 million passengers) being within current UK airport capacities (at least 370 million passengers), and the need to ensure the UK achieves Net Zero by 2050 with aviation still one of the largest emitting sectors. We therefore do not assume a surge in emissions occurs in the early 2030s, as happens with the airport expansion modelled in the Headwinds and Widespread Innovation scenarios. Airport expansion could still occur under the Balanced Pathway, but would require capacity restrictions elsewhere in the UK (i.e. effectively a reallocation of airport capacity).

#### Box M8.1

##### Climate Assembly scenarios

The Climate Assembly debated five aviation scenarios, with changes in demand from 2018 to 2050 of -15%, +20%, +25%, +50% and +65%. Growth of 65% growth was highly unpopular - a majority wanted to see a 25-50% growth in flights, with the higher end of the range acceptable if technology was developed to mitigate the additional emissions. However, the weighted average of scenario Borda votes was +24% growth, and the report also noted that a majority voted for +25% growth or less. This gives added confidence that the required demand management to keep the Balanced Net Zero Pathway to only 25% growth by 2050 would be acceptable to the UK general public.

Source: Climate Assembly UK (2020); CCC analysis.

\* This assumes that jet production is maximised and that other co-products (e.g. diesel, LPG) also still displace fossil fuels (increasingly difficult to 2050 as other sector counterfactuals decarbonise); and that EfW plants with CCS are displacing grid electricity with zero emissions by 2050 (rather than displacing fossil gas with CCS plants).

- **Efficiency:** The Balanced Net Zero Pathway takes the same efficiency assumptions as in the Headwinds scenario, in line with historical average improvement.
- **SAF:** Use of SAF matches Headwinds and Widespread Engagement for biomass to FT jet, and similar assumptions are taken on HEFA biojet (with slight differences due to waste fats/oils availability). Our Balanced Net Zero Pathway also assumes some synthetic jet fuels might be available in 2040s, at one third of the level deployed in the Widespread Innovation scenario, due to the higher costs of hydrogen and Direct Air Capture in the Balanced Net Zero Pathway compared to the Widespread Innovation scenario. Similar to the Tailwinds scenario, we have not allocated residual waste to jet fuel in this scenario.

The resulting GHG emissions in the Balanced Pathway grow during 2021-2023 with the return in passenger numbers post-COVID, before flat demand, efficiency measures and the start of SAF deployment lead to falls in emissions to the early 2030s. The more back-ended passenger growth in the Balanced Pathway (compared to Headwinds) has passenger numbers starting to grow from the mid-2030s, meaning that emissions continue to decline to 2040, as this later passenger growth is able to be accommodated by further improvements in efficiency and the continued uptake of SAF (compared to emissions increasing in Headwinds in the early 2030s with earlier passenger growth). The Balanced Pathway therefore only sees growth in passenger numbers towards 2050 once SAF is commercially proven and contributing at scale (in this scenario, there is 8% SAF used in 2035, increasing at slightly above 1 percentage point a year). From 2040, DfT modelling then introduces a new generation of aircraft (including the start of hybrid electric aircraft) that lead to further falls in emissions, with continued SAF uptake and passenger numbers continuing to increase to 2050.

Aviation measures reduce sector emissions to 23 MtCO<sub>2</sub>e/year by 2050 in the Balanced Pathway, and all scenarios have positive emissions. The aviation sector will therefore require significant amounts of GHG removals to be developed to offset an increasing proportion of the sector's (declining) gross emissions to 2050, and aviation is therefore likely to be a key driving force behind the long-term deployment of engineered removals.

## b) Sector classifications

Note that with our current sector classifications, some emissions reduction options have been counted outside of the CCC's Aviation sector, even if these emissions reductions are achieved via aviation policy and could count towards a separate Net Zero goal for the sector. For example:

- Sequestering biogenic CO<sub>2</sub> by installing CCS on UK biojet production facilities is counted within the CCC's engineered GHG removals sector, as a form of bioenergy with CCS (BECCS).
- Airlines paying for Direct Air Capture with CCS (DACCS) in the UK, in order to offset their remaining aviation gross emissions, is also counted within CCC's engineered GHG removals sector.
- Airlines paying for tree planting in the UK, in order to offset their remaining aviation gross emissions, is counted within CCC's Land Use, Land Use Change & Forestry (LULUCF) sinks sector.

These do not constitute recommendations on emissions accounting, merely what we have assumed for this analysis. These 'negative emissions' options are discussed in greater detail in the LULUCF and engineered GHG removals chapters.

This CCC sector classification also means that whilst some SAF fuels can be strongly carbon-negative on a lifecycle basis at the point of use (e.g. if there is upstream biogenic CCS involved in their production), our Aviation sector analysis only considers the direct accounting CO<sub>2</sub> emissions from the use of SAF in the sector, i.e. nil and not negative. If an alternative accounting methodology were followed, the negative emissions from upstream biogenic CCS could be counted within the Aviation sector emissions, but then these upstream negative emissions would have to be excluded from the GHG removals or LULUCF sinks sector to avoid double-counting. Overall, these discussions reflect emissions accounting classifications and do not affect aggregate UK emissions.

The residual aviation emissions in the Widespread Innovation scenario are used to calculate the Direct Air Capture with CCS requirement (14.5 MtCO<sub>2</sub>/year) in both the Widespread Innovation scenario and the Tailwinds scenario. DACCS costs, energy inputs and deployment profiles are discussed in the GHG removals sector.

### c) Analytical steps

The aviation analysis for the Sixth Carbon Budget advice consists of the following steps:

- **Coverage.**
  - Aviation is split into three sub-sectors: domestic, international and military.
  - Emissions cover CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub>.
  - Coverage is for UK, Scotland, Wales and Northern Ireland.
- **Abatement measures** are split into three types: demand, efficiency (including hybrids) and SAF.
  - Domestic and international passenger demand and fuel use trajectories to 2050 are sourced from DfT aviation modelling, thereby incorporating DfT efficiency assumptions.
  - Trajectory start points were adjusted for 2015-2019 actual NAEI<sup>4</sup> and CCA data<sup>5</sup>, and estimated COVID-19 impacts in 2020-23 (discussed below), and trajectories then re-scaled to meet passenger growth targets for 2050 (discussed above).
  - The domestic share of DfT fuel use increases from 3.4% today to 3.9% by 2050. Military fuel use is derived separately from NAEI<sup>4</sup> and held fixed to 2050. Freight flights are included within DfT trajectories, so are implicitly assumed to scale with CCC passenger profiles.
  - SAF deployments from the CCC's Fuel Supply sector modelling are used to calculate residual fossil jet demands, with the same SAF % blend assumed to be used in each sub-sector (including in military aviation).
  - Direct accounting CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions are calculated based on fuel use, then split into sub-sectors and DAs (discussed below).

- Energy inflows to the sector (SAF = bioenergy, non-bio waste and hydrogen derived fuels, fossil jet and electricity from hybrid planes) are split into sub-sectors and DAs. It is assumed that 50% of the hybrid aircraft electricity use is in the domestic sub-sector.
- **Costs.**
  - Re-scaled DfT departing seat-km data is used to calculate operating cost savings from efficiency measures and increased annualised aircraft capital costs (which are de-annualised to in-year investments), based on ATA data which assumes a 20 year economic lifetime, 10% residual value and a 4.5% interest rate<sup>6</sup>. No cost data was available for the military aviation sub-sector. Marginal added costs of SAF above fossil jet are also calculated for all sub-sectors.
  - Costs are then split into sub-sectors and DAs to calculate £/tCO<sub>2</sub>e abated by each measure, using CCC's 3.5% social discount rate.

Further assumptions used in the analysis include:

- In 2018, 99.91% of fuel used in the UK aviation sector was aviation turbine fuel (avtur or jet), and 0.09% of fuel used was aviation spirit (avgas). CCC have used the term "jet" or "jet fuel" to include all the fuel used in UK aviation. Our analysis uses the 2018 weighted average of avtur and avgas, with constant fuel density, calorific value and carbon content values from Defra.<sup>7</sup>
- NAEI factors are also applied to scale combustion CO<sub>2</sub> to combustion CH<sub>4</sub> (with separate factors for domestic, international and military sub-sectors), and a constant factor to scale combustion CO<sub>2</sub> to combustion N<sub>2</sub>O (applied for all sub-sectors).<sup>8</sup> SAF fuels are assumed to continue to have the same combustion CH<sub>4</sub> and N<sub>2</sub>O emissions per kWh as fossil jet (only their accounting CO<sub>2</sub> emissions are reduced).
- Jet fuel costs are not part of the BEIS/HMT Green Book Long-run variable costs of energy supply (LRVCs) dataset. However, based off IATA<sup>9</sup>, financial market and refining datasets, the jet crack (\$/bbl) above crude oil price is historically very similar to the diesel crack (\$/bbl). The Green Book diesel LRVCs (p/litre) were therefore used and converted into p/kWh values for fossil jet fuel.

## d) Devolved administrations

The 2018 share of emissions from the NAEI is used to apportion UK emissions to emissions at devolved administration (DA) level. Separate splits are used for domestic, international and military aviation:

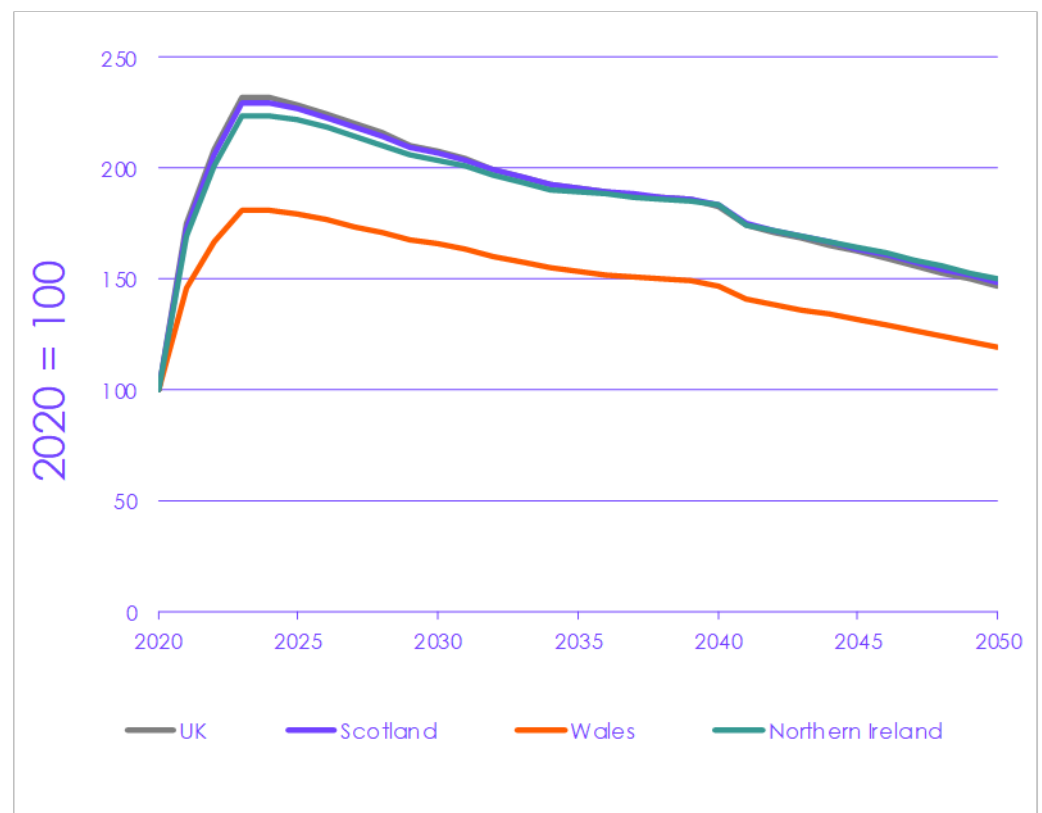
- Domestic: 32.8% Scotland, 0.80% Wales, 13.1% NI, 53.2% England
- International: 4.3% Scotland, 0.29% Wales, 0.55% NI, 94.9% England
- Military: 7.4% Scotland, 3.4% Wales, 2.2% NI, 86.9% England

These DA splits are held fixed over time in all scenarios, except for in the Baseline, Headwinds and Widespread Innovation scenarios, where expansion in London airports from 2030 to 2033 is assumed (delayed from DfT modelling which assumes this happens from 2026):

- This expansion leads to domestic DA splits reaching 28.7% Scotland, 0.73% Wales, 10.9% NI, 59.7% England by 2033, before a linear return to 2018 DA splits is assumed by 2050.
- International DA splits reach 3.8% Scotland, 0.27% Wales, 0.48% NI, 95.4% England by 2033, before a linear return to 2018 DA splits is assumed by 2050.
- No change assumed in military aviation DA splits.

As show in Figure M8.3, Welsh aviation emissions to not rebound post-COVID as much as other DAs relative to the 2020 base year, due to the outsized influence of military aviation emissions in Wales, where fuel use has been assumed to be held flat from 2019. Scotland and NI have much smaller military sub-sectors relative to their combined domestic and international emissions, and so their emissions profile matches the UK profile with the COVID-19 recovery.

Figure M8.3 Comparison of emission pathways for the UK, Scotland, Wales, Northern Ireland



Source: CCC analysis.

Notes: Aviation sector GHG emissions for the Balanced NetZero Pathway, split into DAs, and re-based from 2020 levels (which is at the bottom of the COVID-19 dip, hence strong growth in the following years).

## e) Uncertainties

Given aviation will be one of the largest-emitting sectors in 2050 (23 MtCO<sub>2</sub>e/year in the Balanced Pathway), the following uncertainties could change UK emissions in 2050 by many MtCO<sub>2</sub>e/year and impact Net Zero:

- COVID-19.** Out of all the sectors, aviation has been most impacted by COVID-19, and continues to be severely impacted. There remain major uncertainties as to the size of the aviation industry that will emerge post-COVID, particularly as the pandemic continues to spread globally and many countries return to forms of stricter lockdowns in late 2020. CCC have estimated a drop in UK flights and emissions during 2020-2023 as shown in Table M8.2, with a return to previously projected to demand levels from 2024 in most scenarios.
  - Data for 2020 is based on CAA flight data to date, and OAG scheduling trackers showing UK flights in mid-October at ~30% of last year's levels. We have then assumed flat demand over winter 2020/21, before increases from 2021. Values chosen for 2021-23 are estimates, but align with IATA forecasts for a recovery by 2024, i.e. a return to the chosen pathways from 2024 onwards.
  - In the Widespread Engagement and Tailwinds scenarios we assume a structural shift in demand due to behaviour change (e.g. due to video-conferencing) and have estimated this potential impact via halving business travel (which previously comprised 20% of UK passengers) by 2024. These two pathways ultimately end up at a 15% fall in passenger numbers from 2018 levels by 2050, but most of the change in demand is assumed to happen over the next 4 years.
  - The pandemic may result in a near-term marginal improvement in fleet efficiency, due to earlier retirement of older aircraft (e.g. Boeing 747s), although lower passenger loadings could offset this on a tCO<sub>2</sub>/passenger basis, and so has not been modelled. Lower demand could also decrease or delay purchases of newer, more efficient aircraft.

**Table M8.2**

Aviation COVID-19 impacts, as a % of expected pathway emissions

	2019	2020	2021	2022	2023	2024+	Notes
<b>Headwinds</b>	100%	39%	70%	85%	95%	100%	Recovers to expected pathway
<b>Widespread Engagement</b>	100%	39%	67%	76%	86%	90%	Half of business customers do not return
<b>Widespread Innovation</b>	100%	39%	70%	85%	95%	100%	Recovers to expected pathway
<b>Balanced Net Zero Pathway</b>	100%	39%	70%	85%	95%	100%	Recovers to expected pathway
<b>Tailwinds</b>	100%	39%	67%	76%	86%	90%	Half of business customers do not return
<b>Baseline</b>	100%	39%	70%	85%	95%	100%	Recovers to expected pathway



- **GDP/economic outlook.** We have not attempted to calculate a long-term reduction in aviation demand due to structural changes to the economy or long-term level of GDP due to COVID-19 (flights have historically correlated to GDP). We have also not considered any reductions in supply via e.g. failures of airports, airlines or engine manufacturers. Lower long-term fossil jet fuel prices and slowed aircraft sales and development cycles could lead to smaller efficiency gains than previously projected, although this has also not been modelled.
- **Efficiency** measures are expected to be cost saving in all scenarios, and under a range of fossil fuel costs and passenger demands. However, costs have not been modelled by DfT, and the DfT model is not an aircraft stock/sale model.

We have therefore had to infer added investment costs in each year from representative ATA aircraft Class data, applied to DfT seat-km/year outputs, and de-annualising using annual changes. There are therefore some years with particularly large or small (or even very occasionally negative\*) capital costs, due to the limitations of the datasets.

- **Future aircraft.**
  - The uptake of electric hybrid aircraft in the DfT modelling is relatively modest (around 9% of aircraft kilometres by 2050, consuming 6-7% of jet fuel). The DfT model assumes that full electric planes will not be commercialised by 2050, and it does not have a role for hydrogen turbine or hydrogen fuel cell planes by 2050 either. There could be break-throughs in these aircraft options, although the time taken to design, build, test, scale-up, certify and manufacture new aircraft propulsion systems (and the new aircraft bodies to accommodate them and their energy stores on-board) is significant – at least several decades.
  - Even if one of these options were commercialised in the 2040s, it would be challenging to immediately achieve a large % share of aircraft sales, and given the 20-30 year lifetimes of aircraft, this will not lead to a significant fleet penetration by 2050. These full electric or hydrogen options have energy storage limitations, and would be most suited for domestic or short-haul flights and/or smaller airplane classes, which make up a relatively small share of UK aviation emissions.
  - Combined, these range, aircraft class and development timings mean that 2050 penetrations of these options are likely to be limited, or they could occupy small niches by 2050 – although neither is likely to significantly improve the overall UK emissions profile. Long-haul flights dominate UK aviation emissions and are likely to stay using a hydrocarbon fuel until 2050 or beyond, hence the need for SAF.

\* A negative capital cost is possible, and would indicate a net sale of assets in the year. This only occurs where there is a particularly large divergence in demand from the Baseline scenario, at which point the sector may down-size.

- **SAF** is expected to be an added marginal cost, and this marginal cost will depend heavily on the counterfactual fossil jet cost, the cost of feedstocks (especially for synthetic fuels using hydrogen and DAC CO<sub>2</sub>), and the future improvement in processing plant costs (including the addition of CCS to FT routes which will significantly increase fuel GHG savings). Our scenarios explore different hydrogen and DAC costs, but hold costs of biomass, waste and waste fats/oils fixed over time (prices may well rise over time, but CCC analysis is only focused on resource costs). Processing costs are assumed to fall over time (as they are largely determined by global progress in SAF scale-up), and do not vary between scenarios. However, the earliest, high-risk projects, or smaller UK projects, or projects further from feedstocks or CO<sub>2</sub> sequestration sites, might be significantly more expensive than modelled. SAF costs are therefore have some level of uncertainty.
- **Impact of demand policies.** Although we have assessed how much efficiency and SAF costs would subtract/add to an indicative trans-Atlantic ticket price, our analysis is only taking the outputs of DfT modelling, and we do not have the ability to feed the specific decarbonisation costs back in to the demand framework to calculate the impact on passenger demand. This limitation also applies to demand management policies – DfT modelling internally assumes a rising carbon price, which reduces demand from an original counterfactual scenario, but CCC again only take the outputs after this internal carbon pricing is applied to demand. The particular policies that might be utilised to manage demand could have different impacts on ticket prices (e.g. carbon pricing, frequent flier levy, VAT, fuel duty, APD reform, airport capacity management). CCC analysis has focused on the outcomes (demand, fuel and emissions), rather than prescribing or modelling the policy method for achieving the demand levels required.
- **Measure interdependencies.** Theoretically, any combination of the mitigation measures discussed in section 2 would be possible, as they separately impact demand, fuel use and fuel accounting emissions. However, scenarios that rely on high amounts of technical change or new expensive fuels will likely either require a profitable sector to fund this RD&D, customers being willing to pay more, and/or more government intervention (regulation or support). Scenarios with negative growth, if repeated globally, are likely to result in a slower uptake of new, more efficient aircraft, and less investment in SAF due to depressed fossil fuel prices. Delivery of the Tailwinds scenario would therefore be particularly challenging – a reduction in demand from 2018 levels, with maximal efficiency and 95% SAF by 2050.
- **Non-CO<sub>2</sub> impacts.** These impacts are discussed in Chapter 8, section 4 of the Advice Report. There remain significant uncertainties in the science and mitigation options, and therefore uncertainties regarding the policy response and any interactions with sector GHG emissions (e.g. re-routing aircraft around super-saturated atmospheric zones to avoid cirrus cloud formation could increase GHG emissions).

# Endnotes

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- <sup>1</sup> CCC (2020) *The Sixth Carbon Budget – Methodology Report*. Available at: [www.theccc.org.uk](http://www.theccc.org.uk)
- <sup>2</sup> IATA (2020) *Recovery Delayed as International Travel Remains Locked Down*
- <sup>3</sup> CCC (2020) *2020 Progress Report to Parliament*
- <sup>4</sup> National Atmospheric Emissions Inventory (2020) *UK Greenhouse Gas Inventory, 1990 to 2018: Annual Report for submission under the Framework Convention on Climate Change*
- <sup>5</sup> Civil Aviation Authority (2020) *Airport data 2019*
- <sup>6</sup> ATA & Ellondee (2018) *Understanding the potential and costs for reducing UK aviation emissions*
- <sup>7</sup> Defra (2020) *Greenhouse gas reporting: conversion factors 2020*
- <sup>8</sup> All the analysis is conducted on an IPCC AR5 basis with carbon feedbacks, using 34 tCO<sub>2</sub>e/tCH<sub>4</sub> and 298 tCO<sub>2</sub>e/tN<sub>2</sub>O.
- <sup>9</sup> IATA (2020) *Jet Fuel Price Monitor*

## Chapter 2

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# Emissions pathways for the aviation sector

The following sections are taken directly from Section 7 of Chapter 3 of the CCC's Advice Report for the Sixth Carbon Budget].<sup>1</sup>

## Introduction and key messages

Aviation is one of the sectors in which we expect there to be significant remaining positive emissions by 2050, given the limited set of options for decarbonisation. Remaining residual emissions will need to be offset by greenhouse gas removals (see section 11) for the sector to reach Net Zero.

The evidence base on how to achieve GHG savings in aviation in the UK relies on internal modelling from DfT, Climate Assembly UK demand scenarios and internal CCC analysis of sustainable aviation fuel costs. Further details are provided in the Methodology Report.

We present the scenarios for aviation emissions in three parts:

- a) The Balanced Net Zero Pathway for aviation
- b) Alternative pathways for aviation emissions
- c) Investment requirements and costs

### a) The Balanced Net Zero Pathway for aviation

In the Balanced Net Zero Pathway, the aviation sector returns to close to pre-pandemic demand levels by 2024. Thereafter, emissions gradually decline over time (Figure A3.7.a) to reach 23 MtCO<sub>2</sub>e/year by 2050, despite modest growth in demand.

This gradual reduction in emissions is due to demand management, improvements in efficiency and a modest but increasing share of sustainable aviation fuels:

- **Demand management.** The Balanced Net Zero Pathway does allow for some limited growth in aviation demand over the period to 2050, but considerably less than a 'business as usual' baseline. We allow for a 25% in growth by 2050 compared to 2018 levels, whereas the baseline reflects unconstrained growth of around 65% over the same period. We assume that, unlike in the baseline, this occurs without any net increase in UK airport capacity, so that any expansion is balanced by reductions in capacity elsewhere in the UK.
- **Efficiency improvements.** The fuel efficiency per passenger of aviation is assumed to improve at 1.4% per annum, compared to 0.7% per annum in the baseline. This includes 9% of total aircraft distance in 2050 being flown by hybrid electric aircraft.
- **Sustainable aviation fuels (SAF)** contribute 25% of liquid fuel consumed in 2050, with just over two-thirds of this coming from biofuels<sup>1</sup> and the remainder from carbon-neutral synthetic jet fuel (produced via direct air capture of CO<sub>2</sub> combined with low-carbon hydrogen, with 75% of this synthetic jet fuel assumed to be made in the UK and the rest imported).

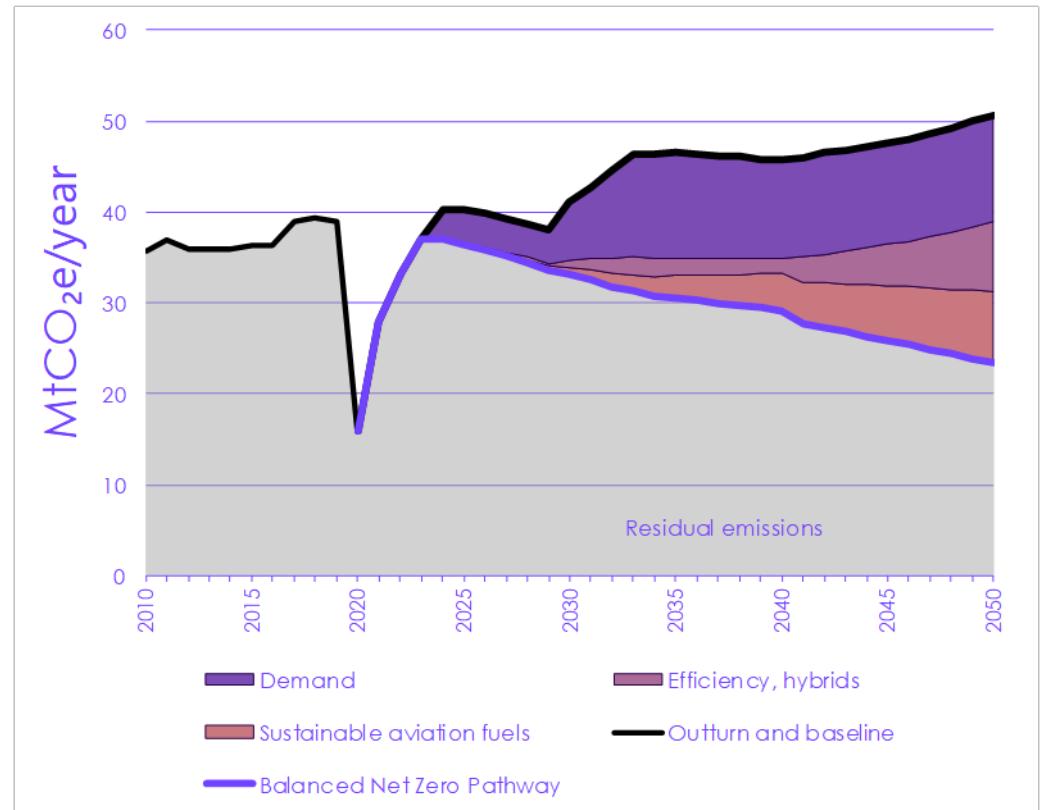
The Balanced Pathway has 25% growth in demand by 2050 compared to 2018 levels, but with no net expansion of UK airport capacity.

A quarter of jet fuel by 2050 is made from sustainable low-carbon sources.

<sup>1</sup> Biofuels are assumed to be produced with CCS on the production plant – overall carbon-negative but assumed to have zero direct CO<sub>2</sub> emissions in aviation. Removals are accounted for in section 11.

Demand management plays a critical role in ensuring GHG emissions continue to decrease, particularly while efficiency benefits and SAF take time to scale up.

Figure A3.7.a Sources of abatement in the Balanced Net Zero Pathway for the aviation sector



Source: BEIS (2020) *Provisional UK greenhouse gas emissions national statistics 2019*; CCC analysis.

## b) Alternative pathways for aviation emissions

Each of our exploratory scenarios for aviation sees emissions fall from 2018 to 2050 by more than 35% (Figure A3.7.b), though with different contributions from efficiency improvements, sustainable fuels and constraints on demand (Table A3.7):

- **Headwinds** assumes the same 25% growth in demand from 2018 to 2050 as in the Balanced Pathway, although with higher demand in the 2030s due to a net increase in airport capacity. Improvements in efficiency are as in the Balanced Pathway, while biofuels comprise 20% of the fuel mix by 2050. Emissions are 25 MtCO<sub>2e</sub> in 2050, 36% below 2018 levels.
- **Widespread Engagement** has lower demand, with an overall reduction of 15% on 2018 levels and therefore around half the 2050 demand as in the baseline. This is in line with the Climate Assembly UK's 'flying less' scenario. It includes a substantial reduction in business aviation due to widespread near-term adoption of videoconferencing. Efficiency improvements are slightly faster than those in the Balanced Pathway at 1.6% per annum, while the share of biofuels in 2050 is slightly lower at 20%, with a further 5% contribution from the biogenic fraction of waste-based fuels.<sup>2</sup> Emissions in 2050 are 15 MtCO<sub>2e</sub>, 62% below 2018 levels.
- **Widespread Innovation** has a greater contribution from technological performance, both in terms of improved efficiency (2.1% per annum) and the contribution of sustainable aviation fuels. By 2050, around a quarter of fuel use is biofuel, with a further quarter carbon-neutral synthetic jet fuel. These technical improvements lead to a lower carbon-intensity and lower cost of aviation, although demand in this scenario is considerably higher, reaching 50% above 2018 levels by 2050 (in line with the Climate Assembly UK's 'technological change' scenario). Emissions in 2050 are 15 MtCO<sub>2e</sub>, 63% below 2018 levels.
- In **Tailwinds**, the reductions in demand under Widespread Engagement are combined with the technology improvements in Widespread Innovation. Demand in 2050 is 15% below 2018 levels and efficiency improves at 2.1% per annum. Very similar volumes of sustainable fuels are used as in Widespread Innovation, but when applied to the lower fuel consumption in Tailwinds these comprise a higher combined share of 95% of fuel use. Emissions in 2050 are 1 MtCO<sub>2e</sub>, 97% below 2018 levels.

Widespread Engagement assumes lower demand in 2050 than in 2018, due mainly to reduced business travel.

Widespread Innovation assumes much higher demand growth is possible, due to rapid technology development.

In each case, for the aviation sector to reach Net Zero by 2050, the remaining emissions will need to be offset with greenhouse gas removals (see section 11).

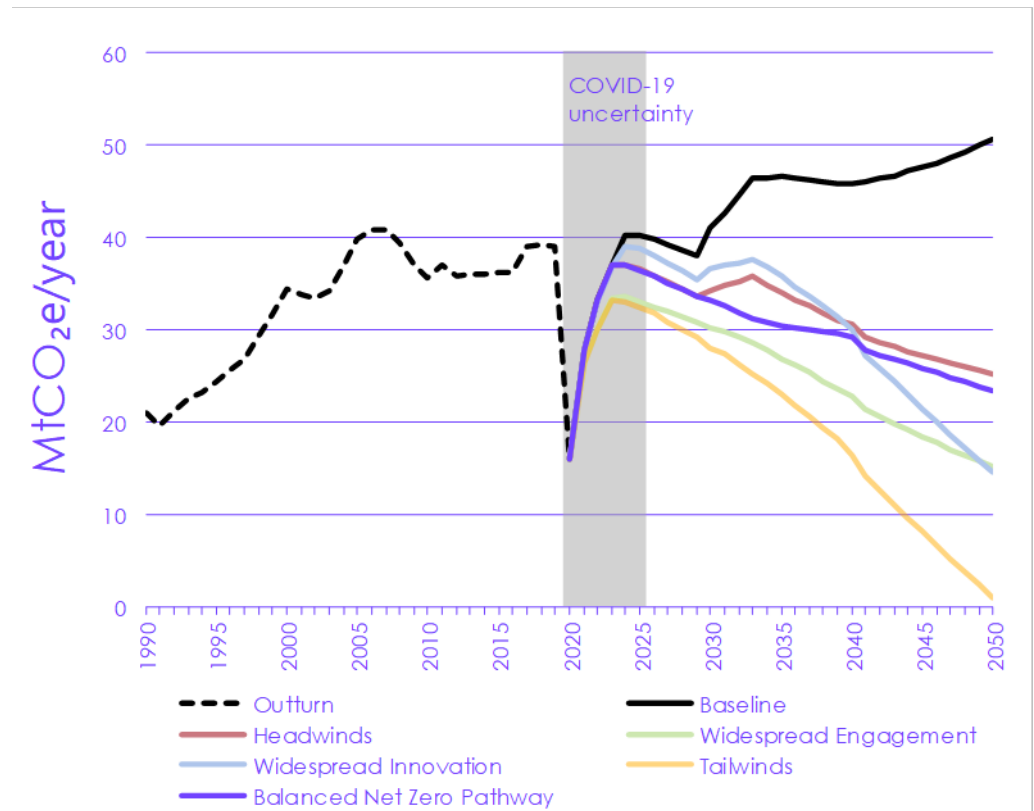
In addition to the GHG emissions presented here, aviation also has non-CO<sub>2</sub> warming impacts due to contrails, NO<sub>x</sub> emissions and other factors. While outside of the emissions accounting framework used by UK carbon budgets (see Chapter 10), we estimate the additional warming from these non-CO<sub>2</sub> effects in section 4 of Chapter 8.

<sup>2</sup> Waste-based fuels save less CO<sub>2</sub> than biofuels, due to approximately half of the waste carbon content being of fossil origin. Only the biogenic fraction of wastes save CO<sub>2</sub> compared to fossil jet fuel.



COVID-19 has had a dramatic impact, and all scenarios remain under 2019 emissions levels. Tailwinds is able to almost completely decarbonise by 2050.

Figure A3.7.b Emissions pathways for the aviation sector



Source: BEIS (2020) Provisional UK greenhouse gas emissions national statistics 2019; CCC analysis.  
 Notes: Only direct CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O combustion emissions in aviation are shown. 'Non-CO<sub>2</sub> impacts' are excluded.

Table A3.7

Summary of key differences in the aviation scenarios

	Balanced Pathway	Headwinds	Widespread Engagement	Widespread Innovation	Tailwinds
Demand growth to 2050 (vs. 2018)	<b>+25%</b>	+25%	-15%	+50%	-15%
Efficiency improvements (%/year)	<b>1.4%</b>	1.4%	1.6%	2.1%	2.1%
Biofuel share in 2050	<b>17%</b>	20%	20%	26%	51%
Bio-waste fuel share in 2050	-	-	5%	-	-
Synthetic jet fuel share in 2050	<b>8%</b>	-	-	25%	44%

## c) Investment requirements and costs

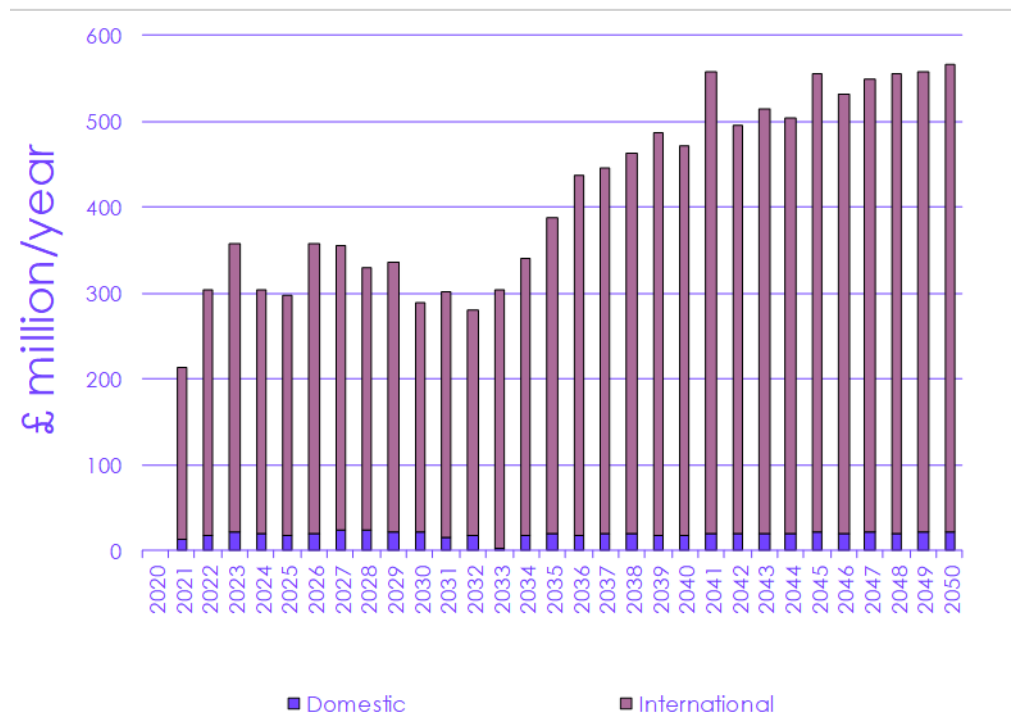
In our 2019 *Net Zero* report, we identified aviation as one of the sectors with cost-effective GHG savings, given that efficiency gains could offset the added costs of sustainable aviation fuels. Our updated Sixth Carbon Budget pathways estimate the full costs and savings involved:

- In the Balanced Net Zero Pathway we estimate total added investment costs above our baseline of around £390 million/year in 2035 and £570 million/year in 2050, for efficiency improvements and hybridisation (Figure A3.7.c).
- However, these added investment costs are offset by operational cost savings of around £1,230 million/year in 2035 and £2,750 million/year in 2050. There are also added operational costs of using sustainable aviation fuels, given their additional cost above fossil jet fuel, of £470 million/year in 2035, and £1,520 million/year in 2050 (Figure A3.7.d). We have not assigned any costs or savings to reductions in demand in our scenarios.

The capital costs of improved aircraft efficiency are more than offset by fuel savings. Sustainable aviation fuels add significant costs.

International aviation dominates UK aviation emissions and investment.

Figure A3.7.c Breakdown of aviation sector additional investment



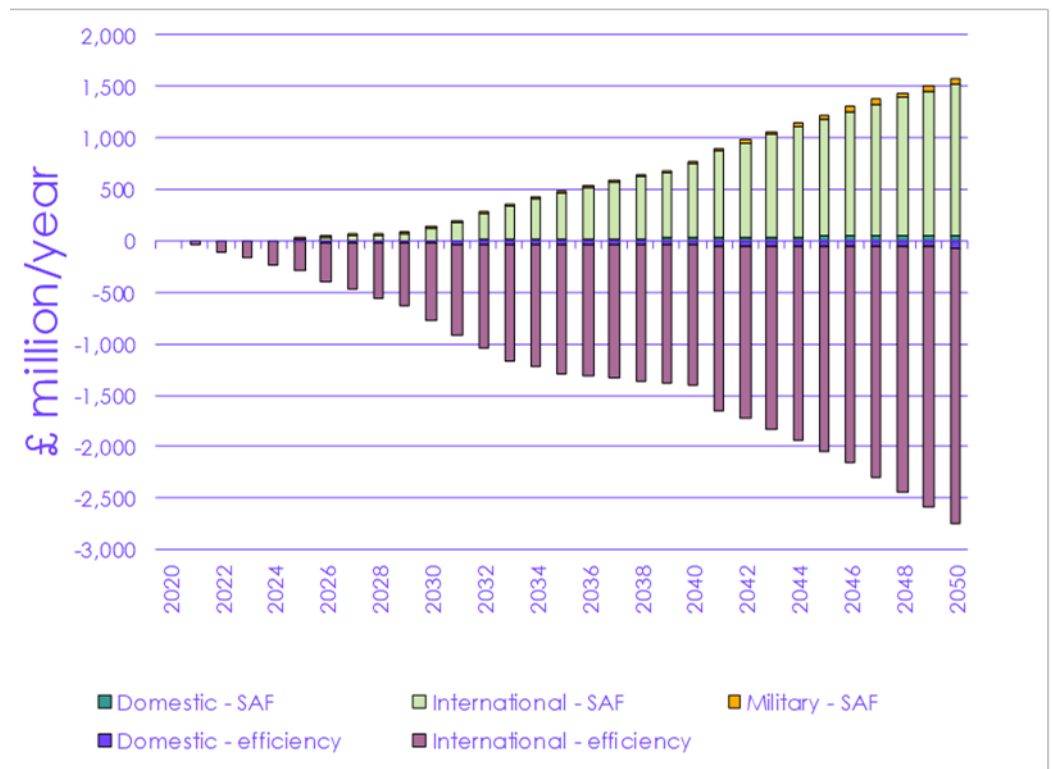
Source: CCC analysis.

Notes: Additional investment in Balanced Net Zero Pathway compared to the baseline, due to higher costs of more efficient aircraft. No costs or savings have been assumed for reductions in demand vs. the baseline trajectory. No military aviation cost data available.

Paying for a fully zero-carbon flight, via the use of GHG removal offsets, will be affordable by 2050.

- Reducing GHG emissions from UK domestic and international aviation is therefore expected to cost between -£90 and -£40/tCO<sub>2</sub>e abated in 2035, and between -£30 and +£20/tCO<sub>2</sub>e abated by 2050.\* There are increases over time due to higher aircraft costs, and the higher share of GHG savings from biofuels and more expensive synthetic jet fuel. In earlier years, efficiency gains significantly outweigh added fuel costs.
- As an example of costs for passengers, sustainable aviation fuels priced with marginal GHG removals might add £35 to a return ticket from London to New York in 2050 in the Balanced Pathway, minus £21 of fuel savings from improved efficiency.<sup>3</sup> If full decarbonisation were paid for using GHG removals to offset residual emissions, this may add a further £41, giving a net added cost of £56.
- The cost of GHG savings in military aviation is based only on the use of biofuels and synthetic jet, and falls to around £110/tCO<sub>2</sub>e abated in 2035, staying at around this level to 2050 in the Balanced Pathway.

Figure A3.7.d Breakdown of aviation sector additional costs



Source: CCC analysis.

Notes: Additional operational costs in Balanced Net Zero Pathway compared to the baseline, due to higher costs of sustainable aviation fuels and costs savings from improved efficiency. No costs or savings have been assumed for reductions in demand vs. the baseline trajectory. No military aviation cost data for efficiency savings available.

\* International aviation is typically at the lower end of this cost range, and domestic aviation at the upper end. Efficiency costs are -£280 to -£135/tCO<sub>2</sub>e, and SAF costs are £110/tCO<sub>2</sub>e on average.

<sup>3</sup> Based on ICAO (2020) Carbon Emissions Calculator current value of 671 kgCO<sub>2</sub> per passenger, economy return. In 2050, 243 kgCO<sub>2</sub> is saved via efficiency, 108 kgCO<sub>2</sub> directly via sustainable aviation fuels, with 89 kgCO<sub>2</sub> saved upstream from biogenic CO<sub>2</sub> sequestration, leaving a further 230 kgCO<sub>2</sub> to be offset via other GHG removals. £180/tCO<sub>2</sub> is assumed for residual offsetting and marginal SAF costs (based on Direct Air Capture with CCS).

# Endnote

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<sup>1</sup> CCC (2020) *The Sixth Carbon Budget – Methodology Report*. Available at: [www.theccc.org.uk](http://www.theccc.org.uk)

## Chapter 3

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# Policy recommendations for the aviation sector

The following sections are taken directly from Chapter 8 of the CCC's Policy Report for the Sixth Carbon Budget.<sup>1</sup> Chapter 8 covers aviation & shipping policy recommendations together – we have excluded shipping-only content here.

**Table P8.1**

Summary of policy recommendations in aviation and shipping

<b>Aviation</b>	<ul style="list-style-type: none"> <li>• Formally include International Aviation emissions within UK climate targets when setting the Sixth Carbon Budget.</li> <li>• Work with ICAO to set a long-term goal for aviation consistent with the Paris Agreement, strengthen the CORSIA scheme and align CORSIA to this long-term goal.</li> <li>• Commit to a Net Zero goal for UK aviation as part of the forthcoming Aviation Decarbonisation Strategy, with UK international aviation reaching Net Zero emissions by 2050 at the latest, and domestic aviation potentially earlier. Plan for residual emissions, after efficiency, low-carbon fuels and demand-side measures, to be offset by verifiable greenhouse gas removals, on a sector net emissions trajectory to Net Zero.</li> <li>• There should be no net expansion of UK airport capacity unless the sector is on track to sufficiently outperform its net emissions trajectory and can accommodate the additional demand.</li> <li>• Monitor non-CO<sub>2</sub> effects of aviation, set a minimum goal of no further warming after 2050, research mitigation options, and consider how best to tackle non-CO<sub>2</sub> effects alongside UK climate targets without increasing CO<sub>2</sub> emissions.</li> <li>• Longer-term, support for sustainable aviation fuel (SAF) should transition to a more bespoke policy, such as a blending mandate. However, near-term construction of commercial SAF facilities in the UK still needs to be supported.</li> <li>• Continue innovation and demonstration support for SAF technologies, aircraft efficiency measures, hybrid, full electric and hydrogen aircraft development and airspace modernisation.</li> </ul>
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Progress in decarbonising aviation and shipping has been slow over the past decade, and changes in emissions have primarily been driven by changes in demands along with some improvements in efficiency. Policy to date has been mainly driven by international fora (negotiations at ICAO and the IMO), although neither organisation has both established ambitious 2050 global goals and a set of policies to meet these goals.

The main policy challenges in aviation and shipping are the international nature of these sectors requiring fuel infrastructure coordination, long asset lifetimes and economic competitiveness concerns.

Aviation policy in the UK has previously focused on aerospace developments, although several announcements have been made in 2020, with an Aviation Decarbonisation Strategy now due in 2021. Funding is still mainly directed at innovation and demonstration activities, rather than long-term market deployment support for sustainable aviation fuels and GHG removals.

Our recommendations are based on an assessment of existing policies and announcements, a review of evidence (including the views of the Climate Assembly) and updating our existing findings set out in our 2020 *Progress Report* and 2019 *International aviation & shipping letter*.<sup>2</sup>

This chapter covers:

1. The respective roles for international and domestic policy
2. Existing UK policy, gaps, and planned publications
3. Key policy changes needed

# 1. The respective roles for international and domestic policy

Inclusion of IAS emissions in UK climate targets does not imply taking a unilateral policy approach for them.

Even with their emissions formally included in UK carbon budgets and the Net Zero target, the primary policy approach to reducing emissions from international aviation and shipping (IAS) should be at the international level. These sectors are global in nature and there are some risks that a unilateral UK approach to reducing these emissions could lead to carbon leakage (under certain policy choices) or competitiveness concerns.

The UK has played a key role in progress by both the International Civil Aviation Organisation (ICAO) and International Maritime Organisation (IMO). In the context of international negotiations at the ICAO and the IMO, inclusion of IAS emissions in the Net Zero target should not be interpreted as a rejection of multi-lateral approaches or as prejudicing discussions on burden sharing.

International approaches are unlikely to overcome all barriers to decarbonising the IAS sectors.

However, international approaches are unlikely to overcome all barriers to decarbonising the IAS sectors. Supplementary domestic policies should also be pursued where these can help overcome UK-specific market barriers, and where these do not lead to adverse impacts on competitiveness and/or carbon leakage.

## a) International approaches

At the international level, global policies consistent with the ambition in the Paris Agreement are required to provide a level playing field for airlines and shipping operators, and to guard against the risk of competitive distortions. The international trade bodies for both aviation and shipping have begun to develop their approaches but further progress is required:

- **Aviation.** The ICAO's current carbon policy to 2035, the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), aims to ensure that most emissions increases above a baseline year are balanced by offsets.
  - In light of COVID-19, ICAO agreed a baseline year change to 2019 (instead of averaging over 2019-2020). This will reduce offset requirements in the initial years of the scheme as the sector recovers. CORSIA's list of eligible emissions reduction measures has also been finalised.
  - A new long-term goal for global international aviation emissions is now required that is consistent with the Paris Agreement. CORSIA then needs to be extended and aligned with this goal, and rules need to be put in place to ensure that CORSIA offsets deliver genuine emission reductions, transitioning to sustainable, well-governed greenhouse gas removals (see Chapter 11).

ICAO needs to set a long-term goal aligned with the Paris Agreement, and strengthen CORSIA.



Domestic policy can focus on supporting low-carbon fuels, managing demand, domestic fleet decarbonisation and developing GHG removals.

## b) Supplementary domestic policies

Supplementary domestic policies that have limited competitiveness or carbon leakage risks should be pursued in parallel to international approaches to decarbonisation. These include support for developing alternative fuels and associated infrastructure, managing demand, decarbonising domestic fleets, and kick-starting a UK market for greenhouse gas removals (see Chapter 11). These domestic policy recommendations are discussed in section 3 below.

By taking these domestic and international policy approaches in parallel to including IAS formally within carbon budgets and the Net Zero target, the UK will be contributing fully to the global effort to tackle aviation and shipping emissions.

## 2. Existing UK policy, gaps, and planned publications

### a) Aviation

Aerospace development has been a focus in UK policy, although the RTFO is yet to bring forward renewable jet fuel.

Existing UK policy in Aviation has been focused on match-funding for aircraft technology development (e.g. the £300million Future of Flight Challenge), and traded certificate price support for aviation biofuels and synthetic jet fuels under the Renewable Transport Fuel Obligation (RTFO)'s 'development fuels' sub-mandate. Recent announcements include:

- The Jet Zero Council has also been established as a forum with the ambition for developing zero-emissions commercial flight.
- £15 million has been invested into FlyZero, with the Aerospace Technology Institute looking at design challenges and the market opportunity for zero-emissions aircraft concepts from 2030.
- £15 million will be invested in a new grant-funding competition for SAF production.
- A SAF clearing house will be set up to enable UK to certify new fuels.
- A planned consultation on a SAF blending mandate has been announced, for a potential start in 2025.
- An aviation Net Zero Consultation and following Strategy were planned for 2020. Plans are to now consult on a combined Aviation Decarbonisation Strategy in 2021.

Government announcements and support to date focuses on innovation and demonstration, but long-term deployment policy needs developed.

However, there remain significant gaps within the policy framework for aviation. Government support at present is focused on innovation funding and demonstration activities, but without clear long-term policy mechanisms driving SAF uptake or valuing negative emissions in the UK:

- The RTFO development fuels sub-mandate is unlikely to drive significant development of jet fuels, as it can be met with cheaper fuels.
- There is currently no price signal for GHG removals in the UK.
- There is a lack of larger-scale deployment support and policy frameworks specifically for sustainable aviation fuel and GHG removals.

UK aviation industry has committed to reaching Net Zero by 2050.

Although the UK aviation industry has committed to a Net Zero goal for 2050 (via the Sustainable Aviation coalition),<sup>3</sup> this is not yet a policy goal for Government. Higher-level strategic gaps include the lack of formal inclusion of international emissions in UK carbon budgets and the Net Zero target, and the need for a sector emissions trajectory to inform demand management and airport capacity policies. Further research is also needed on non-CO<sub>2</sub> effects and potential mitigation options.

# 3. Key policy changes needed

## a) Aviation

International aviation emissions to be included in Carbon Budgets.

The Government should include international aviation emissions within the Sixth Carbon Budget, subsequent carbon budgets and the 2050 Net Zero target.

Government should commit to a 2050 Net Zero goal for UK aviation, with use of verifiable GHG removals.

The forthcoming Aviation Decarbonisation Strategy should commit to a 2050 Net Zero goal for UK aviation, with use of verifiable GHG removals (but with limits), and set out demand management policies to ensure a trajectory to 2050 is achieved and that non-CO<sub>2</sub> effects are addressed.

### i) Aviation emissions on the way to Net Zero

The Government should commit to UK international aviation reaching net zero GHG emissions by 2050 at the latest, and UK domestic and military aviation potentially earlier.

An emissions trajectory to 2050 will set expectations for use of GHG removals over time.

This will necessarily entail having a plan for how verifiable greenhouse gas removals will offset residual emissions over time (i.e. after contributions from efficiency improvements, low-carbon fuels and demand-side measures). DfT should set a net emissions trajectory for aviation (net of a constrained level of GHG removals), or as a minimum, interim targets on the way to 2050.

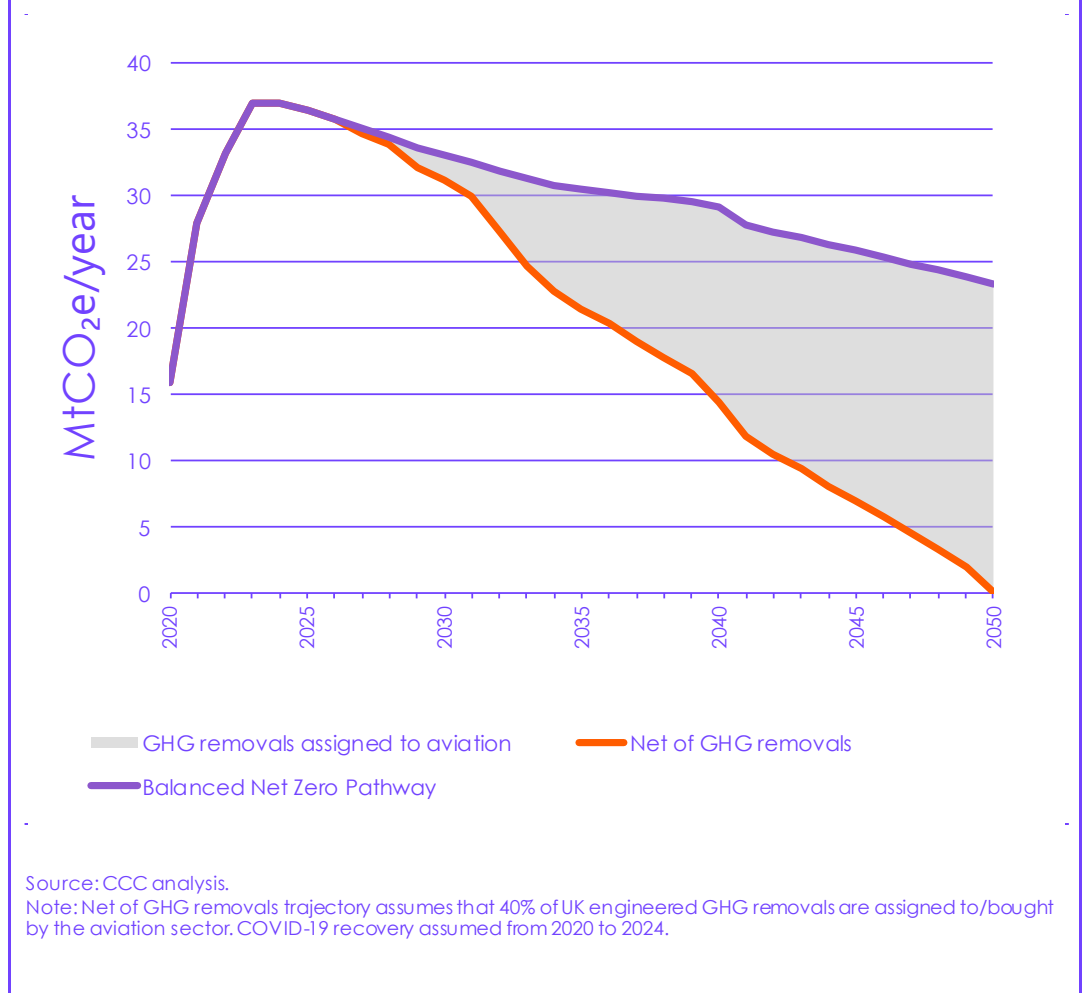
- Following the Balanced Net Zero Pathway, the remaining 23 MtCO<sub>2</sub>e/year of gross aviation emissions in 2050 would require 40% of total UK engineered greenhouse gas removals to be assigned to the aviation sector to achieve Net Zero within aviation.
- With the ramp-up in GHG removals in the UK over time, Figure P8.1 gives an indicative net aviation emissions trajectory that could be followed if 40% of UK GHG removals were assigned to aviation in all years.
- Interim targets for aviation emissions net of greenhouse gas removals could therefore be 31 MtCO<sub>2</sub>e/year in 2030, 21 MtCO<sub>2</sub>e/year in 2035 and 14 MtCO<sub>2</sub>e/year in 2040.
- Setting an aviation sector net emissions target and trajectory is not obviated by IAS inclusion with carbon budgets. This is more important in aviation than other emitting sectors, given that without policy action aviation emissions could rise significantly (as would non-CO<sub>2</sub> effects) and that, even with appropriate action, residual positive GHG emissions are very likely to remain by 2050 (and need compensating for with greenhouse gas removals). The UK aviation industry has also already committed to a 2050 Net Zero target.

Inclusion of IAS in Carbon Budgets does not diminish the value of a sector target and trajectory.

This plan should dovetail with the wider overall strategy for Net Zero, which should set out how this can be achieved with manageable volumes of sustainable greenhouse gas removals.

From the Balanced Net Zero Pathway, aviation emissions net of GHG removals fall relatively smoothly from the mid-2020s to 2050 Net Zero.

Figure P8.1 Indicative UK aviation emissions trajectory to achieve Net Zero with GHG removals



## ii) Demand management

Demand management policy is required, as demand growth will need significantly constrained from baseline assumptions, and there are non-CO<sub>2</sub> risks.

Demand management policy should be implemented, as given expected developments in efficiency and SAF deployment, demand growth will need to be lower than baseline assumptions, and likely constrained to 25% growth by 2050 from 2018 levels for the sector to contribute to UK Net Zero.

If efficiency or SAF do not develop as expected, further demand management will be required. Conversely, if efficiency and SAF develop quicker, it may be possible for demand growth to rise above 25%, provided that additional non-CO<sub>2</sub> effects are acceptable or can be mitigated.

Demand management needs to act as a back-stop to keep emissions on track to the sector trajectory to Net Zero.

A demand management framework will therefore need to be developed and in place by the mid-2020s to annually assess and, if required, act as a backstop to control sector GHG emissions and non-CO<sub>2</sub> effects.

- There are a number of demand management policies that could be considered, as we outlined in our 2019 *IAS letter*.<sup>2</sup> However, the Climate Assembly has provided valuable evidence that demand management policies will have to be fair and be seen as fair, with a clear preference for any taxes to increase as people fly more and fly further (Box P8.1).

- As part of providing wider information regarding transport choices, Government should also consider the feasibility and benefits of providing flight CO<sub>2</sub> labelling to prospective aviation passengers, building on the work of the Civil Aviation Authority (CAA).

The Government should assess its airport capacity strategy in the context of Net Zero and any lasting impacts on demand from COVID-19. Investments will need to be demonstrated to make economic sense in a Net Zero world and the transition towards it.

- Unless faster than expected progress is made on aircraft technology and SAF deployment, such that the sector is outperforming its trajectory to Net Zero, current planned additional airport capacity would require capacity restrictions placed on other airports.
- Going forwards, there should be no net expansion of UK airport capacity unless the sector is assessed as being on track to sufficiently outperform a net emissions trajectory that is compatible with achieving Net Zero alongside the rest of the economy, and is able to accommodate the additional demand and still stay on track.

No net expansion of UK airport capacity unless the sector is on track to sufficiently outperform its trajectory.

The Climate Assembly stated a clear preference for demand taxes to increase as people fly more and fly further.

#### Box P8.1

##### Climate Assembly aviation demand findings

Box 8.1 from the *Methodology Report*, Chapter 8, highlights the Climate Assembly's preferences regarding demand growth. The Assembly recommended 25-50% demand growth by 2050 from 2018, depending on how quickly technology progressed. A weighted average of the scenario votes was a 24% growth.

80% of assembly members 'strongly agreed' or 'agreed' that taxes that increase as people fly more often and as they fly further should be part of how the UK gets to Net Zero. Assembly members saw this as fairer than alternative policy options, such as a carbon tax that would impact all flights.

There were also strong calls for making alternatives to flying cheaper and better, and for the UK to influence the rest of the world in implementing global decarbonisation policies.

Source: Climate Assembly UK (2020).

### iii) Wider supporting policies

Alongside the Aviation Decarbonisation Strategy, UK policy should also:

Support is needed for the UK's first commercial SAF plants.

A SAF blending mandate could provide more certainty to SAF plant investors.

Many other European countries already have SAF blending mandates, so carbon leakage risks are decreasing.

Strict sustainability standards will need to be enforced, any double-counting of removals avoided, and SAF plants should be built with CCS.

- Set out a policy package for supporting the near-term deployment of commercial sustainable aviation fuel (SAF) facilities in the UK (with carbon capture and storage (CCS) where applicable). This may involve capital or loan guarantee support. In the mid-term, SAF support should transition to a more bespoke policy than the RTFO.
  - The existing RTFO will not be suitable for delivering mass commercial roll-out of SAF, due to decreasing liquid road fuel use. It may also make more sense for long-term SAF deployment to be paid for by the aviation sector rather than road fuel users.
  - Government has indicated willingness to consider introducing a SAF blending mandate from 2025,<sup>4</sup> which could ultimately provide more certainty to SAF plant investors than the RTFO. A SAF mandate is likely to be more effective than Contracts for Difference (as the technology maturity of many routes are not high enough and there are variable feedstock costs), inclusion in an Emissions Trading Scheme (likely insufficient and volatile pricing signal) or carbon taxation (would have to be high to incentivise initial SAF deployment, and not perceived as fair by the Climate Assembly).
  - Whether the mandate's added SAF costs then fall to the aviation sector or general taxation will depend on the policy design and any concerns regarding UK operator competitiveness or carbon leakage. Several other European countries already have SAF blending mandates and are introducing ambitious blending trajectories, which suggests the risk of leakage is decreasing (e.g. France is targeting 5% by 2030 & 50% by 2050; Finland & Sweden 30% by 2030; Germany 2% by 2030; with an EU-wide proposal for 1-2% by 2030).<sup>4</sup>
  - Ongoing uncertainty until 2025 about a new UK SAF mandate, and withdrawal of SAF from the RTFO, may risk delaying first commercial SAF projects in the UK reaching financial close for several years. Consideration could be given to either RTFO grandfathering, starting the SAF mandate earlier or running it in parallel to the RTFO.
- Continue innovation and demonstration support for newer SAF technologies, ensuring fuels can meet international standards. The newly announced £15m competition focused only on SAF is welcome, although is smaller than previous competitions.
- Continue RD&D support for aircraft efficiency measures, hybrid, full electric & hydrogen aircraft development and airspace modernisation. Continue to use existing delivery bodies, such as ATI, the Future of Flight Challenge, NATS, and guided by the Jet Zero Council.
- Continue to enforce strict sustainability standards, and work to consistently account for fuels produced with biogenic CO<sub>2</sub> capture without allowing double-counting of any GHG removals.

<sup>4</sup> From our analysis, potential UK SAF blending levels could be 1.5-3.5% by 2030, 4-9% by 2035 and 11-17% by 2040, although the top end of these figures could almost be doubled in a Tailwinds scenario, due to faster technology deployment and higher biofuel imports.

- SAF facilities should have to install CCS, or be built CCS ready, in order to maximise GHG savings from any concentrated CO<sub>2</sub> streams or dilute flue gases.\* The 2022 Bioenergy Strategy should set a date after which all new build plants must use CCS, and a date after which existing plants should retrofit CCS.
- An accounting choice needs to be made as to whether the consumer of a fuel made with CCS gets to account for the GHG removals (i.e. fuels can be carbon negative, further reducing end-use sector direct emissions),<sup>5</sup> or whether the producer of the fuel gets to account for the GHG removals (and the fuel is carbon neutral).
- Any GHG removals accounted for within a fuel carbon intensity factor or by a producer cannot also be claimed by another actor or sector.
- A clear GHG savings methodology needs to be established for wastes.
- Monitor non-CO<sub>2</sub> effects of aviation, continue to work to reduce scientific uncertainties, and fund research into mitigation options such as SAF benefits and engine design improvements.
  - Once mitigation options are better characterised, consider policy responses as to how best to tackle them alongside UK climate targets without increasing CO<sub>2</sub> emissions.
  - As a minimum goal, there should be no additional non-CO<sub>2</sub> warming from aviation after 2050. If mitigation options develop quickly, or new risks are identified, DfT could consider an earlier date, or setting a maximum level of allowable non-CO<sub>2</sub> warming from a base year.

There should be no additional non-CO<sub>2</sub> warming after 2050.

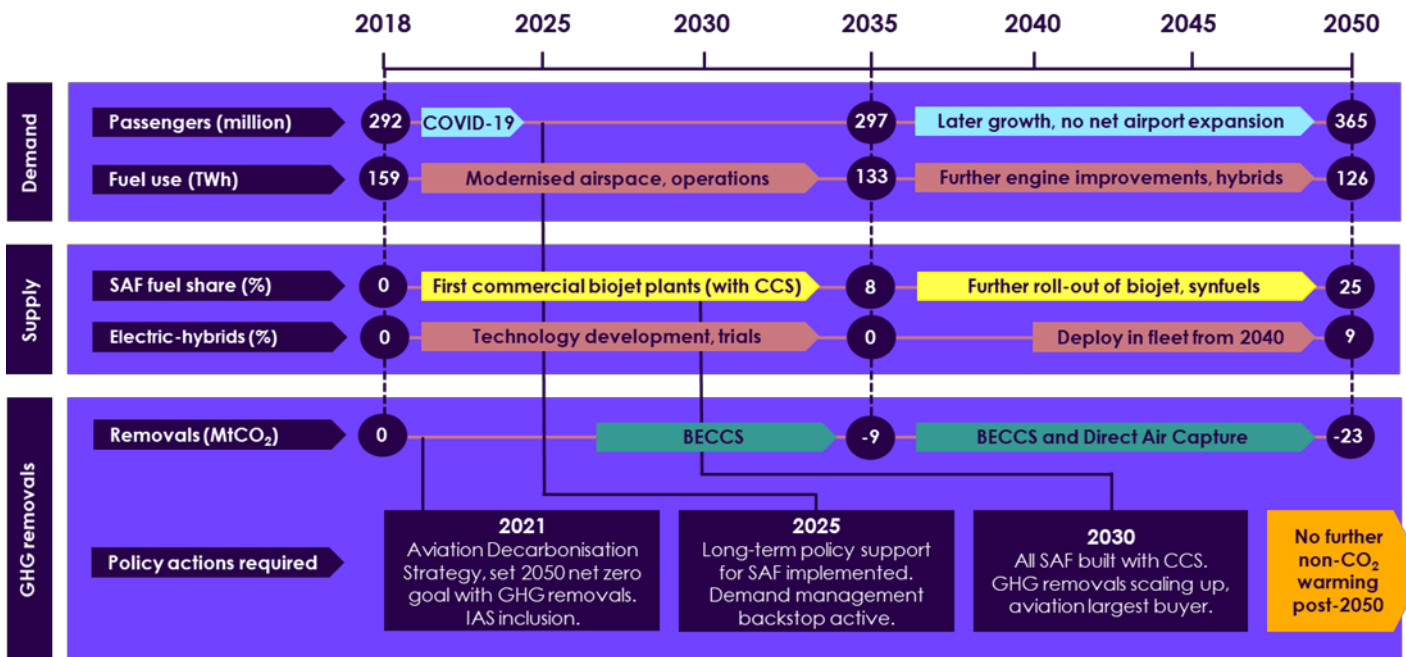
Alongside efforts at ICAO, the Aviation Decarbonisation Strategy and the package of domestic policies, plus parallel progress on a mechanism for deploying GHG removals in the UK (see Chapter 11), should put UK aviation emissions on track to contribute fully to meeting the Sixth Carbon Budget and the Net Zero target. A summary of the required steps in aviation is given in Figure P8.2.

\* Some SAF conversion plants do not produce CO<sub>2</sub>, and hence these CCS provisions may not apply to them. For example, synthetic jet fuel routes use CO<sub>2</sub> as a feedstock, and waste fats/oils to biojet will produce little CO<sub>2</sub>. However, these plants may still have dilute flue gas streams from which CO<sub>2</sub> should still be captured.

<sup>5</sup> UK biofuels policy currently uses GHG emissions thresholds (gCO<sub>2</sub>e/MJ of fuel) as one set of eligibility criteria for support. Setting a negative GHG emissions threshold may lead to perverse outcomes, where only less efficient plants meet the threshold. Any negative threshold would have to be accompanied by a minimum efficiency and would preclude carbon-neutral fuels. It is likely more appropriate to maintain low positive GHG emissions thresholds for eligibility purposes but allow additional benefits to flow to conversion plants capturing biogenic CO<sub>2</sub> (this may be achieved already by the design of wider GHG removals policies).



Figure P8.2 Timeline of key outcomes and policy requirements under the Balanced Pathway (2020-50)



Source: CCC analysis.

Note: SAF = Sustainable Aviation Fuel. BECCS = Bioenergy with carbon capture and storage

# Endnotes

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<sup>1</sup> CCC (2020) *Policies for the Sixth Carbon Budget and Net Zero*. Available at: [www.theccc.org.uk](http://www.theccc.org.uk)

<sup>2</sup> CCC (2019) *Net-zero and the approach to international aviation and shipping emissions*

<sup>3</sup> Sustainable Aviation (2020) *UK aviation commits to net zero carbon emissions by 2050*

<sup>4</sup> Argus (2020) *Europe makes legislative push for aviation transition*



Climate Change Committee  
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**STANSTED AIRPORT 35+ PUBLIC INQUIRY**

**COMMENCED TUESDAY 12 JANUARY 2021**

**INQUIRY PROGRAMME**

**ALL SESSIONS HELD VIRTUALLY**

<b>DATE WEEK 1</b>			<b>TIME ALLOCATED</b>
Tuesday 12 January 10.00 am Day 1	Opening of the Inquiry by the Inspectors Opening Statements by Main Parties	STAL UDC SSE	AM

DATE WEEK 1	TOPIC/PARTIES	WITNESS	TIME ALLOCATED
<p>Wednesday 13 January</p> <p><b>09.15 start</b></p> <p>Day 2</p>	<p><b>Interested Parties – Objectors</b></p> <p>Three Horseshoes Public House, Dutton Hill and Dutton Hill Community Association</p> <p>Broxted Parish Council</p> <p>Eisenham Parish Council</p> <p>Great Canfield Parish Council</p> <p>Helions Bumpstead Parish Council</p> <p>Henham Parish Council &amp; Chickney Parish Chairman</p> <p>High Easter Parish Council</p> <p>Moreton Bobbingworth &amp; The Lavers PC</p> <p>Stansted Mountfitchet Parish Council</p> <p>Stebbing Parish Council</p> <p>Takeley Parish Council</p> <p>Much Hadham Parish Council</p> <p>Thaxted Parish Council</p>	<p>Mr Derek Connell (phoning in)</p> <p>Vere Isham, Chair</p> <p>Dr Mott</p> <p>Councillor Jenny Jewell</p> <p>Neville Nicholson</p> <p>Dr Zoe Rutterford</p> <p>Councillor Neil Reeve</p> <p>Julia Milovanovic, Parish Clerk</p> <p>Peter Jones, Chairman, Airport Working Group</p> <p>Councillor Barrett</p> <p>Councillor Geoff Bagnell</p> <p>Councillor Duncan McDonald</p> <p>Richard Haynes, JLL</p>	<p>AM</p> <p>PM</p>

DATE WEEK 1	TOPIC/PARTIES	WITNESS	TIME ALLOCATED
<p>Thursday 14 January</p> <p><b>09.15 start</b></p> <p>Day 3</p>	<p><b>Interested Parties – Objectors</b></p> <p>Residents of Howe Green, and Great Hallingbury</p> <p>East Herts Green Party</p> <p>The Aviation Environment Federation</p> <p>New Economics Foundation</p> <p><b>Individual Objectors</b></p> <p>Uttlesford Green Party</p>	<p>John Devoti</p> <p>Alex Daar, Chair</p> <p>Tim Johnson</p> <p>Alex Chapman</p> <p>Jonathan Fox</p> <p>Michael Belcher</p> <p>Maggie Sutton</p> <p>Simon Havers</p> <p>Irene Jones</p> <p>Mark Johnson</p> <p>Edward Gildea</p>	<p>AM</p>



DATE WEEK 1	TOPIC/PARTIES	WITNESS	TIME ALLOCATED
Thursday 14 January Day 3	<b>Individual Objectors</b>	Raymond Woodcock <del>Veronica Crossan</del> Cliff Evans George Marriage Quintus Benziger Jonathan Richards Vincent Thompson Peter Franklin <del>Garel Foulser</del> Roger Clark Martin Berkeley Suzanne Walker	PM

DATE WEEK 1	TOPIC/PARTIES	WITNESS	TIME ALLOCATED
Friday 15 January  <b>09.15 start</b>  Day 4	<b>Interested Parties – Supporters</b>  Essex Chamber of Commerce  Suffolk Chamber of Commerce  CBI East  Cambridge Ahead  Visit East of England  AstraZeneca  World Duty Free  National Express  Greater Anglia  Stansted Airport College  <b>Interested Parties – Objectors</b>  The Easter and Rodings Action Group	David Burch, Director of Policy  Andy Walker, Director of Policy  Freddie Hopkinson  Harriet Fear MBE, Chair  Pete Waters, Executive Director  Dr Andy Williams, UK VP Strategy  Martyn Scarf, UK Director  Chris Hardy, Managing Director  Jonathan Denby, Director of Corporate Affairs  Karen Spencer MBE, Principle  Robert Beer	AM

DATE WEEK 2	TOPIC/PARTIES	WITNESS	TIME ALLOCATED
Tuesday 19 January 9.30 am Day 5	<b>THE STRATEGIC CASE FOR GROWTH</b>  STAL	Tim Hawkins, MAG XX SSE	All day
Wednesday 20 January 9.30 am Day 6	<b>LOCAL CONTEXT</b>  SSE <b>AIR TRAFFIC FORECASTS AND PROJECTIONS</b>  SSE	Ken McDonald XX STAL  Brian Ross	AM   PM
Thursday 21 January 9.30 am Day 7	<b>AIR TRAFFIC FORECASTS AND PROJECTIONS</b>  SSE  STAL	Brian Ross XX STAL  Dan Galpin, ICF	AM/PM   PM
Friday 22 January 9.30 am Day 8	<b>AIR TRAFFIC FORECASTS AND PROJECTIONS</b>  STAL  <b>EIA MATTERS</b>  STAL	Dan Galpin, ICF XX SSE  David Thomson	AM/PM   PM

DATE WEEK 3	TOPIC/PARTIES	WITNESS	TIME ALLOCATED
Tuesday 26 January 9.30 am Day 9	<b>NOISE</b> Uttlesford DC  STAL	James Trow, Noise Consultant  Vernon Cole, Cole	AM  PM
Wednesday 27 January 9.30 am Day 10	<b>NOISE</b> STAL <b>AIR QUALITY</b> Uttlesford DC	Vernon Cole, Cole Jarman XX UDC  Dr Mark Broomfield, Ricardo Energy & Environment	AM  PM
Thursday 28 January 9.30 am Day 11	<b>AIR QUALITY</b> Uttlesford DC  STAL	Dr Mark Broomfield, Ricardo Energy & Environment XX STAL  Michael Bull, Arup	AM  PM
Friday 29 January 9.30 am Day 12	<b>AIR QUALITY</b> STAL	Michael Bull, Arup XX UDC	AM

DATE WEEK 4	TOPIC/PARTIES	WITNESS	TIME ALLOCATED
Tuesday 2 February 9.30 am Day 13	<b>CARBON/CLIMATE CHANGE</b>  SSE	Michael Young & Peter Lockley XX STAL	All day
Wednesday 3 February 9.30 am Day 14	<b>CARBON/CLIMATE CHANGE</b>  Uttlesford DC	Dr Mark Hinnells, Ricardo Energy & Environment XX STAL	All day
Thursday 4 February 9.30 am Day 15	<b>CARBON/CLIMATE CHANGE</b>  STAL	Neil Robinson, MAG XX UDC XX SSE	All day
Friday 5 February 9.30 am Day 16	<b>CARBON/CLIMATE CHANGE</b>  STAL	Neil Robinson, MAG XX SSE  George Vergoulas, Arup XX UDC XX SSE	AM  AM/PM

DATE WEEK 5	TOPIC/PARTIES	WITNESS	TIME ALLOCATED
Tuesday 9 February 9.30 am  Day 17	<b>HEALTH &amp; WELL BEING</b> STAL  <b>ECOLOGY</b> STAL  <b>SOCIO-ECONOMIC IMPACTS</b>	Andrew Buroni, RPS  Mike Barker, RPS  Brian Ross	AM   AM/PM
Wednesday 10 February 9.30 am  Day 18	<b>SOCIO-ECONOMIC IMPACTS</b> SSE  STAL	Brian Ross XX STAL  Louise Congdon	AM/PM  PM
Thursday 11 February 9.30 am  Day 19	<b>SOCIO-ECONOMIC IMPACTS</b> STAL  STAL	Louise Congdon XX SSE  Edith McDowall, Optimal Economics XX SSE	AM/PM  PM

DATE WEEK 5	TOPIC/PARTIES	WITNESS	TIME ALLOCATED
Friday 12 February 11 am Day 20	PRELIMINARY CONDITIONS SESSION		AM
<b>15-19 FEBRUARY – ADJOURNMENT</b>			



DATE WEEK 6	TOPIC/PARTIES	WITNESS	TIME ALLOCATED
Tuesday 23 February 9.30 am Day 21	<b>SURFACE ACCESS (ROAD &amp; RAIL)</b>  SSE	Bruce Bamber (Road) XX STAL up to 2 hours	All day
Wednesday 24 February 9.30 am Day 22	<b>SURFACE ACCESS (ROAD &amp; RAIL)</b>  SSE  STAL	Bruce Bamber (Road) XX STAL  Phil Rust, Steer	AM   PM
Thursday 25 February 9.30 am Day 23	<b>SURFACE ACCESS (ROAD &amp; RAIL)</b>  STAL	Phil Rust, Steer XX SSE XX Mr Johnson, Interested Party with rail related questions	All day
Friday 26 February 9.30 am Day 24	<b>PLANNING MATTERS</b>  Utilesford DC	Hugh Scanlon, Lichfields XX STAL	All day

DATE WEEK 7	TOPIC/PARTIES	WITNESS	TIME ALLOCATED
Tuesday 2 March 9.30 am Day 25	<b>PLANNING MATTERS</b>  SSE	Brian Ross XX STAL	All day
Wednesday 3 March 9.30 am Day 26	<b>PLANNING MATTERS</b>  STAL	Alistair Andrew XX UDC	All day
Thursday 4 March 9.30 am Day 27	<b>PLANNING MATTERS</b>  STAL	Alistair Andrew XX SSE 1-1½ hours	AM/PM
Friday 5 March 9.30 am Day 28	<b>PLANNING CONDITIONS AND OBLIGATIONS</b>		AM/PM

**CLOSING SUBMISSIONS ON BEHALF OF THE APPELLANT**

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**INTRODUCTION AND TAKING STOCK**

1. The Submissions incorporate without repetition our Opening Submissions<sup>1</sup>.
2. We begin by reviewing briefly the position of the main parties following the completion of the hearing of evidence over the 7 weeks during which the inquiry has been sitting and against the background of their previously stated positions.

**STAL**

3. STAL's case remains precisely as originally set out in the Statement of Case<sup>2</sup> submitted with the appeal, supported evidentially in the Proofs of our expert witnesses and summarised in our Opening Submissions, namely that the appeal proposals accord with the development plan, are directly supported by Government policy and would give rise to minimal local environmental impacts whilst strongly supporting local and regional job creation and broader economic growth - all within a framework of conditions and obligations which would secure reduced local impacts and an improved package of mitigation measures going forward.
4. STAL has called and made available for questioning by the Panel, and by others where appropriate, 13 witnesses, all of whom have supported evidentially their respective elements of STAL's case. Some have been subjected to extensive cross examination over several days by UDC and SSE. The Panel will have heard the clarity and consistency of this expert evidence and observed the degree to which STAL's written

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<sup>1</sup> INQ1

<sup>2</sup> CD24.1

proofs of evidence were fully supported by the answers given by its witnesses in XX and ReX. It is on the basis of this evidence that we will, at the close of these submissions, request that this appeal is allowed.

## UDC

5. Of course, UDC's decision of 24 January, 2020 is the reason why this lengthy appeal has been necessary.
6. That decision was made 14 months after the resolution of its Planning Committee on 14 November 2018 to grant planning permission for the appeal development and constituted a complete *volte face* from the position it had previously taken. The Minute of the meeting of 24 January 2020<sup>3</sup> (eventually approved in September 2020, 8 months after the event) identify a number of matters which the Planning Committee considered to constitute *not merely* "material changes in circumstance" since the 2018 resolution, but matters sufficient to warrant refusal of planning permission: fleet mix variability and the WHO ENG18; PM2.5s and UFPs; "direction of travel" on CC and net zero. Faced with repeated and crisply expressed advice from all its Senior Officers, independent advice from external consultants of high repute and experience and Opinions from a raft of senior Members of the Bar (Stephen Hockman QC, Christiaan Zwart & Philip Coppel QC<sup>4</sup>), the UDC Planning Committee simply would not accept the advice it was being given and instead preferred to follow the urgings of SSE, recorded for all to see on its lengthy powerpoint presentation.
7. As Mr Andrew explained in his XinC: notwithstanding the seriousness of the decision:
  - i. no opportunity was taken by Members to defer this momentous decision in order to seek further information from STAL;
  - ii. no opportunity was taken to consider the potential to impose planning conditions which might have secured Members concerns; and

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<sup>3</sup> CD.13.4a

<sup>4</sup> Ibid, page 7

- iii. no opportunity was taken to consider whether the package of planning obligations agreed over the course of a year's discussion between STAL and UDC Officers and Members could be modified to meet the concerns of the Planning Committee.
8. Permission was simply refused. Mr Andrew, who sat through all 11 hours over two days, comments upon the extraordinary nature of the proceedings.
9. The UDC Statement of Case<sup>5</sup> submitted on 16 September, 2020, largely followed the themes contained within the RfR, but elaborated these in great detail over 30 pages to include a host of alleged deficiencies and additional requests for information and detail which had never previously been raised (or had been raised earlier and satisfied long prior to Jan 2020).
10. By December 2020, UDC's position had transformed once again into that confirmed in evidence by Mr Scanlon, presumably following mature reflection by its recently appointed new consultant team, including Dr Chris Smith, an air traffic forecasting expert.
11. Accordingly, UDC has run a very narrow case at this inquiry, which has accepted that the appeal should be allowed but has focused instead upon the form and content of conditions which should be imposed. The latest transformation of its case did not become apparent until its proofs of evidence were received and there has been no amendment to its Statement of Case. STAL has repeatedly expressed its fundamental concerns about the newly emergent Condition 15 concept (see our Opening Submissions<sup>6</sup> and Mr Andrew's Rebuttal<sup>7</sup>). However, Mr Scanlon's written proof<sup>8</sup> – and oral evidence<sup>9</sup> – were clear that his acceptance on behalf of UDC that the planning balance falls in favour of allowing the appeal is quite independently of the Council's case on Condition 15, so long as this is subject to an appropriate set of conditions which secure to a sufficient degree the impacts in the ESA. We will address below why the Panel can indeed be satisfied in this regard - and of course the Panel has a complete

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<sup>5</sup> CD24.2

<sup>6</sup> INQ1

<sup>7</sup> STAL/13/4

<sup>8</sup> UDC/4/1

<sup>9</sup> See in particular the answer to the Inspector (Mr Boniface) on Day 24 that para.9.77 of his proof stands as written

discretion as to the scope and content of any conditions which it considers should be applied, subject to the normal tests. What is clear, however, is that UDC's planning evidence, expressed by Mr Scanlon after exhaustive consideration of the planning balance in his section 9, is that the appeal should be allowed whether or not a "Condition 15" type condition is imposed.

12. The Council's evidence has at the same time sought to assert that the concerns expressed by Committee in January 2020 were a proper basis for the reasons for refusal. Mr Scanlon accepted in XX that the assessment of environmental impact in the ESA<sup>10</sup> is not materially different from that set out in the ES<sup>11</sup>. However, he asserted that the level of information provided to UDC in relation to these concerns as at January 2020 was inadequate. We will consider below in relation to our consideration of local impacts whether this is a tenable proposition.

### SSE

13. The application of Rule 6 of the Inquiries Procedure Rules has effectively given SSE equivalent status to UDC at this inquiry and it has taken full advantage of this status to occupy a great deal of inquiry time with extended XX of STAL witnesses. However, it must be borne in mind at all times that SSE is an anti-airport local pressure group, has no democratic mandate within Uttlesford or beyond, no special status within the planning regime and, in our view, has occupied a disproportionate amount of inquiry airtime when compared with all those who depend upon the airport for their livelihoods, their economic prospects, the development of their businesses, their opportunities to visit family and friends overseas or to take highly valued and eagerly awaited holidays abroad, but who could not reasonably be expected to assemble as a Rule 6 party represented by 2 QCs and to participate at this inquiry for 8 continuous weeks.
14. SSE has submitted evidence upon all matters, the recurring factor in which has been Mr Ross. We note in SSE's Closing<sup>12</sup>, the hint of a prejudice claim in respect of the witnesses which they did not call. However, we do not accept that these parties could

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<sup>10</sup> See CD3.18

<sup>11</sup> See CD7.18

<sup>12</sup> SSE Closing, para.1.2

not have given evidence remotely (as did many of our witnesses and all of UDCs) and we note that Dr Holman (who did not appear and whose evidence was not tested in XX) is noted<sup>13</sup> as giving air quality evidence in another case just a few weeks before the commencement of the inquiry. However, the evidence has revealed SSE's position to have been misconceived throughout. It is based upon the proposition that any airport development is "inherently harmful"<sup>14</sup>, with the inference that any and all aviation development is bad. This is patently not a proposition which finds support in law or in government policy.

15. Moreover, SSE's entire case has also proceeded upon what has seemed at times to be a wilfully misconceived approach:
  - i. It has asserted a requirement to demonstrate "sufficient need", which is entirely unreferenced in the MBU policy. This has been linked with preposterous and patently wrong-headed assertion that MBU policy provides no "in principle" support for the appeal proposals, even though the policy provides this support expressly and in terms;
  - ii. It has insisted that DfT MBU carbon modelling provides relevant and reliable evidence that DfT does not intend Stansted to grow above 35mppa in the period to 2050, despite an earlier assault by Mr Ross himself upon the credibility of the very same forecasts and in the face of written evidence from the most senior civil servants within DfT that SSE has completely misconstrued these forecasts.
16. SSE, alone of the main parties to this inquiry, maintains root and branch opposition to this most benign of proposals and does so, in this case, on a series of patently misconceived and/or irrelevant bases. It also appears to be setting up a series of arguments which it will seek to pursue as grounds of legal challenge if it is unhappy with the outcome of this appeal process. Unfortunately, a major task for the Panel will be to deal comprehensively with SSE's various complaints, as we can be sure that, if this is not done, we will back in the High Court with yet another legal challenge - this time to the outcome of this appeal.

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<sup>13</sup> SSE Closing para.12.20

<sup>14</sup> SSE/10/2, para.1.3.3



17. We note that Mr Stinchcombe & Mr Wald have already flagged up five threatened points of legal challenge at para.1.4 of their Submissions. These are all addressed elsewhere in our Submissions and we are confident that the Panel will reject SSE's assertions in respect of these 5 matters.

## **STRUCTURE OF STAL'S SUBMISSIONS IN SUPPORT OF THE CASE FOR ALLOWING THE APPEAL**

- The Nature of the Development
- Development Plan Compliance and the Presumption in Favour
- Other considerations: National Aviation Policy
- Forecasting and the Reliability of the Assumptions underlying the ESA
- Socio-Economic Benefits
- Local Environmental Impacts: Noise & Air Quality
- Carbon & Climate Change
- Surface Access
- Planning Balance
- Condition 15
- Conclusion

## **THE NATURE OF THE DEVELOPMENT**

18. The proposed development comprises minor airfield works to improve the efficiency of runway operation and a modest number of additional stands to support increased Passenger ATMs ("PATMs"). The potential for an increased proportion of PATMs would be reflected in the proposed combined ATM condition and an increased maximum number of passengers permitted to pass through the airport in any given year ("mppa"). The total number of ATMs would not exceed that already permitted. The difference is simply in the proportion of PATMs and the rate of growth predicted - all within the already permitted maximum number: see the full explanation in Mr Andrew's Proof<sup>15</sup> at paragraph 9.4. This reflects a deliberate decision by STAL not to promote an

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<sup>15</sup> STAL/13/2

increased total number of ATMs following public consultation on the scoping of the EIA for its application in 2017<sup>16</sup>.

19. The increase from 35 to 43mppa is achieved through a combination of factors: one is simply the larger size of passenger aircraft and increased load factors - bringing more passengers through the airport per average PATM than was anticipated in 2008 when condition MPPA1 was imposed in 2008; the other is the product of the increased proportion of PATMs and reduced number of CATMs and Other AMs. As we have seen, the increased total number of mppa is precisely as forecast in 2014 when STAL consulted upon its SDP, which was adopted in 2015<sup>17</sup>.
20. Mr Hawkins' evidence has set this increase in its commercial context for STAL, explained the ambitions of STAL to sustain and enhance its route network, increasing connectivity both in its already well established short haul European network but also with the addition of targeted long haul services. He has explained the significance of "headroom to grow" in attracting airline operators prepared to make the investment in expanding the network of routes from Stansted – and the vital role which clarity and certainty play in securing that investment.
21. Mr Hawkins was clear that Stansted could not expand up to its present ceiling and only then seek a further segment of capacity, but that investment in new routes, especially for long haul operators, would only come if there was reliable headroom to accommodate a material level of growth. He was also clear that, immediately prior to the pandemic, a variety of new routes were being discussed.
22. Thus the only material change in off-site impact over and above what was permitted by the SoS in 2008, is the additional 8mppa. Given STN's outstanding public transport offer, at least 50% of these passengers would be expected to use rail, bus or coach. The impact of the other 50% of additional passengers, heading in a variety of different directions, and spread as they are across the year and across the hours of the day, does not unduly exacerbate local peak hour congestion on the network. In consequence, even if the previously agreed ECC improvements to J8 of M11 are delayed or abandoned

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<sup>16</sup> SCI: see CD2.5

<sup>17</sup> See CD15.1: 40-45mppa

altogether, it has been possible to agree directly with HE and ECC (advised by Jacobs and AECOM respectively) a bespoke scheme of measures which would address airport related impacts on J8 - and by a comfortable margin.

23. Accordingly, it has been established that STN can deliver a meaningful increment in passenger capacity for London and the East of England, with minimal additional operational development, whilst remaining within its existing overall ATM cap, and taking advantage of its already record-breaking public transport facilities for terminal passengers. No party has seriously challenged these facts, which form the bedrock of the appeal proposal, and it should come as no surprise, therefore, that Senior Officers of UDC have so consistently recommended approval and that Mr Scanlon has now joined in the chorus.

#### **DEVELOPMENT PLAN COMPLIANCE: SECTION 38(6) AND THE PRESUMPTION IN FAVOUR OF SUSTAINABLE DEVELOPMENT**

24. STAL and UDC agree that there is compliance with the development plan. SSE does not engage with this exercise in Mr Arnott's proof and Mr Ross, unqualified as a planner, was not in a position to elaborate: XX3.
25. Mr Scanlon and Mr Andrew also agree that the presumption in favour of sustainable development is engaged via paragraph 11c of the NPPF, as the environmental protection policies of the ULP 2005 are consistent with the NPPF and not out of date. We do not believe the authorities in respect of the determination of whether or not development is "sustainable development" are in dispute, but they are referenced below for completeness<sup>18</sup>.

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<sup>18</sup> The presumption in favour of sustainable development is to be found only in para 11 NPPF and by working through the test in para 11: see *Barwood Strategic Land II LLP v East Staffordshire Borough Council* [2017] EWCA Civ 893. There is no "wider" presumption in favour of sustainable development arising outside para 11, including by reference to para 7 onwards. A decision-maker will only know if a proposal is sustainable or not by applying the test in para 11: see *Cheshire East BC v Secretary of State for Communities and Local Government*

26. The first “trigger” for the application of the tilted balance under paragraph 11d is “where there are no relevant development plan policies”. “That describes the situation where there is no policy in the development plan that is relevant to the decision whether the application should be granted or refused”: see *Paul Newman New Homes* [2021] EWCA Civ 15. That is plainly not the case here, as Mr Scanlon’s review of the LP policies demonstrates. The second trigger is “where the policies which are most important for determining the application are out-of-date.”: “That involves an evaluation by the decision maker of which of the relevant policies in the local plan are the most important, and whether they accord with current national policy”: *Paul Newman New Homes* at para 43. A full evaluation of these policies has been undertaken by Mr Scanlon. Mr Andrew agrees with his analysis that these policies comply with the NPPF and are up to date.
27. Mr Andrew additionally took the (belt and braces) view<sup>19</sup> that, even if paragraph 11d were engaged, a similar outcome would ensue, as limb (i) was not engaged and the many benefits of the proposed development were not significantly and demonstrably outweighed by their adverse impacts.
28. As noted above, SSE does not apply the statutory development plan, leaves this matter and its consequences for paragraph 11 of NPPF to UDC, and does not advance a case on this issue.
29. Worthy only of a footnote, the “emerging” ULP is no longer emerging. UDC agree it is withdrawn; and has no status or relevance whatsoever. NPPF guidance about the weight to be attached to emerging policies cannot apply once they have ceased to emerge. For the avoidance of doubt, the Inspectors expressed no conclusions on the airport specific policies, notwithstanding that a days’ time was occupied at the EIP with these policies. It is quite impossible to draw any conclusions from this position which would allow

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[2016] EWHC 571 at 26-27. Conversely, a development which satisfies the presumption under para 11 clearly cannot be rendered unsustainable by reference to paragraphs in the NPPF outside para 11.

<sup>19</sup> ReX’d Day 27

weight be attached to the now abandoned policies extensively trailed in Mr Arnott's Proof. This was another bad point which should not have been taken by SSE.

30. Accordingly, Appellant and LPA agree there is a presumption in favour of granting permission without delay. Such a presumption is of course rebuttable, but the balance is strongly tilted and a consideration would, it is submitted, need to be very powerful indeed in order to rebut this presumption.

### **DO OTHER CONSIDERATIONS "INDICATE OTHERWISE"?**

31. We now proceed to consider whether, against the background of agreed compliance with the statutory development plan and the engagement of the presumption in favour of sustainable development, there are other considerations which might conceivably indicate that planning permission should be refused. We consider, in turn, national aviation policy, the socio-economic benefits of the proposals and their local environmental impact.

### **National Aviation Policy**

32. As all parties agree, NPPF is effectively silent on aviation, and current government policy is set out clearly in the APF<sup>20</sup> and MBU<sup>21</sup>.
33. APF, whilst adopting a holding position pending outcome of Airports Commission ("AC")'s work, expressly supported the concept of MBU to meet the need for increased capacity at least until a clearer national strategy - and timetable for its delivery - emerged<sup>22</sup>. This remains national policy.
34. Once the government had accepted the Airports Commission ("AC")'s recommendation for a new NWR at LHR, it became necessary to consider again the role of other airports in the context of the government's broader emergent Aviation Strategy. This happened

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<sup>20</sup> CD14.1

<sup>21</sup> CD14.2

<sup>22</sup> See, for example, CD14.1, para.1.60

with the publication in July 2017 of “Beyond the Horizon: The Future of UK Aviation; A call for evidence”<sup>23</sup> 2017. Here the government records<sup>24</sup>:

“The AC noted in its final report that a new runway will not open for at least 10 years and it is vital that the UK continues to grow its domestic and international connectivity in this period, which will require the more intensive use of existing airport capacity.... We are aware that a number of airports have plans to invest further, allowing them to accommodate passenger growth over the next decade using their existing runways, which may need to be accompanied by applications to increase existing caps. The government agrees with the AC’s recommendation that there is a requirement for more intensive use of existing airport capacity and is minded to be supportive of all airports which wish to make best use of their existing runways including those in the South East. The exception to this is Heathrow, whose expansion is proceeding through the draft ANPS process.... Airports with planning restrictions that wish to take forward plans to ....increase the utilisation of existing runways will still need to submit a planning application to the relevant authority...environmental issues, such as noise and air quality and other others that supported the existing planning restrictions will be taken into account....the government believes that this issue cannot wait until the publication of the new Aviation Strategy. Therefore, as part of the call for evidence, it would welcome views with regards to this proposed policy.” (emphasis added). This critical document, setting out the government’s purpose in publishing the MBU Policy, goes entirely unmentioned in SSE’s Closing.

35. In parallel with this Call for Evidence, the ANPS was advancing slowly through various draft stages. By October 2017, the then Draft<sup>25</sup> ANPS noted at (what was then) paragraph 1.37, the above development and that “The Government’s policy on this issue will continue to be considered in the context of developing its new Aviation Strategy, and in the light of the responses to the call for evidence”.
36. By June 2018, the DfT had completed both its consideration of consultation responses on its proposed policy in relation to MBU and its preparatory work on the ANPS.

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<sup>23</sup> CD14.30

<sup>24</sup> Para.7.19-7.21 *ibid*.

<sup>25</sup> CD14.5, as put to Mr Ross in his XX3

Accordingly, on the same day were published both the ANPS (pursuant to section 5 of the Planning Act 2008) and MBU (as an early component part of the new Aviation Strategy: see HMG Webpage on the Aviation Strategy). Even Mr Ross accepted in XX3 that MBU policy was an early and “highly important” element of the Aviation Strategy.

37. The appeal proposals fall squarely within the scope of the MBU policy statement. This is not in dispute. However, the meaning and effect of the policy appears to be disputed by SSE and the weight to be attached to it was questioned by UDC. The latter questioning was expressed to be on the basis of the Court of Appeal’s judgment in the ANPS/Heathrow challenge - although Mr Scanlon retreated from this in XX, as that judgment was subsequently overturned in December 2020 by the Supreme Court<sup>26</sup>, of course, *after* his proof had been written.
38. The policy states in terms that “the government is supportive of airports beyond Heathrow making best use of their existing runways”<sup>27</sup> subject to assessment of locally associated benefits or environmental impacts and proposed mitigations.
39. It is STAL’s case that this allows the proposals to take advantage of “in principle support” for MBU given by national government to MBU proposals made to local planning authorities. Of course, it does not prejudge the weighing of local benefits and impacts, but it does make it unnecessary for local planning authorities to grapple with the highly complex issue of aviation need and whether, in principle, there is a national need for making best use at any given airport. As is clear, the government has consulted upon this position - in the terms set out in CD14.30<sup>28</sup> - and has expressed a clear policy response.
40. It is submitted that there is simply no other sensible interpretation of CD14.2. We note that UDC does not dispute this approach. Only SSE is maintaining its completely wrong-headed suggestion that MBU merely invites airports to make applications and that, thereafter, the local planning authority is at liberty to reach whatever conclusion it might wish on “the need” for the development, rather as it might in respect of a new

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<sup>26</sup> CD14.74

<sup>27</sup> CD14.2, para.1.29

<sup>28</sup> See above

foodstore. This is manifestly wrong, would defeat the purpose of the policy (and the very considerable effort taken by government to publish it at an early stage) and place a burden upon LPAs to grapple with issues which it has taken national governments, independent commissions of experts and the Higher Courts many years to resolve. The SSE approach to the interpretation of national MBU invites confusion, dissension and delay. It should be firmly rejected.

41. We also have the great advantage in this case that DfT and MHCLG are clearly and unambiguously aligned on the meaning and effect of MBU policy as applied to the very proposals now before the Panel. This arises as a direct result of SSE bringing claims for judicial review against both Government departments in respect of their rejection of SSE's request that the application be "deemed an NSIP" or "called in" for determination by either or both Secretaries of State. This led ultimately to the disclosure of Ministerial Submissions to both Secretaries of State, in each case signed off by Senior Officials within the DfT and MHCLG.
42. The first such advice<sup>29</sup> is dated June 2018 and is contemporaneous with the publication of MBU policy. In this document, at paragraph 28, the DfT records that STAL's application is "in line with Government policy on airports making best use of their existing capacity in the South East". There is no suggestion that an additional "need" test should be applied, nor that the application is deficient for not setting out to demonstrate a nationally contextualised bespoke need case.
43. The second such advice<sup>30</sup> is dated March 2019 and follows on from UDC's resolution of November 2018 to grant planning permission for the appeal proposals. Here the senior civil servant in the Planning Casework Unit advises the Minister, at paragraph 13, that "this proposal accords with current national aviation policies, which are supportive of airports beyond Heathrow making the best use of their existing runways". It also notes<sup>31</sup> that these policies "highlight the importance of aviation to the UK economy following the country's decision to leave the EU and the importance of increasing airport capacity to support the development of long-haul routes to and from

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<sup>29</sup> CD14.71

<sup>30</sup> CD12.15b

<sup>31</sup> Paragraph 14 *ibid.*



the UK post exit from the UK.” It notes, quite properly, that local economic and environmental impacts will be for LPAs to judge, but does not suggest that STAL should have demonstrated a “need” for the development in national terms independently of that set out in the referenced government policy.

44. It is also noteworthy that this Ministerial Submission was supported (at Annex D) by clear advice from DfT which cited the MBU Policy<sup>32</sup> and confirmed its status as “part of the Aviation Strategy”, published “separately alongside the NPS”.
45. In summary, it is simply untenable to reach any conclusion other than that “supportive”, means that the government expresses in principle support for MBU proposals. Anything less, would render the publication of MBU nugatory and a worthless exercise.
46. Of course, the other central element of the MBU policy is its “carbon stress test”, which examines the impact by 2050 of all UK airports pressing ahead, subject to defined criteria, with MBU. This exercise and its implications will be considered later in the context of our submissions on carbon, but this further reinforces our submissions above. Why would the government go to the very considerable trouble of modelling these carbon impacts if it was entirely neutral as to whether or not MBU applications come forward or are approved?
47. There are two further points which are made by SSE under this head, which derive from the wording of the ANPS<sup>33</sup>. These points are new to the SSE case, and were entirely absent from the legal onslaught mounted by its QCs upon the decision-making process of both DfT and MHCLG in 2018-2019, where no suggestion was made by SSE that the Departments had failed to apply the government’s own policy and should have considered whether STAL’s proposals met a “sufficient need” test.
48. Absent from the High Court challenges and SSE’s Statement of Case, these newly trailed points appeared for the first time in Mr Arnott’s proof and in SSE’s Opening Submissions. Mr Ross, on his third appearance<sup>34</sup>, suggested in XX that these points were the product of Mr Arnott’s scrutiny of the Manston DCO process. We shall never

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<sup>32</sup> CD14.2

<sup>33</sup> CD14.3

<sup>34</sup> Day 25

be able to confirm that with Mr Arnott, but it has not escaped our notice that SSE's Counsel were jointly instructed in the 2020 challenge to the Manston DCO and would have been alive to the argument.

49. In summary, first, SSE has contended that para.1.41 of the ANPS declares that the ANPS is “important and relevant” for other applications for development consent for an airport development not being one to which the ANPS relates. The formulation “important and relevant” derives from section 105(1)(c) of the Planning Act and signals that a given NPS represents the nationally adopted way to meet a given national infrastructure need and that this NPS should carry weight when determining a DCO application for development which seeks to meet the same need. In our submission, it is unarguable that the expression “application for development consent” refers to an application for a DCO and cannot apply to an application of planning permission. However, even if it did, the fact that the MBU as a policy statement has been published by the same Department of Government on the same day as the ANPS is surely sufficient to rebut any suggestion of conflict or even tension. Indeed, the DfT has stated expressly in CD14.71<sup>35</sup> that “Modelling undertaken to consider the policy of making best use of existing runways... did not affect the forecasts associated with proposed Heathrow expansion.”
50. Second, SSE now contends that paragraph 1.42 of ANPS imposes a requirement upon any applicant for planning permission or development consent wishing to make more intensive use of existing runway to demonstrate “sufficient need for their proposals additional to (or different from) the need which is met by the provision of a NW Runway at Heathrow”. The passage in question notes that “it may well be possible” for such need to be demonstrated; indeed this is expressed in precisely the same terms within draft paragraph 1.40 of the Draft ANPS of October 2017<sup>36</sup>. However, the final sentence of the comparable paragraph 1.42 in final version of ANPS has now evolved to read: “...Government policy on this issue will continue to be considered in the context of developing a new Aviation Strategy”. As has already been observed, the first substantive component of the new Aviation Strategy “caught up” with the slowly

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<sup>35</sup> Para.26

<sup>36</sup> CD14.5

emerging statutory ANPS and was published on the same day as the ANPS, viz. the MBU Policy<sup>37</sup>.

51. As Mr Ross expressly agreed in XX3, MBU Policy is not referenced in ANPS. This is no doubt because it did not exist as adopted policy when ANPS was completing its final procedural stages. However, it does now exist; it set out what the government expects from applications below the DCO threshold and notes that those above that threshold will be “considered on a case by case basis by the Secretary of State”<sup>38</sup> There is no suggestion that “sufficient need” is a question for applications below the DCO threshold and, as we have seen above, the DfT modelling for the MBU Policy confirmed that the policy “did not affect the forecasts associated with proposed Heathrow expansion”<sup>39</sup>.
52. Accordingly, it is submitted that the government’s own MBU policy (which is formally part of the Aviation Strategy) fully addresses any question of need in relation to the appeal proposals. Moreover, the supporting modelling work for MBU confirmed the absence of any impact on the case for the NWR at LHR. This is the basis upon which Mr Andrew (rightly) considers that ANPS is not relevant to this appeal. Mr Scanlon, for UDC, takes precisely the same view.
53. Of course, as with so many matters, SSE considers that it “knows better” than the Government itself and the local planning authority in this regard, but we have been denied the opportunity to test this policy issue properly by the non-appearance of Mr Arnott and the absence of a suitably qualified planning witness to replace him.
54. We suspect that Mr Arnott’s misconceived new point on sufficient need has emerged from a mis-application of the facts underlying the Report of the Manston ExA to the STN35mppa plus context.
55. The Manston ExA was faced with a full DCO application to re-open the airport and was obliged to examine in detail the question of “sufficient need” for those freight/cargo-led proposals. They noted the MBU Policy Paper<sup>40</sup>, but observed, correctly, that “freight or

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<sup>37</sup> CD14.2

<sup>38</sup> Paragraph 1.27 *ibid.*

<sup>39</sup> CD14.71, para.26

<sup>40</sup> CD14.59, para.5.5.20 & 5.5.21

cargo flights are not mentioned within this paper”<sup>41</sup> and do not return to consider it again. Manston was, of course, a DCO scale proposal and the ExA undertook a thorough UK-wide review of freight capacity, demand and forecasts, before concluding that the promoters had failed to establish sufficient need. Of course, the Secretary of State ultimately took a different view, although his reasoning has been quashed and the decision has been remitted to him for reconsideration.

### **Policy Summary**

56. In our submission, the support in principle for MBU so clearly articulated in recently published government policy documents offers yet further reinforcement to the development plan and NPPF presumptions in favour of this development. We do not suggest that this agglomeration of presumptions is incapable of rebuttal, but it is submitted that residual impacts of real weight and substance, incapable of adequate mitigation, would need to be identified in order to overcome the positive case for the development.
57. MBU policy asks local planning authorities to take “careful account of all relevant considerations, particularly economic and environmental impacts”<sup>42</sup>. These submissions will go on to consider the socio-economic evidence supporting the STAL’s proposals in order to examine whether there is yet a further layer of supportive considerations to weigh before turning to the local environmental impacts and associated mitigation in order to consider whether there are any considerations which might tell against the development. However, before the assessment of local impacts can be addressed, it is necessary to pause and consider the evidence which has been heard on the topic of forecasting, which necessarily underpins the assessment of these impacts – both economic and environmental.

### **FORECASTING AND THE RELIABILITY OF THE ASSUMPTIONS UNDERLYING THE ES & ESA**

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<sup>41</sup> Para. 5.5.21 ibid

<sup>42</sup> CD14.2, para.1.29

58. Mr Galpin is the only expert air traffic forecasting witness who has given evidence to the inquiry. It submitted that his professional credentials and experience at ICF, a major international provider of forecasting advice, entitles the Panel to accord very considerable weight to his evidence. He has provided carefully considered forecasts, using recognised ICAO procedures and having interrogated likely route developments at Stansted. Following the lengthy delay in determining the application and the emergence of the pandemic, these forecasts have updated by Mr Galpin for the ESA 2020 and an additional Covid low case has been developed as a sensitivity. It is submitted that this work represents a well-considered and robust approach to the likely growth of traffic at the airport over the next decade to 2032 (or to 2034 in the Covid low case). Moreover, STAL's case is strongly endorsed by two of its most important carriers: see WR2 and WR3. Stansted is home to Ryanair, one of the most dynamic and financially robust carriers operating in the UK, with the drive and vision to deliver substantial growth over the next decade; Emirates, is a key player in the long haul sector, with the financial strength and ambition to build its already impressive network of routes, supporting the critical international hub role of Dubai. We invite the Panel to reflect on this strong expression of support from the airlines who will actually be delivering much of the planned growth, (which is in stark contrast to the opposition expressed by airlines to BAA's G1 proposals in 2006-07).
59. By contrast, UDC position on forecasting is, to say the least, somewhat contradictory. On the one hand, Mr Scanlon tells us: "The Council has not challenged the Appellant's forecasting exercise and there is no suggestion that the updated forecast provided within the ESA does not represent a reasonable account of future growth in demand"<sup>43</sup>. At the same time, there has been excessive emphasis on the alleged unreliability of forecasts, with comparisons regularly being drawn with reading tea leaves.
60. The position of UDC is all the more curious given that the Council took advice from an independent air traffic forecaster, Dr Chris Smith, whose position in the UDC witness team was obviously sufficiently advanced for his evidence to be cross-referenced in Dr Broomfield's Proof & Appendices<sup>44</sup> and for a slot to be allocated for him in early versions of the programme. However, at the eleventh hour, Dr Smith was mysteriously

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<sup>43</sup> UDC/4/1, paragraph 8.5

<sup>44</sup> UDC/4/3, para.132

cast adrift and no satisfactory explanation has been offered for his disappearance from the UDC witness line up. Even though UDC is participating at this inquiry as the statutory planning authority, supposedly acting in the public interest, it has refused to share Dr Smith's advice to it, hiding behind the cloak of legal professional privilege to refuse to shed any light on the outcome of this publicly funded review of the ESA forecasts. There would be no need for "wild theories" (or, indeed, any theories) if reasonable requests for disclosure had been met.

61. Mr Scanlon appeared very uncomfortable when asked questions in XX about the role of Dr Smith in the UDC witness team, conceding eventually that Dr Smith did participate in team meetings to determine the shape and content of the UDC case. It is inconceivable, in our submission, having received expert advice on the subject, that UDC would not have proffered alternative forecasts or an informed commentary upon STAL's forecasts if it considered that it had an evidential basis for so doing which supported its case.
  
62. Instead, the inquiry has had the Condition 15 debate foisted upon it, at least in part founded upon the UDC-generated proposition that forecasting is wholly unreliable, akin to reading the tea leaves, and that, accordingly, UDC needs to be able to review any approval of the proposal at frequent intervals in the future, when there will be far greater clarity as to the rate of growth of traffic at Stansted. It is submitted that the position adopted by UDC is highly unsatisfactory, that Dr Smith's review should have been fully disclosed and that the attempt to airbrush him from the UDC case leaves one with real – and entirely legitimate - doubts as to the content of this advice and its likely consequences for UDC's evidential position at this inquiry. As it is, UDC has adopted "a position" on forecasting at this inquiry (namely that it is so unreliable that Condition 15 is required), but has not supported this evidentially and has actively removed from the inquiry the one expert whose evidence would have enabled the robustness of UDC's position to be tested. It was therefore with some surprise that we listened to several pages of UDC Submissions on forecasting founded upon an evidential vacuum. We ask the Panel to discount any aspect of UDC's Submissions or broader case in this regard which it considers to be unsupported by evidence.

63. SSE's position in relation to forecasting is scarcely more edifying. Its case is firmly rooted in the proposition that the Panel should adhere to the DfT 2017 Forecasts<sup>45</sup>, as re-run for the MBU Policy Paper in 2018. This is said in SSE's opening submission and Mr Ross's evidence<sup>46</sup> to be the "authoritative and independent" basis for forecasting growth at Stansted.
64. What, however, SSE failed to do was to acknowledge in Mr Ross's evidence that SSE – and Mr Ross in person in sworn testimony to the High Court<sup>47</sup> – had only a year before lodging his "Forecasting" Proof of Evidence publicly denounced these very same forecasts now asserted to be "authoritative" as:
- i. making "little sense";
  - ii. raising "fundamental questions about the reliability of the [DfT] model"; and
  - iii. containing "a staggering degree of error".
65. This omission, in circumstances where Mr Ross knew<sup>48</sup> that he had a duty to the Panel to set out all relevant matters in his proof of evidence, was astounding. It suggests that he was more intent on generating an arguable case for this inquiry than in ensuring that his evidence was complete, coherent and consistent with his previously expressed testimony. Whilst Mr Ross described his/SSE's behaviour as "naughty", that adjective scarcely does justice to his conduct. We note that SSE's Closing Submissions completely avoid mention of this woeful passage of evidence from Mr Ross.
66. At the same time, and in the same part of his evidence, Mr Ross has wilfully distorted the position carefully explained by the DfT in the same High Court proceedings that the airport specific (and in particular Stansted specific) forecasts were not intended by the DfT to be relied upon as indications of growth, but that the exercise was expressly directed to the aggregate effect of the MBU policy: see in particular the First & Second Witness Statements ("WS") of Sarah Bishop for the Secretary of State for Transport<sup>49</sup>.

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<sup>45</sup> CD14.14

<sup>46</sup> SSE/3/2, para.9.1, for example.

<sup>47</sup> CD14.61, paragraphs 57-58

<sup>48</sup> XXd by THQC on Day 7

<sup>49</sup> CD17.65, paragraphs 86-90; CD17.66, para.12

67. WS2, para.12 notes, referring back to paras 87-90 of WS1, that there is “uncertainty in any forecast, especially at airport level where there are strong overlapping passenger catchments that may make forecasting demand less predictable (the overlap of Stansted Airport and Luton Airport catchments is a good example of this). However, regardless of whether or not the predicted statistical distribution of passenger demand at a given airport is fully accurate, at national level the predicted overall or total passenger demand is unchanged and will be met by other airports and produce aggregate CO2 emissions which can be identified with a greater degree of certainty. This overall demand and resulting CO2 emissions figure was shown to be compatible with carbon targets in place at the time of MBU policy formation.”
68. This passage is worthy of quotation in full, as it provides clear and irrefutable evidence that the DfT 2017 Forecasts<sup>50</sup> (as re-run for MBU in 2018) are not intended to be reliable at an individual airport level, certainly not in the shorter term and certainly not “where high levels of competition between airports occur”. As Mr Ross’s own Third Witness Statement in these same proceedings observed<sup>51</sup> “a further example of our concern regarding the models reliability is the DfT forecast that Stansted would handle 22.3m passengers in 2018 whereas it actually handled 28.0m”. Given these substantial inaccuracies in these forecasts for the early years, it is hardly surprising that their projection and extrapolation from such an inaccurately low base cannot provide a reliable picture of Stansted’s growth over the next decade or so. The problem is compounded with the AC’s forecasts and commentary, which are now long out of date and simply fail to paint an accurate picture of Stansted’s potential for growth, as subsequently illustrated – indeed proven - in its performance the years leading up to 2020.
69. Notwithstanding their patent temporal and geographic weaknesses, as described by Ms Bishop, Mr Ross and SSE now cling on to the DfT 2017 forecasts<sup>52</sup>, following their Damascene conversion as to their reliability and now they think they can deploy them evidentially to their advantage. However, these forecasts are not expressed<sup>53</sup> to be policy, but simply a basis for informing policy decisions. As Mr Galpin explained in

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<sup>50</sup> CD14.14

<sup>51</sup> CD14.61, para.57-58

<sup>52</sup> CD14.14

<sup>53</sup> Ibid Introduction



evidence, CD14.14 was the forecasting document which the government used in reaching its decision on which of the three options of new runway capacity in the SE it wished to support (out of the two at LHR and LGW). This is the reason for the reference at para.1.2 that forecasts can be “used to inform decisions on the need for and location of new airport capacity”: see the detailed assessment of the three options at Annex E and elsewhere.

70. By contrast, Mr Galpin’s forecasts do rely upon accurate figures for the Stansted’s traffic levels up to 2019, they do factor in specific local market data and assess the opportunity to serve Stansted’s strong local catchment. These forecasts will, necessarily, be vastly more reliable than those of DfT, but particularly so for the period to 2032 (or 2034 in the Covid low case), which is the period for which they are expressed to be valid. The labels “short term” and “long term” do not have a standardised meaning in air traffic forecasting, but it is clear that DfT was forecasting strategically to 2030, 2040 and 2050. In the short term, DfT 2017 did not forecast Stansted to reach its actual 2018 throughput until 2028<sup>54</sup> (10 years later than in reality!). It is inevitable that they will be far less accurate than Mr Galpin’s for the period for which Mr Galpin has produced his forecasts and with which this inquiry is principally concerned. If the picture changes by 2050, due for example, to the opening of a third runway at LHR, then Stansted, along with other South East airports, may conceivably lose traffic to an expanded and reinvigorated Heathrow. That, however, is not a relevant consideration for the MBU policy where building UK capacity and connectivity in the interim is the critical objective.
71. Contrary to SSE’s Submissions, we do not accept that MBU Policy obliges an airport such as Stansted, seeking to make best use of its existing capacity, to anticipate or assess which other proposals for MBU *might* be approved in the future elsewhere. That is not how the planning system works. Many airports may have aspirations or ambitions (expressed with varying degree of vagueness) to expand, but until these are approved, they do not have status for planning purposes and do not need to be treated as commitments. If, in due course, these proposals are formally advanced, then their promoters will have to have regard to any consent for MBU expansion granted at

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<sup>54</sup> See STAL/2/2

Stansted (or elsewhere). By contrast, where there is already room for some incremental growth without the grant of further consents (such as at LHR or LGW), then Mr Galpin explained that he had allowed for such growth in producing his forecasts<sup>55</sup>.

72. Mr Ross has mounted an attack on the Mr Galpin's "base case" for the DM scenario. However, Mr Galpin fully justified this in evidence: see in particular his Rebuttal Proof<sup>56</sup>, sections 3 and 4. It was Mr Ross's material which was found wanting when tested in XX. He was particularly asked to explain the provenance for the assumptions as to pax/PATM made in section 5 of his Forecasting Proof<sup>57</sup>. He could only suggest that his figures were his "judgments" and confirmed that none of these figures had been validated by a forecasting expert. In particular, he could point to no evidential basis for his assumed 0.65% annual growth rate in pax/PATM. There was mention of some spreadsheets, but these were never produced. We ask the Panel to prefer Mr Galpin's expert evidence on these matters.
73. A final point on the forecasting evidence is SSE repeated litany that previous forecasts have shown "optimism bias" and should be discounted. Whilst it is true that many earlier forecasts have not come to pass, this has usually been for perfectly understandable reasons, such as the impact of the global financial crisis. However, other than SSE point scoring, it is very difficult to see why this matters to the planning decision which the Panel is required to make. If the predicted impacts (economic and environmental) are ultimately postponed for a year or even several years, due to growth following a slower trajectory, this would have no meaningful impact on the assessment of the proposed development and cannot possibly provide a reason to refuse planning permission.

### **THE SOCIO-ECONOMIC BENEFITS OF THE DEVELOPMENT**

74. As we noted in our Opening Submissions, Stansted is the largest passenger airport serving North and East London and the East of England Region, providing balance to the London system of airports, which is otherwise so heavily weighted towards the West and South by Heathrow & Gatwick. It is also located at a pivotal location regionally, at

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<sup>55</sup> STAL/2/2, para.3.10

<sup>56</sup> STAL/2/3

<sup>57</sup> SSE/3/2, paras.5.3.7 & in section 5.4

the junction of the M11 and A120, half way between London and Cambridge and just north of the new A414 junction 7A on M11. This enables Stansted to make a major contribution to the region and to the growth corridors in which it sits, as explained by Ms Congdon<sup>58</sup>. This contribution will be all the more valuable as the UK tries to develop its connectivity and boost economic growth post Brexit and post Covid. Connectivity as an engine for growth has many dimensions, ranging from the obvious facilitation of travel by business passengers, through increased bellyhold cargo opportunities, to the provision of an air-bridge for highly valued employees in the bio-tech sectors who rely on air travel to maintain regular links with family overseas.

75. On Day 4 of the inquiry, a wide range of witnesses gave direct and eloquent testimony as to the critical connectivity role which Stansted plays for the region. These witnesses represented the regional business community (including exporters) and included the CBI, regional Chambers of Commerce, Cambridge Ahead and one of the region's largest, fastest growing and most dynamic employers, Astra Zeneca. They gave powerful qualitative evidence, subject to cross examination by Mr Ross, of the user benefits which they would derive from growth and in particular network growth at Stansted.
76. Additionally, in this context, it is important to have regard to the range of educational facilities which STAL sponsors on the airport campus and which is providing learning and training opportunities for hundreds of students annually, along with a clear route to employment thereafter. As Ms Karen Spencer explained on Day 4, these facilities now have a proven track record and are being expanded. The provision of a greater number of potential jobs on site will enable the conversion rate from education to employment to be increased. This is plainly both a social and economic benefit.
77. UDC does not contest the socio-economic benefits of expanding capacity at STN. A wide range of key regional economic stakeholders, including Essex County Council, is strongly supportive of growth at Stansted. Mr Scanlon, for UDC, reviews the evidence in his proof and concludes that these considerations should attract "significant positive weight in the balance"<sup>59</sup>.

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<sup>58</sup>STAL/12/2 & 4

<sup>59</sup> UDC/4/1, para.9.34

78. *Only* Mr Ross seeks to diminish these benefits. We do not accept that Mr Ross's previous business career with Bass (some decades ago) puts his evidence on a par with that of Ms Congdon and Ms McDowall. Mr Ross was unable to refer us to a single piece of economic advice provided to an airport sector client which is in the public domain. Whilst Mr Ross's long history of carrying forward SSE's assault upon proposals to expand Stansted's operations is not in doubt, that is not the same as undertaking a balanced and independent expert assessment of the socio-economic impacts of airport growth, as STAL's two witnesses on this topic have sought to do.

### **User Benefits**

79. Mr Ross has tried to goad STAL into commissioning a complex piece of modelling to quantify user benefits. This can only be undertaken on a national basis and STAL simply did not - and does not - consider that such an exercise would be of value either to UDC or to the Panel, especially given the regional focus of the case advanced by STAL. Moreover, such an exercise is not required by MBU nor by any other element of national aviation policy.

80. STAL made its position clear in its Scoping Report<sup>60</sup>. SSE, despite a very lengthy response, running to over 20 pages<sup>61</sup>, did not request that user benefits be monetised or otherwise subjected to quantification, as Mr Ross conceded in XX. So this yet another bad SSE point, raised late in the day and after the scope of the ES had been fully and properly determined by UDC subject to normal statutory processes – and with the participation of SSE.

81. Mr Ross did concede in XX, however, as he was obliged to, that user benefits can be evidenced directly by parties who wished to take advantage of improved connectivity, precisely as has happened at this inquiry. He did not challenge the global economic role and profile of Cambridge tech cluster (rivalled only by E & W Coast of the USA) and accepted in XX that “Cambridge is driving extraordinary levels of job and broader economic growth and is of great importance to the economy of the East of England”.

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<sup>60</sup> CD4.2, para.12.13

<sup>61</sup> CD4.4, p.21 onwards to p.25 & CD23.55

82. Mr Ross has certainly not undertaken any numerical assessment (declaring that this was “not my job” XX’d). At the same time, he seemed not to have engaged fully with Ms Congdon’s evidence, with which he did not claim particular familiarity and did not challenge once during his 2 hours XinC, although this evidence had been in the public domain for 2 months by the time this topic was heard at the inquiry.
83. In XX, he did not challenge Ms Congdon’s conclusion as to the role of connectivity in economic growth; nor Stansted’s role as a key driver of growth in the region. Mr Ross was obliged to acknowledge (XX2) that not a single business has given evidence that its prospects of growth will be *hampered* by the proposed expansion of Stansted’s route network. On the contrary, representatives of the business community have given extensive evidence that the converse is true and that economic growth will flow from increased connectivity. This evidence is simply ignored in SSE’s Submissions.

### **Displacement**

84. This is yet another woefully misconceived SSE argument, obliging LPAs determining MBU applications to assume that proposed additional capacity they are considering is “footloose” and to undertake a comparative exercise to examine where in the UK such capacity might, in theory, be better directed. This is another example of wrong-headed thinking by SSE: it cannot possibly have been in the contemplation of the government when it published its MBU policy and it is a task which individual LPAs are self-evidently not well equipped to undertake.
85. Although Mr Ross purported not to be pointing the finger at Luton, he plainly was; although neither Luton Airport nor Luton Borough Council object to these proposals and, indeed, Luton’s forecasts assume that Stansted gains planning permission to grow to 43mppa.
86. Moreover, additional capacity can be provided at Stansted with the bare minimum of additional infrastructure. This is in contrast to other proposals such as those at Luton, which require extending the airport infrastructure across a sensitive valley and are far

more capital intensive<sup>62</sup>; and, as we have seen, there is no requirement at Stansted for any greater number of ATMs, merely a modest re-assignment of PATMS within the total already permitted.

### **Trade balance**

87. This is a very well-rehearsed argument for Mr Ross and SSE, who ran a very similar point at the G1 inquiry and subsequently in the High Court<sup>63</sup> – all to no avail. The simple point is that Government policy does not treat outbound tourism in the simplistic way which Mr Ross suggests is appropriate<sup>64</sup>. There is no legal or policy basis to suggest that the government supports constraining air travel, with all the social and economic benefits which it brings (many of which are not easily capable of monetisation) by reference to the trade balance. Moreover, even if this was the case, then the issue is a complex one, with the need for very careful interrogation of the alternative ways in which such monies might be spent and the potential for these, too, to contribute negatively to the trade balance (for example by the purchase of imported goods, such as cars or furniture, or by taking a foreign holiday by other means than air travel).

### **Cost of carbon**

88. This is considered to be neutral factor in this case, as the incremental impact in carbon terms of DC over DM is a tiny, negligible fraction. This assessment is before one takes account of the convergence between DC and DM up to 2050, as shown on Mr Andrew's Figure 1<sup>65</sup>. In any event, the DfT does not ask that this be assessed for MBU applications.

### **Job creation**

89. The predicted growth will provide jobs and increased economic activity, as explained by Ms McDowall in her proof and rebuttal proof. UDC does not challenge Ms

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<sup>62</sup> See Figure 3.1 of CD 14.46

<sup>63</sup> CD12.3a, para.14.237 & CD14.64, para.50

<sup>64</sup> See APF and WP refs

<sup>65</sup> STAL/13/2, page 35

McDowall's assessment of 3,000 additional direct jobs and 5,600 total (to include indirect and induced): see her Table 3.3.4<sup>66</sup>.

90. SSE, as recently as last September in its SoC<sup>67</sup>, asserted that the true figure should be 2,000 direct jobs. However, by the time Mr Ross's proof was issued, this figure had been slashed to 1,200. The adjustment went completely unexplained by Mr Ross in XX2, although we hazard that the explanation may be "pessimism bias". Whatever the explanation, Mr Ross went on to accept the even 1,200 jobs was a "substantial number", with the clear implication that even he could not completely gainsay the benefits of the development.
91. Mr Ross's assessment is rendered even more unreliable by his assertion that the proposed growth will generate *no* indirect or induced jobs, despite SSE requesting at the Scoping stage that STAL assess precisely these elements of job growth, presumably in the knowledge that these categories of jobs are universally assessed for proposals such of this scale and nature. The SSE response given in XX by Mr Ross, namely that SSE simply wanted these figures to be assessed so that they could ignore them, lacked credibility and suggested that SSE was, even at the earliest stage in the planning process, more interested in the forensic endeavour of manufacturing an objection than in a genuine examination of the merits of the appeal proposals.
92. Mr Ross's minutely argued examination of the range of jobs (and salaries) available at Stansted Airport was a self-defeating exercise. It revealed that Stansted generates a good range of jobs across all categories to suit a very wide variety of employee. SSE's case that UDC is a district largely populated by executives, as well as being a highly unattractive argument, is a complete red herring. Indeed, Mr Ross was obliged to admit that there is no conceivable objection to an employment hub (such as STN) providing a variety of jobs attractive to workers beyond its district boundaries so long as there is good public transport access available to take them to and fro their workplace. This is patently the case for much of NE London, Harlow and other settlements served by WAML and the parallel (and perpendicular) bus routes.

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<sup>66</sup> STAL/11/2, page 17

<sup>67</sup> Paras.8.1-8.4

93. Accordingly, it is submitted that Mr Scanlon for UDC was entirely correct to attach significant weight to the socio-economic issue. Thousands of jobs and a real boost to regional economic growth are at stake, such that the arguments for allowing the appeal become even more heavily tilted in its favour.

**WHAT THEN ARE THE LOCAL ENVIRONMENTAL IMPACTS WHICH MUST BE WEIGHED IN THE BALANCE?**

94. At the outset, we observe that the ES & ESA have assessed a wide range of effects in considerable detail. No Regulation 25 requests have been made by UDC in respect of the EIA provided. Mr Thomson of RPS coordinated the assembly of the ES and ESA. He submitted a Proof of Evidence to the inquiry<sup>68</sup> speaking to the scope and comprehensive nature of the EIA process for the appeal development. No challenge was made to his evidence and no rebuttal evidence was served by any party seeking to contradict the account he gives in his Proof. We reject any suggestion that this EIA did not comply with the 2017 Regulations.

**NOISE**

95. It is, in our submission, highly significant that the noise impacts of the proposed development have been the subject of so little dispute at this inquiry. If, as SSE allege, all airport development, including these proposals, is inherently harmful, then the most obviously controversial impact by far would have been expected to be noise. This has not proved to be the case.
96. The noise impacts of the development have been the subject of extensive analysis by Mr Vernon Cole, a distinguished expert in this field. He concluded in the Chapters which he contributed to the ES and ESA that there were no unacceptable impacts associated with the appeal proposals. His work was reviewed for UDC by their own officers and independently by Mr Peter Henson of Bickerdike Allen Partners, another highly experienced consultant. Their combined view was that the noise impacts were acceptable and so professional officers reported to UDC on numerous occasions.

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<sup>68</sup> STAL/3/2



However, SSE's presentation<sup>69</sup> on the inapplicable WHO ENG18 and entirely speculative fleet mix issues misled the Committee into rejecting the soundly based recommendations of Officers, supported by a phalanx of well-aligned professional advice.

97. Mr Trow was newly instructed in September 2020 to advance the Council's noise reason for refusal and, after a lengthy discourse, he concluded<sup>70</sup> that "the Development is acceptable having regard for [sic] the effects presented within the ESA" and subject to appropriate conditions.
98. The Panel now has the benefit of a SoCG on Noise<sup>71</sup>. This leaves little room for doubt: "The development is acceptable and there are no noise grounds on which to refuse the current application". Mr Trow confirmed in XX his complete contentment with that proposition.
99. Mr Peachey's evidence for SSE is focussed upon methodological disputes and disagreements and completely fails to establish any basis for the refusal of permission. We have been completely unable to test this evidence, but it has been addressed and rebutted by Mr Cole at STAL/4/4, Part 2 In particular, we reject Mr Peachey's speculation as to how government noise policy should or might develop.
100. In short, there is nothing approaching a noise based reason for refusal disclosed by the evidence of any party.

### **Mitigation**

101. What is clear from the ES and ESA is that the noise effects reported therein support the imposition of a noise contour condition which will be considerably tighter than area conditioned by the 2008 planning permission and currently in force, thereby securing a reduction in community noise impacts going forward when compared with those which the Secretaries of State authorised in 2008. This reduction would be secured as a direct consequence of the grant of planning permission for the appeal proposals.

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<sup>69</sup> CD 13.4(c)

<sup>70</sup> Trow Proof, para.8.11

<sup>71</sup> CD25.3

102. The “51, 54 or 57” dB LAeq daytime contour dispute was never a dispute of principle. It did not reflect any unwillingness on the part of STAL to accept the adjustment to the contour level which is considered to represent the onset of community annoyance (i.e. 54 rather than 57). It simply reflected the preference of STAL for a contour which could easily be compared with historic noise contours in operation at Stansted for two decades. The contours move together, so a tighter 54dB contour will also be a tighter 57dB contour. This preference for consistency was shared with UDC Officers<sup>72</sup>, who proposed a 57dB LAeq contour as Condition 7 to the permission. Mr Trow has now moved on from his preference for a 51 dB contour and both parties have “met halfway” at 54dB LAeq 16 hour.
103. Another notable feature of the noise assessment reported in the ESA is that the night noise analysis for the Development Case is actually more favourable than that which would obtain in the Do Minimum Case, due to the increased numbers of quieter “new gen” aircraft which would make up the fleet utilising Stansted if the development goes ahead. Mr Cole has also given evidence on the shoulder periods, in which there will be virtually no change in aviation activity.
104. Noise contours have been produced, which illustrate these effects. This has led to a rehearsal of the debate at the G1 Inquiry as to whether or not a night noise contour should be imposed. STAL has resisted this on the basis that this would result in two overlapping regimes operating to control night noise impacts. Indeed, this is precisely the basis upon which the Secretaries of State rejected such a proposal in 2008. This is an outstanding matter upon which the Panel will need to take a view; however, the positions of the parties are clear. One factor which can be dismissed is Mr Ross’s assertion that the DfT is currently consulting on the de-designation of Stansted airport. This is patently not the case<sup>73</sup>. Moreover, if Stansted were ever to be the subject of de-designation, it is perfectly obvious that the existing regime would need to be replaced by something else. The nature of that replacement regime would inevitably be the subject of consideration at that time.

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<sup>72</sup> See CD13.1b Schedule of Conditions attached to the Committee Report, Condition 7

<sup>73</sup> See CD19.37, page 23

## **Other noise mitigation**

105. This includes a major enhancement of the noise insulation grant scheme, with wide ranging benefits for both residential properties and schools, as set out in Schedule 2 to the UU, with generous geographic and financial provision, as Mr Trow accepted. The scope of this mitigation is all agreed, with one exception to which we now turn.

## **Thaxted School**

106. Government policy as set out in the APF<sup>74</sup> requires for schools to be provided with acoustic insulation when exposed to noise levels above 63 dB  $L_{Aeq,16h}$ . This is likely to be reduced to 60dB if the provisions in Aviation 2050<sup>75</sup> are adopted into policy. [Qualification for the residential SIGS scheme is set out in Schedule 2 of the UU<sup>76</sup>. For daytime noise, the lowest level of qualification starts at 57dB  $L_{Aeq,16h}$  or N65 200.]
107. Schedule A7.A/SCH8 in ES Appendix 7.A<sup>77</sup> reveals that no schools are exposed to noise levels above the current government SIGS threshold of 63 dB  $L_{Aeq,16h}$  for any of the assessment scenarios. Only Howe Green, is exposed to levels above the proposed reduced threshold of 60dB. In total, only three schools (Howe Green, Spellbrook and Little Hallingbury) are exposed to levels above the lowest SIGS daytime qualification threshold of 57dB.
108. Following submission of the 2018 ES, discussions with UDC and their noise advisors resulted in an agreement that STAL would also consider noise effects at schools where flyover noise levels exceed 72dB  $L_{Amax}$  in accordance with guidance in BB93<sup>78</sup>. The

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<sup>74</sup> CD 14.1

<sup>75</sup> CD 14.27

<sup>76</sup> CD 26.30a

<sup>77</sup> CD 8.3

<sup>78</sup> INQ 14

subsequent assessment is discussed in Section 3.2 of the Notes to inform the UDC Planning Committee<sup>79</sup> Report prepared by Mr Henson of BAP in August 2018.

109. The results of the flyover analysis at schools are set out in Section 8 of Mr Cole's proof<sup>80</sup> and Appendix 8<sup>81</sup>. A total of five schools are assessed as likely to be exposed to aircraft flyover noise levels above 72dB  $L_{Amax}$ , the three listed above plus Leventhorpe and Mandeville. Thaxted was the subject of a detailed analysis<sup>82</sup> to verify whether it would be eligible for SIGS, but the analysis determined that it was not forecast to be exposed to noise levels in excess of:

- Government SIGS threshold: 63 dB  $L_{Aeq,16h}$  (now) or 60 dB  $L_{Aeq,16h}$  (future, possible);
- STAL residential SIGS
- daytime lowest threshold: 57 dB  $L_{Aeq,16h}$  or N65 200;
- BB93 based flyover noise level: 72 dB  $L_{Amax}$ .

110. Mr Trow suggested in his proof that it should be considered eligible for qualification on the basis that it is forecast to be exposed to higher  $L_{Aeq,16h}$  noise levels than Leventhorpe and Mandeville, and to exclude it is therefore inconsistent. However, he failed to point out that it is not the  $L_{Aeq,16h}$  value that justifies qualification for those particular schools but the 72 dB  $L_{Amax}$  flyover value.

111. In Mr Trow's XinC, he also suggested that, although the N65 value at Thaxted for future development cases does not exceed the SIGS qualification value of 200, it is close enough to indicate likely qualification. A7.A/SCH8 in ES Appendix 7.A identifies values of 189 for 2027DC and 161 for 2032DC. Mr Cole pointed out in XinC and XX

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<sup>79</sup> CD 19.38

<sup>80</sup> STAL 4-2

<sup>81</sup> STAL 4-3

<sup>82</sup> CD 19.25

that the value in 2019 was already 164 and if this were sufficient to be a cause of noise disturbance at Thaxted School this would have already been highlighted and may have given substance to his claim. However, there is no history of Thaxted School raising concerns about levels of noise due to aircraft flyovers and forecast noise changes associated with this development are small enough that we do not expect that situation to change.

112. This is a matter upon which the Panel will not doubt wish to reflect and reach a clear view so as to trigger the “blue pencil” clause in the UU as appropriate. We consider it highly relevant that neither Thaxted School itself, nor ECC as Education Authority has made representations during this lengthy process to suggest that sound insulation is required.

### **The reason for refusal in relation to noise impacts**

113. The Panel will recall all too well that UDC Members reached their conclusions on noise in reliance two clearly identified matters:
- i. The significance of the WHO ENG18; and
  - ii. The possibility that the forecast fleet mix at Stansted might change, giving rise to different impacts in the DC case.
114. First, in relation to the WHO ENG18, Mr Trow offers not one word of support for the position adopted by UDC Members. He is clear in his proof that he regards these guidelines as “idealistic”<sup>83</sup> and that their implementation is “not feasible without a significant step change in aircraft technology, otherwise reduction to these levels would result in significant harm to the aviation industry and economies”<sup>84</sup>. In XX, Mr Trow expressly accepted that the WHO Guideline levels “have no current status in government policy for the assessment of aircraft noise” and that he was “not advocating their use by UDC”. This approach is identical to that adopted by Mr Cole, who discusses the WHO ENG18 at length in his main proof<sup>85</sup>.

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<sup>83</sup> UDC/x/y, para.4.20

<sup>84</sup> Ibid para.4.21

<sup>85</sup> STAL/4/4

115. Second, in XX, Mr Trow was categorical in his rejection of the need for a LPA to give any consideration at all to fleet mix issues. He was adamant that the issue for the LPA was simply the setting of an appropriate “noise related restriction” and that it would then be for the airport to ensure that flights were scheduled in order to achieve compliance with that restriction.
116. We looked at the Jan 2020 Report<sup>86</sup> at the end of Mr Trow’s XX, which concluded with him accepting that he agreed with UDC Officers that WHO ENG18 were and are “not government policy and not the appropriate way to assess this application” and that there was “no requirement for an additional sensitivity test” or address any uncertainties regarding the fleet mix as “the noise contour was the appropriate safeguard, which puts the ball firmly in the Airport’s court”.
117. Accordingly and in our submission, the noise reason for refusal and the basis upon which it was advanced remain entirely undefended by UDC’s expert noise witness. Indeed, Mr Trow readily accepts that there is no noise based reason to withhold permission. We will return to this reason for refusal again in our submissions on costs.

## **AIR QUALITY**

118. As with noise, air quality is no longer pursued as a reason for refusing permission. Dr Broomfield accepts that the development is acceptable on AQ grounds subject to the imposition of suitable conditions<sup>87</sup>. This is, of course, the same conclusion as was arrived at by UDC’s original air quality consultants, WYG<sup>88</sup>, and its experienced planning officers, who advised the Committee accordingly.
119. Before turning to consider the negligible impacts of the development on air quality, it is necessary to set out the relevant policy context in a little more detail, in light of Dr Broomfield’s surprising contention that national policy in the NPPF obliges STAL to demonstrate an absolute reduction in emissions as a result of the development,

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<sup>86</sup> CD13.4b

<sup>87</sup> Ms Holman, on behalf of SSE, was not called to give evidence. Her evidence has been comprehensively addressed by Dr Bull in his rebuttal proof and Dr Bull has also responded to further requests for clarification by SSE. Her evidence is not therefore addressed further in these closing submissions.

<sup>88</sup> See CD 13.1b for WYG final comments

regardless of whether or not these emissions result in any adverse air quality impacts; and that any increase in emissions would therefore be contrary to the policy objective in paragraph 170(e) of the NPPF to help to improve local AQ “*wherever possible*”.

120. This interpretation of para 170(e) is then relied upon to seek to justify the imposition of a set of air quality conditions, which would constrain emissions to the levels assessed in the do minimum case at 2027 and 2032<sup>89</sup>.
121. The rationale for this is said by Dr Broomfield to be to “*specify a limit on emissions which would result in an improvement in the air quality impact of the airport compared to the situation if the proposed development does not go ahead*”<sup>90</sup>. In reality, the effect of the condition would be to prevent the airport from growing to 43mppa at all (or, indeed, from utilising the number of atms already permitted), based on its projected fleet mix.
122. Having abandoned any attempt to defend the reasons for refusal, this is now the central plank of UDC’s air quality case. However, it is hard to believe that Dr Broomfield really considers this to be a sensible argument. There can be no possible justification for constraining the airport to the emissions forecast for the DM scenario, when the air quality assessment does not predict *any* adverse impacts on air quality based on the fleet mix assumptions in the ES/ESA. This would negate the purpose of undertaking an EIA in the first place. It would also defeat the primary purpose of this planning application, which is not to deliver improvements in air quality *per se* but rather to enable the airport to grow to 43mppa, in a manner that does not give rise to unacceptable air quality and other local environmental impacts.
123. Moreover, anyone reading UDC’s closing submissions would be forgiven for thinking that AQ will get *worse* between now and 2032 with the development in place. It is said in terms that there will be a “*consistent picture of worsening air quality.*”<sup>91</sup> This is simply incorrect. The correct position, as Dr Broomfield accepted in XX, is that there will be a significant *improvement* in AQ between now and 2032 with the development

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<sup>89</sup> CD 26.10

<sup>90</sup> CD 26.11

<sup>91</sup> UDC Closings para 47

in place. There is, therefore, nothing remotely incompatible about this development with the Government's ambitions to continue to "improve" air quality over time.

124. With these preliminary observations in mind, we turn to consider the policy context.

### **The policy context**

#### UDP Policy ENV13

125. The starting point is the policy ENV13 of the up-to-date Local Plan. It is common ground that the development complies with this policy.

#### NPPF paras 170 and 181

126. Air quality is addressed primarily in para 181. However, para 170 contains an overarching objective for planning decisions to contribute to and enhance the local environment. This translates into a requirement (in sub-para e) to prevent new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of air pollution. The reference to "unacceptable" provides a benchmark against the relevant air quality standards<sup>92</sup>. The objective in para 170(e) that development should also "*help*" to "*improve*" local environmental conditions, such as air quality, is qualified by the words "*wherever possible*." This recognises, in terms, that it may not always be possible to deliver an absolute reduction in emissions or overall improvement in air quality, commensurate with delivering growth.

127. The specific paragraph dealing with AQ impacts is para 181. Para 170 and para 181 must be read together.<sup>93</sup> Para 181 requires planning policies and decisions to "*sustain and contribute towards*" compliance with air quality limit values and objectives, "*taking into account*" the presence of AQMAs. As Dr Bull emphasised in XX, this is focussed on ensuring that development meets those standards and does not exceed them. Consistent with the qualification in para 170, there is no absolute requirement to

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<sup>92</sup> See UDC/4/2 "*A concentration recorded over a given time period, which is considered to be acceptable in terms of what is scientifically known about the effects of each pollutant on health and on the environment*"

<sup>93</sup> Dr Bull ReX



improve air quality, only to identify opportunities for mitigation or improvement (preferably at the plan-making stage). The kind of broad measures identified in para 181 – “*traffic and travel management and green infrastructure provision and enhancement*” – are typical mitigation measures. It will be virtually impossible to *quantify* the precise level of reductions in emissions arising from such measures, and there is clearly no requirement to do so.

128. Dr Broomfield’s interpretation also completely ignores the *in principle* policy support for aviation growth, established by MBU. It is implicit in MBU that a proportionate increase in emissions from additional flights and surface access movements associated with delivering additional capacity will be acceptable, provided no adverse impacts arise which cannot be mitigated against.
129. The same is clearly true of the APF and the Aviation 2050 green paper. Indeed, the paragraph in Aviation 2050 relied upon by UDC, and to which Dr Bull was taken in XX, expressly confirms that “the Government *supports* continued growth in aviation over the next 30 years.”<sup>94</sup>
130. Moreover, and as Dr Bull was at pains to point out<sup>95</sup>, the significance of air quality impacts depends on the pollutant concentration levels experienced at sensitive receptors. The inventory of emissions, from which Dr Broomfield derives his proposed emissions limits in condition 10/ 15, is merely an “*input*” into the air quality model. It “*cannot be used to assess the impact of the emissions*”<sup>96</sup> because this will depend to a very large extent on the location of the source and manner of release. Dr Broomfield’s interpretation is also completely at odds with the way that air quality impacts are actually measured and assessed.
131. NPPF paras 170 and 181 must therefore be read in a straightforward manner, as set out above. There is no requirement to demonstrate absolute reduction in emissions, in the absence of any evidence of adverse air quality impacts.

### East Herts District Plan

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<sup>94</sup> CD 14.27 para 3.3

<sup>95</sup> In XinC

<sup>96</sup> Bull p/e para 57

132. Policy EQ4 is also a material planning consideration. It requires applicants to “*take account of*” the East Herts AQ Guidance, which contains guidance about AQ assessment and the assessment of mitigation for schemes within (or affecting) East Herts. However, as Dr Broomfield agreed<sup>97</sup>, this guidance ultimately leaves it to the LPA to determine the acceptability of mitigation measures.<sup>98</sup> Moreover, there is no objection from East Herts to this development on AQ grounds (or at all) and it was also satisfied with the AQ mitigation measures to be secured under the UU and conditions<sup>99</sup>. As we explain below, only Dr Broomfield still seeks to pursue the argument that there will be *any* adverse impacts on the Bishop’s Stortford AQMA.

#### Aviation 2050 and the Clean Air Strategy

133. There is nothing in either of these documents to suggest that there is any emerging policy requirement for development to deliver an absolute improvement in AQ. As noted above, the Government instead makes clear its support for aviation growth, while acknowledging that this *can* have “significant environmental impacts”, which this development clearly does not. This is squarely on all fours with the approach in MBU. A requirement for every aviation proposal to deliver an absolute improvement in AQ, even where no significant impacts are predicted to arise would plainly be incompatible with a framework which positively *promotes* aviation growth.

134. The Clean Air Strategy<sup>100</sup> contains an ambition “progressively” to cut exposure to particulate matter, but no new target for PM 2.5 emissions has yet been set and the timescales within which the WHO guidelines can be met remain uncertain<sup>101</sup>. As Dr Bull put it in XX, to try to read more into this document is to “speculate on a policy which the Government hasn’t yet formulated.”

135. In any event, what relevance this has to the determination of this appeal is wholly unclear. It is agreed by Dr Broomfield that the incremental PM 2.5 emissions from this development will not exceed 1% of the WHO guideline and it is no part of his case to

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<sup>97</sup> Broomfield xx

<sup>98</sup> CD 16.10 para 3.1.1

<sup>99</sup> CD 16.15

<sup>100</sup> CD 16.4

<sup>101</sup> CD 16.19

suggest that this development will give rise to unacceptable PM 2.5 concentration levels<sup>102</sup>. The Panel will note the unchallenged evidence of Dr Bull that the highest annual mean concentration at any receptor as a result of this development is just 11.6ug/m<sup>3</sup> for both 2027 and 2032<sup>103</sup>. This is well below the AQ standard of 25ug/m<sup>3</sup>. As Dr Bull confirmed in ReX, it is also well below the Government's "second stage" limit of 20 ug/m<sup>3</sup>, referred to at page 28 of the Clean Air Strategy. There could be no possible objection to this development on the grounds of PM 2.5 impacts, although this is precisely the basis on which UDC refused permission in Jan 2020, as we explain below.

### **Air quality effects**

136. All relevant pollutants (nitrogen oxides, PM 10 and PM 2.5 emissions) have been assessed as part of the air quality assessment in the ES/ ESA. The impacts on air quality at all modelled human or ecological receptors as a result of this development will be negligible and comfortably below the relevant AQ standards. There will be an overall improvement in AQ at all receptors in the DC at 2032, compared to the 2019 baseline. This was accepted by Dr Broomfield in XX.
137. For the avoidance of doubt, the impacts of the revised daily traffic flows associated with the two-way trips on sensitive receptors have also been assessed. There is no predicted change in the traffic flows, and therefore no change in the assessment of AQ impacts, within the Bishop's Stortford AQMA, or at Stansted Mountfitchet and Takeley. For other locations, including along the M11, Round Coppice Road, and the A120, the degree of traffic changes would lead to negligible changes in NO<sub>2</sub> concentrations and all sensitive receptors would experience negligible impacts in 2032.
138. Total NO<sub>2</sub> concentrations would remain well below the air quality standard of 40µg/m<sup>3</sup> at all sensitive receptors, even after the revised daily traffic flows are taken into account.<sup>104</sup>

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<sup>102</sup> See UDC/4/3 para 136 and 147

<sup>103</sup> STAL/5/2

<sup>104</sup> STAL/10/4

The Bishop's Stortford AQMA

139. As we have noted, *only* Dr Broomfield maintains that this development has the potential to give rise to “*significant*” impacts on the AQMA. This view is not shared by EHDC, which withdrew its original objection at the application stage<sup>105</sup>, and which would surely have made its presence known at this Inquiry in support of UDC if it had any lingering concerns about the AQ impacts of this development. Mr Andrew was clearly right to say in XinC that substantial weight must be given to the lack of any objection from EHDC, when considering the impacts on its AQMA.
140. In XinC, Dr Broomfield belatedly conceded that he was also in no position to challenge the modelling of traffic flows through this junction by Mr Rust. The traffic flows through the AQMA associated with the development were the subject of sensitivity testing in the TAA<sup>106</sup> precisely in order to assess the extent of any “*causal link*” between the use of the airport and traffic through the Hockerill Junction. UDC’s assertion that such a link exists flies in the face of the agreed evidence before the Inquiry.
141. This sensitivity testing confirmed that the additional daily flows as a result of the increase from 35 to 43mppa are tiny: 61 vehicles per 24 hour period, or just 1 vehicle every 24 minutes. It is ludicrous of UDC to suggest that this is “*just below*” the threshold in the IAQM guidance of <sup>107</sup> 100 vehicles AADT in an AQMA, above which an air quality assessment even needs to be considered in the first place. 61 vehicles is clearly *well* below this threshold. Outside an AQMA, this threshold rises to 500 AADT.
142. The reason for this, as Mr Rust explained<sup>108</sup>, is that this is a congested junction and not therefore an attractive route for traffic. There is an attractive and quick alternative to the town centre in the form of the ring road and northern bypass, with several access points to new housing. Moreover, even these “*infinitesimal*” traffic flows are a conservative

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<sup>105</sup> CD 16.15

<sup>106</sup> CD 11.24 and STAL/10/3

<sup>107</sup> CD 16.9, page 21, Table 6.2

<sup>108</sup> Rust XinC

assessment because this assumes that these are all new trips, whereas in reality many of these will already be travelling through the junction<sup>109</sup>.

143. In light of these agreed traffic flows, Dr Broomfield's insistence that there remains the potential for a significant AQ impact on the AQMA is absurd. If there was any merit in his claim that the location of this AQMA was so unusual, or its features so distinctive, that an additional vehicle every 24 minutes might have the potential to cause a significant air quality impact<sup>110</sup>, this would surely be a matter that EHDC would be capable of judging for itself. UDC's suggestion in closings that the "ebb and flow of traffic" and drivers avoiding the bypass "due to accidents" might somehow materially increase these impacts only serves to demonstrate just what a bad point this is.
144. In fact, and as Dr Bull explained in XX, there are many similar examples of AQMAs based around confined junctions in historic market towns and it is not unusual in this regard. But in any event, the Panel is not concerned with assessing the AQ issues in the AQMA generally. It is concerned with the AQ impacts arising from this development. In XinX, Dr Bull drew attention to Table 7 of his proof, which demonstrates that airport-related road traffic contributes just 0.4% of NOx concentrations in the AQMA. Road vehicles not connected to the development and background concentrations contribute 99% of the NOx levels in the AQMA.
145. To put this in context, Mr Andrew explained<sup>111</sup> that the East Herts District Plan has allocated some 4,500 new homes in Bishops Stortford. As he explained, this new housing will result in transport movements in and around the town resulting in impacts "*well beyond*" those associated with this development.
146. The performance of the model and the impacts on the AQMA were also the subject of extensive scrutiny and sensitivity testing following submission of the ES, in consultation with UDC and WYG.<sup>112</sup> This tested the impacts of the development if background concentration levels are held constant at 2016 levels, which Dr Broomfield

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<sup>109</sup> Rust XinC

<sup>110</sup> An assertion that was fairly described as "astonishing" by Dr Bull

<sup>111</sup> XinC

<sup>112</sup> Inexplicably, Dr Broomfield failed to acknowledge any of this work when formulating UDC's statement of case, although even the most cursory glance at the November 18 OR should have drawn it to his attention.

accepts is not remotely realistic; and applying an adjustment factor of 8.5 to bring the modelled concentrations in line with measured concentrations, and confirmed that the impacts remained negligible<sup>113</sup>.

147. As Dr Bull explained, on the basis of the agreed “infinitesimal” traffic flows through this junction, no amount of adjustment to the model would change the conclusion that the development makes a negligible contribution to NO<sub>2</sub> levels in the AQMA<sup>114</sup>. This was agreed with UDC, and with WYG, and it is the reason that EHDC – whose absence UDC skates around in its closing submissions - plays no part in this appeal.

### UFPs

148. It is common ground that there is no air quality standard for UFPs and no means of assessing the impacts of UFPs, based on current scientific knowledge. If it becomes necessary or possible to regulate these impacts in the future, Dr Bull explained that it is highly likely that the Government will take steps through the regulatory regime to tackle UFPs at source, rather than trying to prevent or restrict the UFP-emitting activity through the planning system.<sup>115</sup>
149. Dr Broomfield’s solution was, instead, to impose a condition requiring an absolute reduction in PM 2.5 emissions, on the basis that “*you would expect UFPs to behave similarly*” to PM 2.5 emissions. There is clearly no policy basis for the imposition of such a condition, for the reasons we explain above. However, on the basis that PM 2.5 emissions are the best available proxy for assessing the impacts of UFPs, and that PM 2.5 levels are assessed as negligible, there is also no reason to believe that UFP impacts will not also be negligible.
150. We note that UDC has not suggested any measures, to be secured by way of condition or by the UU, which would directly address these impacts. This is, of course, because there is no way of even assessing these impacts at the current time, let alone addressing

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<sup>113</sup> No challenge was made by UDC to Dr Bull’s evidence in his rebuttal that Dr Broomfield has himself authored assessments including similar – and higher – adjustment factors. As Dr Bull confirmed, the scale of adjustment used is by no means exceptional.

<sup>114</sup> Bull XinC

<sup>115</sup> Other examples of regulatory measures include the introduction of smokeless zones through the Clean Air Act, the removal of lead from petrol and the removal of sulphur from coal and oil combustion: Bull XinC

them. But in any event, if new air quality standards for UFPs emerge in the future, these can be addressed through the air quality management strategy proposed by STAL. UFPs are not an issue that the Panel needs to – or can – resolve now.

*Impacts on ecological receptors*

151. It is common ground that the development will not give rise to any unacceptable air quality impacts at any of the sensitive ecological receptors. There is no objection to the development from NE, which was closely involved at the application stage and has confirmed that it has no objection to this appeal.
152. The only outstanding issue is whether a condition should be imposed, requiring assessment against the 24-hour mean concentration at the Elsenham Woods and Hatfield Forest SSSIs.
153. As Dr Bull explains, Dr Broomfield’s insistence on this assessment is directly contrary to the explicit advice contained in the IAQM guidance, that only the annual mean should be used in assessments unless “specifically required by a regulator.”<sup>116</sup> NE has never asked for this assessment to be undertaken.
154. Mr Barker had the final say on this issue and his evidence has not been the subject of challenge. As he explained, in order for an acute impact on vegetation to occur, so as to require a 24-hour assessment, there has to be an interaction between NO<sub>x</sub>, sulphur dioxide and ozone. However, high concentrations of sulphur dioxide and ozone levels are uncommon in the UK and they do not occur here.
155. At its apex, UDC’s case in its Closings<sup>117</sup> concludes that “each of the air quality impacts identified by UDC is capable of being mitigated through an appropriate condition and/or mitigation package.” However, the evidence demonstrates that the development will have no significant air quality impacts and so there is no requirement, in EIA terms, to provide any mitigation to offset these impacts and it is for this very good reason that the ES/ESA does not need to set out specific mitigation measures. As Dr Bull put it in XX,

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<sup>116</sup> STAL/5/3, Appendix 4, page 16 para D.4.10

<sup>117</sup> Para.76

in the absence of any more than negligible air quality impacts, any measures to tackle AQ will therefore deliver “*improvements*” meeting the requirements of para 170 and 181 of the NPPF.

156. As we go on to explain, the package of measures secured by the UU<sup>118</sup> and conditions<sup>119</sup> is extensive and yet it appears to have been almost entirely ignored by Dr Broomfield.

**The package of mitigation and improvement measures proposed as part of this application**

157. In claiming that the UU was “*business as usual*”, in terms of measures to reduce AQ impacts, Dr Broomfield conceded that he was unaware of the circa £1.7million pa additional funding generated by the sustainable transport levy (“STL”), to be put towards sustainable transport measures as a result of the development.
158. As Mr Andrew explains, the purpose of the STL is to promote the use of modes of transport other than private car and to promote the use of sustainable measures of transport including the introduction of new technologies. It is administered by the Stansted Area Transport Forum (“SATF”), which includes Officers from both UDC and East Herts (as well as NR, TFL and HE).
159. Mr Andrew provided further detail about the SATF in XinC. As he emphasised, the SATF is a long-standing partnership approach, set up in 1999. It has a track record of investing successfully in sustainable transport measures, including substantial investment in local bus networks (£1million invested to date from previous obligations), including to upgrade these to the latest vehicle technology.
160. The UU also provides for a top-up to the ring-fenced bus network development fund (of £1million), with priority to be given to funding for ULEV and low emissions vehicles once the technology becomes viable. In XX, Dr Broomfield seemed to cast doubt on the value of this mitigation, on the basis that there is a prerequisite for a business case to be made out. As with so much of his evidence, however, this criticism takes no account of

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<sup>118</sup> CD 26.30a

<sup>119</sup> CD 26.26a & b



commercial and practical realities. As Mr Andrew explained, it would make no sense for the SATF to invest in services that cannot become self-sustaining, and there would be “*no positive outcome either in terms of sustainability or air quality if the service fails*”.

161. Once drawn to Dr Broomfield’s attention, he accepted that the UU provides “*substantial investment*” and generates “*significant*” sums towards sustainable transport measures and that these measures are “*directly relevant*” to reducing emissions, including in the AQMA<sup>120</sup>.
162. Moreover, the *beauty* of these mechanisms is that they are not set in stone nor fixed at the time of the grant of permission and so there is clearly no justification for a “Condition 15” type mechanism in order to keep the mitigation measures “*up to date*” with technological advances<sup>121</sup>. The flexibility to invest in new technologies over time means that technological advances to deliver AQ improvements will indeed be shared with the local community, as a direct result of the funding generated by the development.
163. As well as the sustainable transport measures, the UU also secures ongoing monitoring of air quality at locations around the airport.
164. In addition to the package of measures under the UU, STAL has also agreed to a condition requiring an air quality management strategy to be submitted to and approved by UDC before 35mppa is reached<sup>122</sup>. The strategy will be subject to regular review and will therefore be an evolving document, which will take account of any new AQ standards or policies.
165. Finally, rapid electric vehicle charging points will be provided at the airport, as requested and agreed with EHDC.
166. This package of measures goes well beyond meeting the requirement to mitigate the negligible air quality impacts of the development. UDC’s assertion that the UU simply

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<sup>120</sup> Broomfield xx

<sup>121</sup> Agreed by Broomfield in xx

<sup>122</sup> CD 26.14

“rolls forward” measures already contained in previous s106 agreements is unfair and is clearly refuted by the table in Mr Andrew’s rebuttal, which shows the true scale and value of the UU sustainable transport measures, which are all “new” and directly related to this development<sup>123</sup>. It is admirable in its scope and ambition, as well as in its flexibility, and it more than satisfies the high-level objective contained in paragraph 170(e) of helping to improve local air quality “*wherever possible*”.

### **The Committee’s decision in January 2020**

167. UDC’s case on appeal bears little resemblance to the reasons given by the Committee for refusing permission on AQ grounds. As the minutes of the Jan 2020 meeting make clear<sup>124</sup>, the Committee focussed exclusively on PM 2.5 emissions (assessed as being negligible at all human and ecological receptors) and perceived concerns around UFPs (not capable of being quantified or assessed at all). No consideration was given to NO<sub>2</sub> emissions in the AQMA, which was the focus of Dr Broomfield’s evidence.<sup>125</sup>
168. In resolving to refuse permission on this basis, the Committee also ignored the clear and correct advice of Mr Harborough, who reminded Members that “*Dispersion modelling of fine particles had been carried out and concluded that the airport expansion would have no significant effects on the concentration of such particles.*”<sup>126</sup> [emphasis added].
169. What, then, was the basis for the Committee’s decision to refuse permission? The answer is to be found in the presentation made by SSE<sup>127</sup>, which included a slide headed “*Health Impacts*”. This made generic references to health impacts from PM 2.5 emissions arising “*at levels below WHO guideline limits*” and noted a “*growing concern*” around UFPs, which - it was said - “*have been found 14 miles from an airport.*”
170. There was no evidence before the Committee to indicate that the development would give rise to unacceptable PM 2.5 concentration levels at any human or ecological receptor, by reference to any relevant air quality standards or policy test, let alone that

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<sup>123</sup> STAL 13/4 Table 1

<sup>124</sup> CD 13.4a

<sup>125</sup> Accepted by Dr Broomfield in xx

<sup>126</sup> CD 13.4b para 5

<sup>127</sup> CD 13.4a

any impact which could not have been mitigated to an acceptable level. On the contrary, the ES demonstrated that PM 2.5 concentrations would be well below the AQ standard at all receptors.<sup>128</sup> UFPs are, of course, not even capable of being quantified or assessed by reference to any air quality standard or at all.

171. Moreover, the *health* impacts of PM 2.5 emissions “*below WHO guideline levels*” and of UFPs, as a subset of PM 2.5 particles, were indeed assessed as part of the Health Impact Assessment in the ES, as Dr Buroni explained in XinC. This concluded that the development would have negligible health impacts associated with AQ changes.
172. As Mr Andrew confirmed, no consideration was given by the Committee to the measures to be secured under the UU at all. The extensive package of surface access measures to deliver AQ improvements, described above, was entirely ignored.
173. The decision to refuse permission on AQ grounds, contrary to the clear and correct advice of senior UDC officers, without any evidential or policy basis for doing so, and without any consideration of the scope for mitigation of any residual impacts, was plainly therefore unreasonable. We return to this reason for refusal in our submissions on costs.

## **PUBLIC HEALTH AND ECOLOGY**

174. The development will not give rise to any adverse public health or well-being impacts, including impacts associated with air quality and noise. It will have a positive influence on health and well-being at a regional scale through generation of employment opportunities and through leisure, travel and social connections. Overall, there will be a minor beneficial public health and well-being effect as a result of the development (changed from a minor adverse effect in the ES).
175. There was no challenge to this evidence and no request was made to cross-examine Dr Buroni. His evidence must therefore be given full weight. The absence of any serious

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<sup>128</sup> The highest level of PM 2.5 emissions was assessed as being just 13.7ug/m<sup>3</sup> in 2023 and 14.4ug/m<sup>3</sup> at 2028: see CD 13.4g

challenge to this evidence is, in itself, a clear indication of the very limited environmental impacts of this development.<sup>129</sup>

176. Likewise, there was no request to XX Mr Barker, and no challenge to his expert ecological evidence that the development will have no adverse impacts on any sensitive ecological receptor. But in any event, STAL has committed to continue air quality monitoring at Hatfield Forest and Elsenham Woods SSSIs with mitigation to be agreed with UDC, in the event of any damage arising to vegetation as a result of the NO<sub>x</sub> air quality standard being exceeded.

## **CARBON AND CLIMATE CHANGE**

177. As foreshadowed, this issue occupied a great deal of time at the Inquiry, and yet the correct approach to the assessment of carbon impacts remains as set out in our Opening Submissions<sup>130</sup>. The start and end point for the Panel’s consideration of the carbon impacts of this development is MBU, which remains in force and has not been withdrawn nor superseded by later Government policy. Its lawfulness is “*beyond argument*”<sup>131</sup>. As we explain below, arguments about the merits of MBU - whether dressed up in terms of its ‘soundness’ or the weight to be given to the policy – are not matters which are suitable for investigation at all, per *Bushell*.

### **The legal and policy context**

#### **MBU**

- (i) Carbon impacts of MBU proposals have been pre-authorised by MBU

178. The approach to be taken to the carbon impacts of MBU proposals is crystal clear. As Mr Hawkins put it<sup>132</sup>, MBU “*narrows the range of issues*” for LPAs to consider “*on the merits*” to local environmental impacts only. It is a cumulative impact assessment of small scale (less than 10mppa) MBU proposals, which models and therefore

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<sup>129</sup> Dr Banatvala’s evidence was addressed fully by Dr Buroni in his rebuttal evidence and we do not address it further here.

<sup>130</sup> INQ1

<sup>131</sup> CD 14.62a para 115 per Dove J

<sup>132</sup> Hawkins XX’d

preauthorises the carbon impacts of these developments, and therefore takes this issue away from local planning authorities.

179. This was confirmed in the High Court by Ms Bishop for the DfT, who deals in terms with the correct approach to assessing carbon impacts under MBU:

*“there is no requirement for local authorities to assess individual airport planning applications for an increase of less than 10 mppa or 10,000 CATMs against wider national carbon emission ambitions, as impacts within these parameters and how to mitigate against them have already been considered by my team in formulating and developing the government’s MBU policy”*<sup>133</sup>.

180. Faced with the clear wording of the policy, and evidence from a DfT senior official that carbon emissions from MBU proposals are not a matter for LPAs to consider, both Mr Lockley and Dr Hinnells sought to argue that, although MBU may not “*require*” LPAs to assess the carbon impacts of an MBU proposal, it nonetheless leaves it open to them to assess and weigh these impacts in the balance, presumably at their absolute discretion.

181. This is a hopeless argument. The length and nature of the closing submissions made by UDC and SSE on this subject only serves to illustrate why these complex matters are wholly unsuited to be addressed and resolved by Local Planning Authorities determining smaller scale MBU applications. It also flies in the face of the clear wording of MBU and the evidence from the DfT itself as to how the policy should be interpreted and applied. It also flies in the face of SSE’s own evidence in the same proceedings, when Mr Ross sought to argue that this application should be treated as an NSIP precisely because carbon emissions were a national issue and outside the merit of LPAs.<sup>134</sup> In XX, Mr Lockley suggested that Mr Ross may have “*changed his mind*” since that time. Such a *volte face* would be true to form but on this, at least, Mr Ross was entirely correct.

182. In its closings, UDC claimed that Mr Robinson had agreed that “*carbon emissions can be a matter for the LPA to take into account.*” This is a complete misrepresentation of his evidence, as the Panel’s notes of the evidence will show. His evidence was that the

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<sup>133</sup> CD 17.65 para 61

<sup>134</sup> CD 14.61 para 47: “*MBU... states, in terms, that it is not necessary for CO2 emissions to be considered by LPAs when deciding planning applications because these have been taken into account at national level.*”

use of the qualification “local” would have been unnecessary, unless the draughtsman was intending to distinguish local impacts, to be taken into account by the Local Planning Authority, from national impacts i.e. carbon. While he agreed that MBU does not say explicitly that local authorities “should not” look at carbon emissions when making their decision, he maintained – throughout his evidence - his position that MBU advocates an approach which removes carbon from the matters to be considered by LPAs.

183. We are, therefore, squarely in ***Bushell*** territory. The merits of MBU and the carbon modelling underpinning it are not suitable or eligible for investigation at this Inquiry at all.

184. In this regard, we respectfully urge the Panel to be extremely wary of arguments by UDC and SSE, which are couched in terms of the “*weight*” to be given to MBU. This is an illegitimate attack on the merits of MBU, dressed up as a question of planning judgment. While the relevance of national policy to a particular development is, of course, a matter for the decision maker, it cannot be open to the Panel to determine that MBU should attract *less weight* on the basis that it is no longer said to be legally sound in the absence of any suggestion from the Government that MBU is no longer extant policy. This would amount to a legal challenge to MBU by the back door. It would also be an attack on the merits of the policy and the modelling underpinning it, contrary to ***Bushell***.

(ii) The approach to modelling carbon impacts in MBU

185. With this caveat in mind, we turn to consider the approach taken in MBU to modelling the cumulative carbon impacts of MBU proposals. This was clearly set out and explained by Ms Bishop in her second witness statement<sup>135</sup>:

*“at the seven airports assumed to increase permitted use in response to demand pressure, MBU used publicly available proposals to increase permitted use caps. Elsewhere, we assumed an increase in permitted use by a third (up to a limit of 9.5 mppa, as any increase of 10 mppa or above would fall above the threshold for NSIP status and therefore be required to be decided nationally, by central government, at which point further assessment may be carried out).”*

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<sup>135</sup> CD 17.65 para 71

186. Mr Galpin was therefore clearly right to describe MBU as a “*stress test*” of the carbon implications of the policy. As Ms Bishop put it, the approach in MBU was to see “*what could be the largest amount of carbon that could be produced across the whole of the UK airports system commensurate with our forecast of passenger demand.*”
187. In light of this explicit evidence as to the approach adopted by the DfT in formulating MBU, we simply do not understand UDC’s assertion<sup>136</sup> that MBU “*does not name or assess any single or cumulative set of airport proposals*” and so is not a “cumulative assessment” at all. It suggests a complete failure to grapple with the evidence before this Inquiry, which has spent a disproportionate amount of time examining this policy and the methodology behind it. It is precisely because MBU has already assessed the cumulative impacts of small scale MBU proposals that there is no question of an “unstructured free for all”, as suggested. Expansion proposals of greater than 10mppa will, of course, be considered at a national level under the DCO regime.
188. As we go on to explain, the modelling underpinning MBU was also undertaken in the full awareness that “*other or improved*” abatement measures were likely to become available by 2050. It is, as Mr Robinson put it, a “*stress test*” to determine “*what mitigation measures would be needed to meet the planning assumption*”. It is not a statement of carbon policy, which will be set out in the Aviation Strategy.

### **The NPPF**

189. We have heard a great deal about para 148 of the NPPF from UDC but we can deal with it briefly here. As Mr Andrew confirmed, para 148 is not new and it appeared in a similar form in the 2012 NPPF, which pre-dated MBU. It establishes a high-level objective for the planning system to “*support the transition to a low carbon future in a changing climate.*” It is clearly not directed at, and takes no account of, the “*complexities of aviation*”<sup>137</sup> such as IAS. For that, we need to look to national aviation policy, including the detailed carbon modelling which informed MBU.

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<sup>136</sup> UDC closings para 89

<sup>137</sup> Robinson XX

## The CCA 2008 and the approach to IAS

190. In light of the way the arguments have been put, it is necessary briefly to consider the statutory framework under the CCA 2008<sup>138</sup>. This establishes the respective roles and duties of the Secretary of State and the CCC. Thus, part 1 of the Act establishes duties, imposed on the Secretary of State, in relation to the setting of carbon budgets and policies for meeting carbon budgets and, ultimately, the duty to meet the ‘net zero’ target established under s1.
191. The Government has not delegated the Part 1 duties to another body, in clear recognition of the importance that Parliament accords to tackling climate change<sup>139</sup>.
192. The CCC is established by Part 2 of the Act. It has an important advisory role, including (by virtue of section 35) to advise the Secretary of State on the consequences of treating emissions from international aviation and shipping (“IAS”) as emissions from sources in the UK for the purposes of Part 1. However, it is not the body with ultimate responsibility for discharging the duties under Part 1 and the Government is not obliged to follow its advice. All of this was accepted by Mr Lockley in XX.
193. Despite the importance that the Government accords to tackling climate change, IAS emissions do not count as emissions from sources in the United Kingdom for the purposes of Part 1, including the net zero target, “*except as provided by regulations made by the Secretary of State*”. No such regulations have been made to date.<sup>140</sup>
194. Unless and until any Regulations are made, IAS emissions continue to be accounted for informally, via a “headroom” or “allowance” made when setting the carbon budget. This headroom is not a legally binding target at all. It has been set, for the purposes of the fifth carbon budget, at 37.5MtCO<sub>2</sub>. This is the most recent carbon budget to be published by the Secretary of State under Part 1 and it runs from 2028-2032.<sup>141</sup>

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<sup>138</sup> CD 17.1

<sup>139</sup> Accepted by Mr Lockley in XX

<sup>140</sup> This is a good example of the Government declining to follow the CCC’s advice. As Mr Lockley put it in XX, “*the Committee has advised [under Part 2] that they should be included but, as a result of the Government not having to accept their advice, they remain excluded at this date.*”

<sup>141</sup> In XinC Dr Hinnells appeared to suggest that the planning assumption might be 32.6MtCO<sub>2</sub> but he agreed in XX that the current headroom is 37.5MtCO<sub>2</sub>.



195. As recently as October 2020, the Government made clear in its response to the CCC's June 2020 progress report (which recommended formal inclusion of IAS in the net zero target) that the Government is not currently minded to include IAS in the UK's carbon budgets or in the net zero target. Instead, the Government's approach remains to prioritise the international process and to negotiate in ICAO for a long-term emissions reduction goal consistent with the temperature goals of the Paris Agreement<sup>142</sup>. At the time of writing, inclusion of IAS in the carbon budget – and therefore in the net zero target - remains no more than a “contingency measure in case international progress does not go far enough or fast enough” and only to be deployed “if there is insufficient progress at an international level.”<sup>143</sup>
196. Clearly, it will be for the Government to decide – taking account of advice by the CCC and in accordance with its statutory duties under the CCA - how to deal with IAS emissions and whether and when to activate contingency plans to impose limits on IAS at a national level. It is certainly not for LPAs, or Inspectors on appeal, to seek to regulate IAS emissions at a local level, and on an airport-by-airport basis, through the development control process.

### **Matters relied upon by UDC and SSE to “reduce the weight” given to MBU**

197. A great deal of time has been spent at this Inquiry analysing the advice of the CCC. However, as the CCA makes clear, the CCC's role is to advise the Government. It is not providing advice to this Panel and it will be for the Government to decide whether to accept its advice or not. It is because this advice is directed at the Government, and it is for the Government to decide how to address in the first instance before formulating a policy response, that SSE's “prematurity” analogy does not get off the ground<sup>144</sup>.
198. Moreover, as we go on to explain, the detailed scrutiny to which the CCC's advice has been subjected (which has only been necessary because of the undue weight which UDC and SSE seek to place on it), has given rise to a number of queries about the assumptions

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<sup>142</sup> As Mr Coppel helpfully clarified in XX of Mr Robinson, the Government's commitment to the international process in fact reflects its obligations under sub-article 2 of the Kyoto Protocol, which commits Annex 1 member states including the UK to pursuing limitations or reductions in greenhouse gas emissions via ICAO.

<sup>143</sup> CD17.64, p.106

<sup>144</sup> SSE closings para 1.26

underpinning the CCC's advice. These will ultimately be for the Government to resolve but the fact that there remain outstanding queries about the CCC's approach, which it has not been possible to resolve on any of the extensive documentation from the CCC which is before the Inquiry, clearly underlines the dangers of treating the CCC's advice as if it was akin to Government policy.

### **The amendment to net zero and the CCC's September 2019 advice**

199. The relationship between the net zero amendment and IAS emissions has caused a great deal of confusion, particularly on the part of Dr Hinnells, who appeared to be under the impression that the "headroom" for IAS had "vanished" altogether, following the amendment to s1 of the Act, and that there was no longer any "space" for any residual IAS emissions.<sup>145</sup>
200. The correct analysis is that IAS are not caught by the amendment to net zero at all. They continue to be excluded from carbon budgets set under the Act, and the Government continues to prioritise the international process to address these emissions. The planning assumption remains set at 37.5MtCO<sub>2</sub> for the fifth carbon budget, which will run until 2032. Moreover, and as Mr Robinson emphasised<sup>146</sup>, in deciding how to get to net zero, the Government will need to look at emissions across the whole economy, of which aviation accounts for just 7%<sup>147</sup>. It will then be a matter for the Government, taking account of the advice from the CCC, to decide how to balance emissions from competing sectors, and what level of IAS emissions to allow for, in order to achieve an overall net zero outcome.
201. Nor has the amendment to s1 resulted in the headroom for aviation growth being "squeezed"<sup>148</sup>. This reveals a complete misunderstanding of the CCC's advice at that time (since updated in the 6<sup>th</sup> CB, as we explain below), that "*aviation emissions could be reduced from 36.5 MtCO<sub>2</sub> in 2017 to around 30 MtCO<sub>2</sub> in 2050*"<sup>149</sup>:

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<sup>145</sup> Hinnells XinC

<sup>146</sup> XX by UDC

<sup>147</sup> CD 17.78 pg 6

<sup>148</sup> Hinnells XinC

<sup>149</sup> CD 17.28

- i. In advising the Government on how to get to “net zero” IAS emissions, the CCC assumed a 25% growth in demand by 2050, compared to 2018 levels. This equates to 365-370mppa i.e. exactly the same level of aviation growth as was assumed in the CCC’s 2009 advice when the 37.5MtCO<sub>2</sub> headroom was originally set<sup>150</sup>. This was also the advice of the CCC at the time when the Government published MBU.
  - ii. The only change in the CCC’s advice following net zero related to the abatement measures potentially available to *bring down* the level of emissions associated with the same level of aviation activity:
    - (a) In 2009, the CCC assumed a “likely” fuel efficiency improvement rate of 0.8% and just 10% SAF uptake. In its “speculative” scenario, the CCC assumed 1.5% fuel efficiency improvements and SA penetration of 30% by 2050, which is much closer to its projections in its most recent advice on the 6<sup>th</sup> CB.
    - (b) By 2019, the CCC assumed a fuel efficiency rate of 1.4%. However, the CCC continued to assume just 10% uptake of SAF by 2050. The CCC assumed that limited use of GGR offsets would be required to get remaining IAS emissions to net-zero.
202. As we explain below, the CCC’s latest advice on the 6<sup>th</sup> CB is more optimistic still, and this has enabled the CCC to conclude that the emissions associated with the CCC’s recommended level of aviation activity can now be reduced to just 23MtCO<sub>2</sub>.<sup>151</sup>
203. All of the CCC advice, pre- and post- MBU, therefore assumes exactly the same level of aviation growth to be compatible with the Government’s obligations under the CCA. We note that the CCC’s advice that “*limits to further airport expansion*” should be considered as one option to constrain demand to 365mppa also first appeared in 2009<sup>152</sup>.

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<sup>150</sup> Agreed by Mr Lockley in XX

<sup>151</sup> CD 17.78 Figure A3.7.a

<sup>152</sup> CD 17.2

204. However, as Mr Lockley confirmed<sup>153</sup>, the Government has given no indication that it plans to adopt the CCC's advice on capping growth to this level. Instead it published MBU, which supports growth to 444mppa as being compatible within the current planning headroom.
205. It is also far from clear how the CCC has arrived at the conclusion, in its advice since MBU was published, that aviation activity should *continue* to be constrained to 365mppa:
- i. As Mr Lockley confirmed, it is ATMs not passengers, which generate CO2 emissions. However, the only reference in any of the documentation before the Inquiry to the number of ATMs associated with 365mppa is in the CCC's 2009 advice, when the CCC advised that the Government should plan for a "*maximum allowable increase in ATMs of around 55% and a maximum demand increase of around 60%*"<sup>154</sup> and that the "*maximum increase in ATMs compatible with the emissions target is around 3.4 million per year in 2050 compared to around 2.2 million per year in 2005.*"
  - ii. Mr Lockley agreed, therefore, that the 365mppa figure was set up to align with 3.4m ATMs. However, the ATM assumption relating to this mppa figure appears to have vanished from the CCC's more recent advice altogether.
  - iii. Absent a clear understanding of and explanation for the CCC's approach, this raises questions because 365mppa today would align with anything like the same number of ATMs as in 2009. We know from evidence put by SSE before the Inquiry that, between 2009 and 2019, the average passengers/ATM increased from 105 to 135<sup>155</sup>. The CCC's assumption in 2009 of 365mppa from 3.4m ATMs translates into 107 pax/ATM, which is in line with average load factors at that time. By contrast, using the 2019 ratio (of 135 pax/ATM), 3.4m ATMs would align with a passenger throughput of 459mppa.

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<sup>153</sup> Lockley XX

<sup>154</sup> CD 17.2 page 148

<sup>155</sup> CD 23.62

- iv. Table 2 in MBU<sup>156</sup> reveals that the DfT assumed, based on its 2017 aviation forecasts for 2050, that 444mppa was aligned with just 3.043m ATMs. This equates to a ratio of 146 p/ATM at 2050. Applying the same ratio to 3.4m ATMs would generate 496mppa.
206. In his note<sup>157</sup>, Mr Lockley confirmed that he had been unable to identify the ATM analysis underpinning the CCC's latest advice. He suggested, however, that the CCC had simply adopted the methodology in the DfT's 2017 Aviation Forecasts to convert mppa to ATMs. However, MBU is also based on the 2017 Aviation Forecasts. Applying the same alignment between ATMs and mppa as used in MBU would lead to either a much higher passenger throughput, or a much lower ATM assumption, but the explanation for this is not to be found anywhere in the documents published by the CCC, which are before this Inquiry.
207. As we explain below, the CCC's long-standing advice that demand should be constrained to 365mppa has also directly informed the CCC's "*no net expansion*" advice in the 6<sup>th</sup> CB, which has generated so much hot air at this Inquiry.

### **The CCC's advice on the 6<sup>th</sup> CB**

208. As Mr Robinson explains, the 6<sup>th</sup> CB is unchanged in key respects, including its long-standing advice that aviation growth should be constrained to 365mppa.<sup>158</sup> Set against this, however, is a "*growing confidence*"<sup>159</sup> in the potential of mitigation measures, particularly the take up of SAF, as well as the potential for carbon removals to become available to compensate for residual emissions.
209. In its balanced pathway, the CCC now assumes 25% uptake of SAF by 2050, compared to just 10% in its September 2019 advice. It has therefore moved substantially towards

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<sup>156</sup> CD 14.2

<sup>157</sup> INQ 036

<sup>158</sup> STAL/8/4

<sup>159</sup> STAL 8/4 para 7.3

the 32% SAF assumption adopted in the SA's road map<sup>160</sup>, described by Dr Hinnells in XinC as a "*powerful piece of work.*"<sup>161</sup>

210. The dramatic effect of the CCC's new abatement assumptions can be seen in Figure A3.7.a of the "Aviation Summary"<sup>162</sup>, which now shows residual emissions reduced to just 23MtCO<sub>2</sub>. However, this is also another key area of the CCC's advice, where questions remain unanswered at the end of this Inquiry:

- i. The CCC assumes "*baseline*" emissions of approx. 51MtCO<sub>2</sub>. This baseline<sup>163</sup>, we are told, is taken "*direct from DfT modelling*" and assumes "*high demand growth (64% growth in passenger numbers by 2050, from 2018 levels), low efficiency improvement (0.7%/ year), no hybrid electric aircraft and no SAF deployment.*"<sup>164</sup> However, 64% growth on 2018 levels gives a "baseline" of 478mppa, which is substantially higher than the 444mppa assumed in MBU, also derived from the DfT's 2017 aviation forecasts.
- ii. Neither Mr Robinson nor Mr Lockley was able to explain where the CCC derived this baseline from. In his note, however, Mr Lockley suggests that it reflects the DfT's *unconstrained* demand forecast, adjusted to take account of "*later available data*" and "*the effects of COVID.*"<sup>165</sup>
- iii. However, the 2017 DfT Aviation Forecasts make clear that the *unconstrained* forecasts are a "*modelling diagnostic tool*" which are "*highly theoretical in that they include input assumptions that could not exist.*"<sup>166</sup> They are not the basis for calculating actual demand at all and they are not the basis for the CO<sub>2</sub> emissions forecasts in the 2017 Aviation Forecasts. These use the capacity constrained forecasts<sup>167</sup>. The capacity constrained forecasts are also the basis for MBU<sup>168</sup>. If

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<sup>160</sup> CD 17.5

<sup>161</sup> Although both UDC and SSE belatedly sought to discredit the SA Road map and its projections in closings, no evidence was led by either UDC or SSE in relation to this issue and nor was this the subject of XX of Robinson.

<sup>162</sup> CD 17.78

<sup>163</sup> CD 17.78, page 10

<sup>164</sup> Ibid

<sup>165</sup> INQ 036, para 13

<sup>166</sup> CD 14.14, para 6.3

<sup>167</sup> See, for example, CD 14.14, para 8.3 "As with the constrained ATM forecasts, from which these emissions forecasts are developed."

<sup>168</sup> CD 14.14 para 7.4 and figure 1

Mr Lockley is correct, which we do not believe to the case, this would be a major departure from the methodology used by the DfT.

- iv. From this baseline of 51MtCO<sub>2</sub>, demand measures are applied to reduce emissions to 37.5MtCO<sub>2</sub>. The CCC then assumes that SAF will reduce emissions by approximately 10MtCO<sub>2</sub> and that efficiencies and hybrids deliver a further reduction of 4.5MtCO<sub>2</sub>. Thus, abatement measures deliver a reduction of 14.5MtCO<sub>2</sub>, even after demand measures have been implemented.<sup>169</sup> This leaves residual emissions of 23MtCO<sub>2</sub> to be offset with GHG removals.
211. As Mr Lockley accepted, these abatement measures are “*far more extensive in their scope*” than at the time MBU was undertaken. Applying a similar level of abatement from SAF and efficiencies and hybrids to the 40.8MtCO<sub>2</sub> in MBU would clearly dramatically reduce overall emissions, compared to the reduction of just 3.6MtCO<sub>2</sub> assumed at that time.
  212. Mr Robinson was clear, therefore, that *even if* the DfT were to repeat the modelling exercise in MBU but applying a lower planning assumption, this would be highly unlikely to change the policy approach in MBU. As he put it, “*the Government would apply the same stress test and arrive at the same conclusion*”.
  213. This brings us to the CCC’s advice in the 6<sup>th</sup> CB on demand management, including its “*no net capacity*” advice. As Mr Robinson explained, the scope of this advice and the work underpinning it need to be carefully considered and understood. As with the other aspects of the CCC’s advice, considered above, it is by no means as clear cut as it may appear at first glance.
  214. In particular, and as Mr Robinson explained, although the CCC identifies a range of demand management measures<sup>170</sup> that could be pursued to meet its demand profile, it has not undertaken *any* analysis to see which demand measures – or combination of measures - would be most effective. Indeed, the CCC states in terms that “*Our analysis only assumes a demand profile is achieved, and does not model the policies required to*

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<sup>169</sup> CD 17.78, Figure A3.7.a

<sup>170</sup> Reducing passenger demand for flying through carbon pricing, a frequent flyer levy, fuel duty, VAT or reforms to Air Passenger Duty, and/or restricting the availability of flights through management of airport capacity

*achieve these profiles.*<sup>171</sup> Mr Lockley agreed in XX that *“the CCC has taken the view that it is not for them to recommend a specific policy mix for demand management”*.

215. It is indeed, therefore, *“surprising”*<sup>172</sup> that the CCC should have opted in its policy recommendations to go straight to an immediate moratorium on new airport capacity. As Mr Robinson put it, even if the Government were persuaded of the case for demand management, it would be for the Government to explore all of the options and to decide how to achieve the right balance of demand management measures *“in the most proportionate and least damaging way.”*<sup>173</sup> That exercise forms no part of the advice provided to it by the CCC.

216. Moreover, very recent pronouncements from the Government make it absolutely clear that it has no intention of imposing a moratorium on new airport capacity, with all the economic damage this would entail:

i. In its October 2020 response to the CCC<sup>174</sup>, the Government responded head on to the CCC’s recommendation that the Government should *“review its airport capacity strategy in light of COVID and net zero”*. Having reiterated its commitment to the international process and to negotiating through ICAO, the Government stressed that *“Airport expansion is a core part of boosting our global connectivity and levelling up”*.

ii. It is equally clear from this response that the Government is developing its strategy for aviation emissions and that its focus will be on technological innovation and investment, together with market-based mechanisms, rather than constraining demand:

*“The UK is already a global leader in decarbonising aviation. We plan to build on our existing work that is delivering clean aerospace R&D, supporting the deployment of sustainable aviation fuels, modernising our airspace, and establishing domestic and international market-based mechanisms, to reduce emissions faster and further.”*

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<sup>171</sup> CD17.78, pg 9

<sup>172</sup> Robinson XinC

<sup>173</sup> Robinson XinC

<sup>174</sup> CD 17.65 page 106



- iii. As Mr Robinson explained, this focus on green investment reflects the Government's long held support for green aviation and the UK's historic strengths in this area. As recently as 27 January 2021, we saw further evidence of this support for green investment, with the Government's announcement of a further £84million to invest in the green aviation sector.<sup>175</sup>
- iv. This approach is entirely consistent with the strategy set out in the very recently published National Infrastructure Strategy, published in November 2020<sup>176</sup>. This emphasises that "*infrastructure investment is fundamental to delivering net zero emissions by 2050*"<sup>177</sup>. At the same time, it confirms the Government's long held position that aviation connectivity is essential for a global Britain. It is clear from this document that the Government is fully aware of the challenge of reconciling connectivity with net zero and is developing its response to this issue. Moreover, there is no evidence that the Government has suddenly gone lukewarm on aviation, and there is nothing to suggest any waning in support for MBU as a means to deliver growth. All of this was agreed by Dr Hinnells in XX.
- v. Instead, the Government intends to "*square the circle*" of connectivity and net zero<sup>178</sup>, by focussing at a domestic level<sup>179</sup> on a blitz of green investment, which (as the NIS notes) will "*create jobs to support the recovery from COVID-19, and support the government's levelling up agenda by ensuring key industrial areas are at the heart of the transition to net zero.*" It is a policy approach which ticks all of the boxes as the UK emerges from COVID and the Government looks for opportunities to rebuild the economy and deliver growth and jobs, whilst simultaneously moving towards a net zero future. It is also squarely on all fours with MBU's in principle support for aviation growth, subject to local environmental impacts being addressed.

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<sup>175</sup> INQ 19

<sup>176</sup> CD 23.41

<sup>177</sup> Ibid pg 12

<sup>178</sup> Hinnells XX

<sup>179</sup> Noting, as set out above, that IAS continue to be treated as excluded from UK emissions sources: see pg 47

## Non-CO2 Impacts

217. We can deal briefly with this issue. Both the recent *Heathrow* judgment and the CCC's advice in the 6<sup>th</sup> CB emphasise the significant uncertainties surrounding these impacts and how to account for them. Far from promoting a policy response now to address these impacts, the CCC's 6<sup>th</sup> CB advice re-iterates that *'there remain significant uncertainties in the science and mitigation options, and therefore uncertainties regarding the policy response.'*<sup>180</sup>
218. In XX, Dr Hinnells confirmed, correctly, that it is "*clearly not a requirement*" to assess non-CO2 impacts at the present time. Mr Lockley was also unable to point to any basis or requiring an assessment of non-CO2 impacts to be undertaken.
219. Mr Vergoulas clearly explained in his evidence why it is not possible to assess non-CO2 impacts at the current time.<sup>181</sup> As he explained, there is not even any scientific consensus as to what multiplier to use to account for non-CO2 impacts, nor any consensus about what mitigation measures should be employed to reduce these impacts (not least because reducing non-CO<sub>2</sub> impacts by, for example, re-routing to avoid contrails, can result in additional fuel burn and therefore increase CO<sub>2</sub> emissions). Moreover, the "great advantage", as he said, of these short-lived effects is that they do not remain in the atmosphere and so, by reducing ATMs, it is possible to have an immediate beneficial effect on the warming consequences of non-CO<sub>2</sub> emissions once the science becomes more clearly understood.
220. SSE in its closings tried to claim that Mr Vergoulas had agreed in XX that non CO2 impacts were "to be considered a significant adverse environmental impact for the purposes of EIA". However, this is plainly not what Mr Vergoulas said, as the Panel's notes will show. Mr Vergoulas did not dispute that non CO2 impacts were "important". However, he went on to explain that it was currently impossible to assess the significance of these impacts at all, based on current scientific knowledge and in the

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<sup>180</sup> CD 17.78 pg 18

<sup>181</sup> STAL/9/3 and Vergoulas XX

absence of any agreed multiplier or metric. He explained that he had followed the advice of the CCC, as well as the approach adopted by the DfT and the Government.

221. Mr Vergoulas was clearly therefore correct to say that non-CO<sub>2</sub> impacts do not need to be addressed in the ES/ ESA. This is entirely consistent with the advice of the CCC and the approach taken by the DfT in MBU. These are highly complex questions, which will be for the Government – not LPAs considering MBU applications - to resolve in due course, and as a scientific consensus emerges.

### Summary of the policy position

222. The above submissions are made without prejudice to our primary position that this extensive scrutiny of the merits of the carbon assessment underpinning MBU is not an appropriate or lawful exercise at this Inquiry. However, after a full week of evidence, it is also clear that there is no merit whatsoever in the arguments pursued by UDC and SSE that MBU has been somehow rendered “unsound” by subsequent developments, including the amendment to net zero and the CCC’s recent advice. The approach to carbon impacts underpinning MBU has been shown to be entirely sound and, indeed, conservative in its assumptions. It must be given full weight, as an up-to-date statement of national aviation policy, which deals expressly with this development.

### **The carbon emissions associated with this development**

223. Faced with legal and policy arguments that ranged far and wide, and a great deal of grandstanding about the existential threat posed by climate change (which no one – least of all STAL’s witnesses - sought to dispute for one moment), there is a real risk of losing sight of the scale of impacts under consideration here.
224. The ES/ ESA contains a detailed, airport specific assessment of the carbon emissions associated with this development, unlike the DfT’s model which SSE sought to rely on to suggest that the emissions had been “down played”. This is a favourite SSE argument, but it has no more merit in relation to carbon emissions than it does in relation to demand forecasts. For all the reasons we have already explained, the DfT model plainly is not

intended to be used at an airport specific level. In any event, and as Mr Vergoulas explains, this argument goes nowhere because the 2.08MtCO<sub>2</sub> which the DfT modelled for growth to 44.8mppa is closely aligned with the 2.03MtCO<sub>2</sub> modelled in the ES for the same baseline year.<sup>182</sup>

225. That is sufficient to dispense with SSE's case on the carbon emissions actually associated with this development.
226. As Mr Andrew explained, the carbon assessment was undertaken before MBU was published and so, in the absence of the clear policy direction in MBU, the ES included an assessment of the emissions from this development against the 37.5MtCO<sub>2</sub> headroom. It concluded, correctly, that the development was unlikely to materially impact the UK's ability to meet its carbon reduction targets and that Stansted's share of the headroom would not materially change as a result of the proposed development.
227. Dr Hinnells confirmed in XinC that the carbon modelling in the ES/ ESA "*reflects a reasonable range of outcomes*" and neither he nor Mr Young seriously sought to dispute the assessment undertaken by Mr Vergoulas. Dr Hinnells agreed that the incremental emissions generated by this development compared to the DM scenario are just 0.09MtCO<sub>2</sub>. This increment is not only accepted by UDC but is now positively relied upon by UDC in its closing submissions in support of the contention that the carbon emissions from this development are "significant"<sup>183</sup>. In the best practice scenario, which is now more closely aligned with the CCC's latest projections<sup>184</sup>, the incremental emissions associated with this development would be just 0.07MtCO<sub>2</sub>.
228. An increase of 0.09MtCO<sub>2</sub> equates to just 0.24% of the current planning assumption of 37.5MtCO<sub>2</sub> or 0.3% against 30MtCO<sub>2</sub> or 0.39% against 23MtCO<sub>2</sub>. As Dr Hinnells fairly conceded, these are "*tiny fractions for a non-DCO development under the MBU proposal.*" On no sensible analysis can this be said to be "significant". In this regard, the IEMA guidance prayed in aid by UDC<sup>185</sup> plainly does not say that any GHG emissions, even at this level, should be treated as "significant" for EIA purposes. It

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<sup>182</sup> STAL/9/3

<sup>183</sup> UDC closings, para 106(2)

<sup>184</sup> As confirmed by Mr Vergoulas in XX

<sup>185</sup> Para 106(11)

advises, in the absence of any clear “standard” against which significance can be assessed, that professional judgment is required. The exercise of that judgment here leads necessarily and inevitably to the conclusion that the carbon impacts of this development are negligible.

229. To put these emissions into context, the emissions associated with the Heathrow NWR are projected to be 21MtCO<sub>2</sub>, or nearly the entire amount of the residual emissions recommended by the CCC.<sup>186</sup> The scale of that project is clearly “*a world away*”<sup>187</sup> from the impacts the Panel is considering here. While we say para 5.82 of the ANPS does not apply at all to this development, SSE’s reliance on this paragraph (said to be of “key importance”)<sup>188</sup> therefore takes it nowhere, as the stark comparison with Heathrow makes clear. Para 5.82 says in terms that an increase in emissions alone is not a reason for refusing permission, and it is simply fanciful to suggest that an “increase in carbon emissions resulting from this development” of just 0.09MtCO<sub>2</sub> is “so significant that it would have a material impact on the ability of Government to meet its carbon reduction targets”.
230. Moreover, this “*tiny fraction*” assumes that the airport does not seek to utilise its permitted 274,000 ATMs, in the event that permission is refused. As Mr Andrew explained, however, in the event that permission is refused the airport will plainly seek to “*make the best use of the asset that we’ve got*”<sup>189</sup> - and certainly by 2050.
231. In short, therefore, this development delivers a material increase in airport capacity with no new ATMs<sup>190</sup>, a modest amount of hardstanding and an increase of, at most, 0.09MtCO<sub>2</sub>. The undisputed gravity of climate change and the challenges faced by the Government in tackling this issue - whilst simultaneously delivering on its objective to boost connectivity and deliver economic growth - only serves to emphasise that this development is a very “*easy win*”, in terms of delivering additional airport capacity at

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<sup>186</sup> CD 14.26, PEIR Vol 1, Chapter 9, Fig 14.6

<sup>187</sup> Hinnells XX

<sup>188</sup> SSE closings para 5.9

<sup>189</sup> STAL/13/2, para 9.6 and figure 1

<sup>190</sup> C/f the Luton DCO, which is seeking consent for 72,000 additional ATMs

absolutely minimal environmental cost. Or, as Mr Robinson put it, this development is **“about the most efficient way that you could have to deliver new capacity”**.

### **Conditions**

232. As with noise and air quality, UDC no longer argues that permission should be *refused* on the grounds of carbon impacts. However, it continues to insist on the imposition of a set of conditions to micro-manage carbon emissions from every aspect of the airport, including – primarily - emissions from IAS<sup>191</sup>. We can deal with this briefly in light of our submissions above:

- i. Just as it is no part of an LPA’s remit to consider IAS emissions when determining MBU applications, so it is not for LPAs to seek to regulate IAS emissions through planning conditions. As Dr Hinnells accepted, carbon emissions from IAS are not a local impact: they are a national or even international impact. Quite apart from the fact that STAL has no control over these emissions, they are clearly unsuitable to be regulated at an airport or local level.
- ii. There is no policy basis for the imposition of a condition controlling IAS emissions and Dr Hinnells is clutching at straws by suggesting this can be derived from para 148 of the NPPF. On the contrary, the emissions from this development have been ‘pre-authorised’ by MBU, without any requirement to demonstrate mitigation of those impacts at a local level. The imposition of this condition is plainly not therefore necessary to make the development “*acceptable in planning terms*”.
- iii. It is also neither necessary nor reasonable for landside/ airside activities at the airport to be micro-managed to the extraordinary degree proposed by UDC. The emissions from all landside activities at 2032 are projected to be just 0.005MtCO<sub>2</sub>. Emissions from airside activities are only fractionally higher, at 0.021MtCO<sub>2</sub>. These are tiny levels and they arise from the operations of the airport as a whole, not from the impacts of this development.

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<sup>191</sup> Assessed in the ES as comprising 93.5% of the total emissions airport, as Mr Robinson agreed in XX by SSE

- iv. As Mr Andrew explained, it is also not within STAL's gift to micro-manage all emissions from the operation of the airport. There are 180 businesses on the airport site and many of these activities, including vehicle movements, are undertaken by third parties and are outside STAL's control.
- v. The same is true of surface access movements to and from the airport and "*in its vicinity*". The decarbonisation of these movements is a matter for the DfT, not STAL<sup>192</sup>. In XX, Dr Hinnells conceded that "*this is not the principal issue because travelling in vehicles is dealt with by clear policy elsewhere*". He also acknowledged that "*Stansted does better than most airports... in terms of public transport.*"

233. As Mr Robinson explained, the airport has worked hard to reduce all carbon emissions from operations and buildings under its control. This includes airport buildings and plants and the limited number of airport vehicles controlled by it. It has achieved Level 3+ Airport Carbon Accreditation and it has committed to reducing these emissions to net zero by 2038. The airport is already doing everything to reduce emissions that it is within its power to do.

### **The reason for refusal**

234. Our submissions, above, concerning the correct approach to this issue and the negligible impacts of this development are entirely consistent with the careful advice and clear direction given to Members by UDC's Officers in advance of the Jan 2020 committee meeting:

- i. As Dr Hinnells agreed, the Nov 18 OR reviewed the ES in some detail. It faithfully recorded the conclusions in the ES, including the incremental difference of just 0.3MtCO<sub>2</sub> (in the ES *pessimistic* scenario). Officers advised in light of these conclusions that the development was unlikely to impact on the UK's ability to meet its climate change target.<sup>193</sup>

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<sup>192</sup> Although the UU measures to reduce trips by private car will also help to reduce carbon emissions associated with these movements.

<sup>193</sup> CD 13.1(b), para 9.350 onwards

- ii. The updated OR in Jan 2020 dealt squarely with the amendment to net zero and the CCC's subsequent advice<sup>194</sup>. It correctly advised, however, that these were matters for the Government to consider and address through the Aviation Strategy and that it was not for LPAs to try to predict what policy choices the Government may or should take. It advised Members that, in the meantime, MBU had not been withdrawn or qualified and remained extant Government policy.<sup>195</sup>
235. The advice given to Members, both as to the legal and policy approach, and the negligible impacts of the development, was clear and cogent and it was correct. Had Members followed this advice, they would inevitably have concluded that there was no valid basis for refusing permission on carbon grounds.
236. Instead, Members simply ignored the relevant policy context and decision-making framework, and the negligible impacts arising from this development. The minutes reveal that they focussed instead on UDC's "*declaration of a climate emergency*", although this is not adopted policy and it does not deal with IAS at all.<sup>196</sup> Instead of considering the additional emissions compared to the DM scenario, Members apparently concluded that the "*increase in passengers*" would "*increase carbon dioxide emissions by 1.0MtCO<sub>2</sub>*"<sup>197</sup>. To compound the confusion, Members went on to compare these emissions to UDC's "*net zero target*" of 0.5MtCO<sub>2</sub> by 2030.
237. This discussion led to the formulation of a reason for refusal which is near incomprehensible and which makes no attempt to engage with the relevant policy framework, including MBU. It has ultimately led to an Inquiry involving a full week of evidence on carbon emissions, which are not a matter for consideration by the Panel at all. The Committee's decision to refuse permission contrary to the clear advice of its Officers was plainly unreasonable. We return to these matters in more detail in our application for costs.

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<sup>194</sup> CD 13.4(b), para 40 onwards

<sup>195</sup> CD 13.3(b) at para 43

<sup>196</sup> Hinnells XX

<sup>197</sup> See CD 13.4(a) and the SSE presentation slide on pg 31, which drew Members' attention to the difference between the 2016 baseline and the 2028 DC scenario and referred to an "additional" 1MtCO<sub>2</sub>.



## **SURFACE ACCESS**

238. STN is admirably well suited to perform this role both geographically and by virtue of the road and rail links which serve it. It already operates a major Public Transport Hub, with the highest public transport mode share of any major UK airport (50%). Further growth at Stansted therefore enables these facilities to be utilised to a greater degree, supports their reinforcement and sustains their viability via a virtuous circle.

## **Position of the Highway Authorities**

239. Agreement had been reached about the appropriate mitigation to address increased traffic flows at the time of the November 2018 and January 2020 Committees. However, this has been revisited following the statement by ECC that financial constraints would cause it to defer its intention to implement a scheme for the improvement of J8 of the M11, to which STAL was to make an agreed contribution. Further discussion with HE and ECC has now led to a new stand-alone mitigation strategy, which is the subject of a recent additional HSoCG<sup>198</sup> and has now been incorporated into the planning obligation, with the agreement and support of ECC. HE & ECC have, accordingly, withdrawn from the inquiry.

## **Position of UDC**

240. UDC has been very clear that it takes no objection on surface access grounds and, although RfR No.4 is alleged to be infrastructure related, UDC has made no attempt to evidence an objection which relies upon highways and transportation issues.

241. This is particularly significant for the issue of impacts on local roads. As would be expected, UDC has taken a keen interest in impacts on local roads and settlements from an early stage in the planning process. Indeed, and by way of example, UDC sought from STAL a detailed assessment of the impacts on Parsonage Lane and Takeley, which is before the Panel as CD11.12. It is not credible to suppose that UDC Members would have omitted to include impacts on local villages if they had been sufficient to support a reason for refusal on the basis of the severity of residual impacts (as per NPPF109).

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<sup>198</sup> CD25.6

## **Position of Mr Bamber**

242. Mr Bamber alone (for SSE) pursues a series of complaints about the exercise which all statutory bodies have now signed off. These are pursued by SSE and Mr Bamber in terms which tend to suggest that SSE sees itself as an alternative highways authority with wholly unrealistic expectations about “consultation” and data disclosure to a third party objector (quite irrespective of GDPR requirements).
243. Mr Bamber has been extensively occupied acting for a host of opponents of development in the Uttlesford area. However, he does not act for any statutory body at this inquiry, nor does he have any experience or expertise in assessing the surface access impacts of a major airport. We do not accept that these impacts are similar (or even akin) to other forms of development which highways consultants are called upon to assess. On the contrary, they require intimate knowledge of the internal workings of (and consequential traffic patterns at) a major passenger airport, which Mr Rust has in spades<sup>199</sup>, but which Mr Bamber simply does not possess (however experienced he may be in other areas).

### **The significance of the operational characteristics of a major passenger airport**

244. For example, Mr Bamber appears to be particularly exercised by the fact that the AM peak for airport related traffic does not coincide with the highways network AM peak. He insinuates that this is contrived and that the two peaks could easily coincide such that the impacts would greatly exceed those predicted. However, as Mr Rust explained, this is simply a function of the morning operation of Stansted Airport, with very few aircraft landing in slots which would disgorge passengers onto the road network at 0700-0800 and the Stansted “based” aircraft getting airborne as soon as possible to complete their daily triangulation, generating a peak in inbound traffic movements to the airport long before 0700-0800 network peak. These characteristics are effectively “hard wired” into the operation of an airport such as Stansted.
245. Mr Rust has studied the operation of the airport in great detail and is confident that his assessment is robust. His reliance upon forecast schedules is entirely appropriate; this

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<sup>199</sup> Having worked for STAL undertaking operational studies at STN for many years

approach was supported evidentially by Mr Andrew. In essence the “shape” of the airport day is highly unlikely to change, even with increased throughput. Mr Bamber’s extrapolations are simply seeking to sow seeds of confusion. A further level of reassurance is available in the form of the endorsement of the HAs. This is particularly significant as ECC and HE have direct responsibility for the operation of the M11, A120 and J8 and have many years of experience of the impact of the airport on the adjoining highway network. Indeed, they are the source of the J8 traffic counts. With respect to Mr Bamber, they are far better placed to judge these traffic patterns at Stansted than a sole practitioner traffic consultant based in Berkshire.

246. Mr Bamber has himself undertaken no traffic counts, no surveys, carried out no modelling and made no alternative assessment of flows on any given link or junction. He expressly accepted in XX that he does not claim to have demonstrated any unacceptable levels of impact, but has focused instead on attacking the inputs to the modelling work – and in one respect the outputs.
247. However, a consequence of the late change of heart by ECC in relation to its planned J8 works has been that the full extent of Mr Bamber’s critique of the TAA has been shared with the HAs (and their consultants Jacobs and Aecom) before they “signed off” the modelling and agreed the HSoCG. It is very clear from the extremely detailed Appendix A to the HSoCG that the HAs tested the assumptions in the TAA carefully and only “signed off” the model runs when they were satisfied with the reasonableness and robustness of the assumptions adopted.

## **Methodology**

248. Notwithstanding the HSoCG, Mr Bamber has maintained his catalogue of criticisms and complaints, including his assertion that the TAA methodology is “ludicrous”<sup>200</sup>. It is submitted that the Panel will need to decide how far it wishes to go in interrogating the TAA’s inputs, in circumstances where 5 sets of highway professionals have agreed them and against the backdrop of the test at para.109 of NPPF test which demands that demonstration of “severe residual impacts” before a development should be refused planning permission on highways grounds. Mr Bamber again accepted in XX that his

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<sup>200</sup> Proof, para.2.1.3

proof does not set out or apply the test in para.109 of NPPF and that his proof does not demonstrate “severe residual impact” on the network. A lame attempt to assert such a possibility in ReX is absolutely no substitute for proper examination of this issue in a lengthy written proof, with extensive appendices. There was no such examination in Mr Bamber’s proof.<sup>201</sup>

### **Two-way trip uplift**

249. Mr Bamber’s XinC and XX of Mr Rust by SSE focused on two points: first the correct level of uplift to adopt for two-way trips and second, whether this had been adopted for daily flows.
250. Mr Rust has explained that the TAA adopted a two-trip proportion of 33;23;23 (for 2019; DM;DC) but that these figures were not accepted by the HAs, who agreed by way of substitution the 43;33;33 figures - which had been used in the original TA. The figure of 43% for 2019 had been assessed by Mr Rust following the collation of an entire year of data for vehicular trips to the Express Set Down Area and to the barriered carparks. The 33% for the assessment year assumed a 10% reduction in two way car trips, which Mr Rust considered reasonable and achievable over a 12 year period. The HAs considered and accepted these revised input assumptions<sup>202</sup>.
251. Mr Bamber, by contrast, has requested CAA passenger data for 2019, which is extensively categorised by modes of travel and has sought to make assumptions about which of those might or might not be two-way trips. This exercise is heavily dependent upon judgment, as the CAA data does not investigate this variable for taxis and the like. Mr Rust and the HAs prefer to utilise the STAL year-long data set (as this is a comprehensive measure for private cars and taxis, which STAL can monitor). We ask you to prefer their judgment.
252. Mr Rust has used the 43;33;33 inputs originally set out in the TA to model peak hour flows at J8 and the HAs have accepted these model outputs: see HSoCG dated 7 Jan

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<sup>201</sup> Mr Rust dealt fully with SSE’s obsession with Employee Mode Share. This was fully accepted by the HAs: see CD25.6, Appendix A, page 4, box 4.12 et seq

<sup>202</sup> CD25.6, Appendix A, page 3

2021. Had anyone wished to challenge or explore these further there has been ample opportunity to do so over the past 2 months. Mr Bamber accepted in XX that Mr Rust's two-way uplift had been applied to this modelling and agreed that highways assessment is conducted for the peak hours on the basis that, if the network operates satisfactorily then, it will also operate satisfactorily off-peak. Mr Rust explained that the agreed highway works deliver an improvement in capacity and congestion at J8. As noted above, Mr Bamber puts forward no alternative assessment.

253. Mr Bamber's second point is that the two-way uplift has not been applied to the daily flows in the TAA or Chapter X of the ESA. This is correct, but has no impact on the HSoCG<sup>203</sup>, which does not – and does not need to – address daily flows, as these are not a relevant metric for this exercise. Mr Rust and Mr Bamber were intending to agree a full position statement on these flows when Mr Bamber unfortunately became indisposed. This has been taken forward to some degree with the kind assistance of Mr MacDonald of SSE, but does not have the scope which had originally been hoped for. The additional SoCG<sup>204</sup> which it has been possible to agree has attached at [Figure 1](#) Mr Rust's assessment of the additional increments on network flows between the DM and DC cases at 2032<sup>205</sup>. This data is presented for precisely the same links as for the TAA (compare with Figure 7.3 as updated in CD11.25). It will immediately be seen that these increments are of a very small scale on the links which comprise the strategic highway network carrying the overwhelming majority of traffic to (and dispersing traffic from) Stansted Airport, i.e. the M11 N&S and the A120 E&W. There are no measurable changes in the assessed impacts on the other links, which are relevant primarily for employee trips. These are not, of course, affected by the uplift for daily two-way movements, which is relevant for passenger trips only.
254. Daily trips on these strategic links have a potential significance for two other impacts considered in the ES and ESA, namely surface access noise and air quality. Mr Rust accordingly consulted his colleagues in these disciplines, who have confirmed the minor changes to the daily flows on the strategic highway network have no material impact on

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<sup>203</sup> Ibid

<sup>204</sup> CD25.8

<sup>205</sup> Ibid, para.5

their assessments of surface access noise or air quality<sup>206</sup>. It had been hoped to take matter this forward to a conclusion with Mr Bamber, but he has not produced an alternative assessment of the impact upon the highway links in question for us to review. We invite the Panel to review these documents and revert if there are any matters upon which it seeks further advice or assistance, especially given (for unfortunate reasons with which we entirely sympathise) the difficulty in taking this matter forward in the way which was originally envisaged when both SA witnesses agreed to produce a SoCG. However, we note that the underlying concern of Mr Bamber, expressed very clearly in his oral evidence, was in relation to impacts on sensitive receptors, in particular the villages of Takeley and Stansted Mountfitchet. As Mr Rust's Figure 1 amply demonstrates, there will be no additional impact upon either settlement – nor, for good measure, upon the Hockerill AQMA.

255. Accordingly, it is submitted that, notwithstanding the very late change of position by ECC in relation to its intended works at J8, a replacement scheme has now been developed to the satisfaction of the HAs and their independent consultants which will ensure no severe residual impacts in the DC at 2032. On the contrary, the proposed works will deliver an improvement when compared against the DM case (2033 @35mppa v 2033 @43mppa with Mitigation)<sup>207</sup>. SSE Submissions<sup>208</sup> seek to compare DC with 2014, but of course they should be comparing DC with DM.
256. Additionally, STAL has submitted a robust package of surface access mitigation to reinforce its already impressive credentials as a public transport hub – for rail, coach and bus services. This very high level of public transport provision is, of course, available for use by the local community. All public transport stakeholders (including Network Rail and National Express) have expressed strong support for these proposals and confirmed in evidence that they have existing (or planned) capacity available to meet the additional passenger demand expected. No party has seriously challenged this position. Mr Rhodes evidence was fully rebutted by Mr Rust<sup>209</sup>.

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<sup>206</sup> STAL/10/4

<sup>207</sup> CD25.6, Appendix B, Table 4-2 (AM 932-713; PM 1445- 1190)

<sup>208</sup> Para.9.11(iv)

<sup>209</sup> STAL/10/3, section 3

## **PLANNING BALANCE**

257. Having reviewed the evidence in relation to local economic and environmental impacts, it is necessary to return to the planning balance. We do so, at the risk of repetition, emphasising that this balance is already strongly tilted in favour of allowing this appeal and granting planning permission for the appeal proposals.

258. To:

- i. compliance with the statutory development; and
- ii. the operation of the NPPF presumption in favour of the grant of planning permission; (both of which are agreed by STAL and UDC)

must be added:

- iii. the “in principle” support of recently stated national policy in MBU, formally adopted as part of the government’s new Aviation Strategy; and
  - iv. the range of socio-economic benefits to which STAL’s witnesses have spoken and which has been so clearly endorsed by third party evidence.
259. Only the local environmental impacts have the theoretical potential to outweigh this powerful case for the grant of permission. However, for the reasons we have already discussed, none of these, either individually or cumulatively, comes close to meeting this high threshold. Indeed, on the contrary, when properly analysed, it can be seen that allowing the appeal will result in some beneficial local environmental impacts, when the DC is compared with the DM, for example, in relation to noise.
260. Aviation carbon is self-evidently not a local environmental impact. We submit that MBU policy is clear as to the way in which the government intends this to be addressed by local planning authorities. However, if a carbon crusading LPA were to seek to usurp the role which we think the government has reserved to itself for an application such as STAL’s, then the facts of this case could scarcely be of less assistance to such an

authority. Aviation carbon is the product of ATMs and not passengers. The ATMs upon which STAL relies have already been consented. At 2050, the extrapolated DC v DM carbon increment is miniscule. However, if the DM case is realigned post 2032 to allow the STAL to optimise the commercial potential of its 274,000 ATMs, in accordance with the evidence of Mr Andrew, then this trajectory will plainly converge with that of the DC and there will **no net carbon impact at all** at 2050 and no increase in the only element of “airport capacity” which generates aviation carbon. UDCs and SSEs cases on this topic have been completely misdirected and a great deal of evidence, submissions and time has been wasted.

261. Accordingly, we do not accept that carbon is one of the local environmental impacts which MBU policy intended to be weighed in the planning balance, but even if it is weighed in the balance, on the facts of this case, it makes a negligible impact.
262. No doubt it is for all these reasons that UDC (through Mr Scanlon) accepts that this appeal should be allowed subject to conditions. We note again that he confirmed (in answering Inspectors Questions) that paragraph 9.77 of his Proof<sup>210</sup> stands, uncontaminated by consideration of Condition 15, to which he does not turn until the succeeding paragraphs, which follow the next subheading in his proof. UDC’s Closing Submissions on this point beggar belief. The denial that Mr Scanlon undertook a staged assessment of the balance, factoring in Condition 15 and “revisiting”<sup>211</sup> the planning balance with Condition 15 in place is a delusion of Mr Coppel’s and is so far as removed from the plain words of Mr Scanlon’s proof (confirmed orally to the Inspector) as to engender real doubts as to how Mr Coppel has the nerve to advance it in UDC’s Closing.
263. SSE has not undertaken a valid planning balance exercise<sup>212</sup>, (which is the province of the planning witness not the advocate).

## **CONDITION 15**

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<sup>210</sup> UDC/4/1

<sup>211</sup> Ibid, para.9.80.

<sup>212</sup> See Arnott, SSE/11/1



264. We set out our full response to condition 15 in our submissions of 24 February 2021<sup>213</sup>. UDC’s reply to these submissions<sup>214</sup> is extremely brief and is largely bald assertion as to the alleged lawfulness of the condition. It is telling that not a single authority is referred to by UDC to rebut any of the legal principles cited in our submissions.
265. We can therefore deal briefly with condition 15 in these closing submissions.
266. In light of the Court of Appeal’s judgment in *HS2*, UDC accepts – as it must do – that a condition which seeks to revisit the grant of permission at a later stage would be unreasonable and unlawful. Instead, UDC seeks to distinguish *HS2*, on the basis – it is said – that condition 15 does not “*take away from the airport operator what is permitted by the grant of planning permission*” but instead simply “*defines the mitigation measures needed to regulate the environmental effects of the proposed development.*”
267. However, condition 15<sup>215</sup> plainly does not simply “*define*” the mitigation measures needed to regulate the development, which must in any event be done at the time of granting permission. Its effect is to require the authority to revisit *later* whether the airport should be permitted to grow beyond 35mppa, based on the legislative and policy framework in force at that time. This is not a “fantasy”, as suggested in UDC’s Closing Submissions. It is the effect of the operation of the condition. Thus:
- i. Clause (4) of condition 15 provides that “*An airport operator must not at any time operate the airport where for that year the ppa at the Airport exceeds or will exceed the maximum ppa.*” The “*maximum ppa*” is defined as “*the higher of (a) 35 million ppa; and (b) the number of ppa allowed under the Environmental Modalities Scheme having effect*”.
  - ii. As Mr Andrew noted<sup>216</sup>, in determining whether to grant such approval, clause 10 hands back “*substantial discretion*” to the LPA at each stage to make “*such modifications*” and “*impose such conditions, limitations and restrictions as it considers expedient*”. These include the discretion to limit the increase in the

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<sup>213</sup> CD 26.8

<sup>214</sup> CD 26.17a

<sup>215</sup> CD 26.23

<sup>216</sup> Andrew re-x

maximum ppa to 1 million or more and to limit the period for which the scheme is effective to 2 years or more.

268. The requirement to obtain approval for an “*Environmental Modalities Scheme*” is, therefore, a requirement to obtain permission for the additional ppa by another name, as the definition of “*maximum ppa*” (i.e. “*the number of ppa allowed under the [scheme]*”) makes clear. Increasing capacity would be contingent on securing UDC’s approval first, after permission has been notionally granted. Unless this approval is granted, STAL would be liable to enforcement action and could be required to cease operating the airport altogether. It is impossible to see how this is reconcilable with the *in principle* grant of planning permission now.
269. In XX of Mr Andrew, it was suggested that condition 15 simply “*enables the conditions [attached to the grant of permission] to be recalibrated*”. However, there is absolutely no conceptual or practical difference between “*recalibrating*” the application of this condition and “*recalibrating*” the question of whether the additional 8mppa should be allowed. The effect of Condition 15 is that STAL is prohibited from growing to the 43mppa notionally permitted, without first obtaining the approval of UDC.
270. Indeed, Condition 15 arguably goes even further than just revisiting the principle of the grant of permission for 43mppa. Its purported effect is also to revisit the principle of the consents *previously* granted in 2003 and 2008, by imposing new and unwarranted thresholds on noise, air quality and carbon emissions up to 35mppa, and by preventing the operation of the airport at all after 2027 unless UDC “signs off” on each increment of additional capacity, applying whatever policies may be in force at that time. There is no comparison between Condition 15 and the “Luton 10” condition, where the “tightening”<sup>217</sup> is fixed and pre-determined at the date of the original consent and no further application to the LPA is required.
271. As Mr Andrew correctly put it, “*this is not the way the planning system works and it isn’t how it should work*”. Instead “*the planning system needs to take decisions based on the evidence and policies available at the time of the decision*”. These are wholly uncontroversial propositions.

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<sup>217</sup> UDC closings para 139

272. The other basis on which condition 15 is said to be distinguishable from the condition in *HS2* is because it is not a “*Grampian condition*.”<sup>218</sup> Instead, UDC blithely says that if permission is granted “*the airport operator can grow its operations up to 35mppa without doing more than what is required by Schedule A*”. However, STAL already has permission to grow to 35mppa and there is no earthly reason why it should therefore be required to comply with the restrictions imposed under Schedule A, which were not deemed necessary by the Secretaries of State in granting permission in 2008.
273. Condition 15 plainly therefore undermines the “*fundamental objective of providing, through planning decisions made under the statutory regime, certainty and finality for those affected by them*” (per the Court of Appeal in *Connors* at §90). Quite how Condition 15 is said to provide STAL with this certainty<sup>219</sup> is a mystery: if Condition 15 was imposed, STAL would have no idea whether it would ever be able to grow to 43mppa at all. It would not even know against what “*contemporaneous policies*” the “*evaluation of a modalities scheme*” would be assessed by UDC.
274. In response to questions from the Inspector (Mr Boniface), Mr Scanlon suggested that a Condition 15 type mechanism was necessary in order to provide “*security that Stansted by getting consent now won’t be ahead of the game on other airports*”. But this is also not how the planning system works, as Mr Scanlon well knows. This scheme is before the Panel now and it has to be determined on the basis of the policy framework and evidence before the Panel now. In the unlikely event that the policy framework changes dramatically between the date of the decision on this appeal and the point when STAL reaches 43mppa, Stansted’s permitted 43mppa will simply become part of the baseline against which other airport expansion proposals will need to be considered.
275. Nor, for all the reasons set out in our submissions (which UDC’s very thin reply does not begin to address), does the “*alternative dispute mechanism*” proposed by Schedule C provide a lawful mechanism for remedying this uncertainty. The proposition that planning legislation provides “*a complete statutory code*” for the determination of planning applications is not, as UDC suggests, an “*over-simplification*”: this formulation is lifted directly from the Court of Appeal in *Connors*, referring back to the

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<sup>218</sup> UDC reply §16

<sup>219</sup> CD 26.17a para 20

decision of the House of Lords in *Pioneer Aggregates*. Schedule C flies in the face of this well-established principle and it is unsurprising that UDC has been unable to identify any authority or precedent for importing a binding private law dispute mechanism into the statutory procedure for the discharge of planning conditions.

276. As to para 24 of UDC’s reply, it is extremely difficult to see how the “*alternate decision maker*” in Schedule C can be said to be the “*alter ego of UDC*”<sup>220</sup>, given that its decision is final and binding on UDC even if UDC disagrees with it. This would amount to a clear surrender of the Council’s discretion, contrary to the principles cited at para 28 of our submissions. UDC’s insistence that condition 15 “*does not contain a delegation of power*” therefore makes little sense. The role of the “*alternate decision maker*” is also a world away from that performed by “*outside consultants*” engaged to advise UDC on the proper exercise of its functions, whose advice UDC is free to accept or reject (as it did here).
277. None of this should require spelling out in these closing submissions. There is a sense that UDC and its experts have fallen down a rabbit hole and into an alternative planning universe in their fixation on Condition 15 as the answer to this appeal. There is a very good reason why UDC has been unable to identify any precedent for this condition, and why Mr Scanlon was obliged to concede in response to questions from Mr Boniface that condition 15 is, indeed, “*novel*”.
278. Unfortunately, a great deal of time has also been wasted at this Inquiry, dealing with this condition in evidence and submissions. UDC’s continued defence of this appeal on the “*primary*” basis<sup>221</sup> of a manifestly unlawful and non-policy compliant condition is plainly unreasonable behaviour, for reasons we expand upon in our submissions on costs.

## **CONCLUSION**

279. We conclude by submitting, with perhaps unusual vigour, that the case for allowing this appeal is an exceptionally powerful one; so much so, of course, that the LPA’s

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<sup>220</sup> Ibid para 25

<sup>221</sup> Scanlon response to Inspector’s questions

planning witness has expressed agreement with the conclusion that this would be the correct outcome.

280. UDC's Planning Committee, having filibustered for 14 months following its resolution to grant planning permission, ultimately allowed itself to fall completely under the spell of SSE in January 2020 and refused planning permission for the appeal development for a series of completely unsustainable reasons. It is notable that not one Member of that Committee has been called to explain the rationale for this refusal. SSE has run a series of additional arguments, in an effort to bolster the Council's refusal, but none of these has come to anything.
281. We hope that the analysis set out in these Submissions (based upon the evidence which this Inquiry has heard) has now established irrefutably what the correct outcome should have been in January 2020 and what the correct outcome should be today.
282. We respectfully request on behalf of STAL that this appeal be allowed.

**THOMAS HILL QC**  
**PHILIPPA JACKSON**

12 March 2021

**39 ESSEX CHAMBERS**

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DATE WEEK 7	TOPIC/PARTIES	WITNESS	TIME ALLOCATED
Wednesday 10 March	ACCOMPANIED SITE VISIT		
Thursday 11 March 9.30 am Day 29	SSE CLOSING SUBMISSIONS  UDC CLOSING SUBMISSIONS		AM  PM
Friday 12 March 9.30 am Day 30	STAL CLOSING SUBMISSIONS		AM