Department
for Transport

2026 UK Aviation Forecast

June 2026

Department for Transport
Great Minster House
33 Horseferry Road
London
SW1P 4DR

This publication is also available on our website at www.gov.uk/government/organisations/department-for-transport

Any enquiries regarding this publication should be sent to us at www.gov.uk/government/organisations/department-for-transport

Contents

Figures and Tables

Glossary

Term	**Description**
APD	Airport Passenger Duty
ATM	Air Transport Movement
Behavioural	A scenario considering environmental concerns on passengers’ likelihood to fly
CAA	UK Civil Aviation Authority
CAS	Common Analytical Scenarios
CORSIA	ICAO's Carbon Offsetting and Reduction Scheme
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
Current Trends	Central scenario showing a continuation of existing trends
DESNZ	Department for Energy Security & Net Zero
DfT	Department for Transport
EIS	Entry In Service
ETS	Emissions Trading Scheme
FMM	Fleet Mix Model
GDP	Gross Domestic Product
High Growth	Scenario showing the upper limit of forecasts in a high growth economy
Jet Zero	UK Government framework and plan for achieving net zero aviation by 2050.
Low Growth	Scenario showing the lower limit of forecasts in a low growth economy
NAPDM	National Air Passenger Demand Model
NAAM	National Airport Accessibility Model
NAPAM	National Air Passenger Allocation Model
NO_x	Nitrogen Oxides
NTEM	National Trip End Model
OBR	Office for Budget Responsibility
OECD	Organisation for Economic Co-operation and Development
OEM	Original Equipment Manufacturer
ONS	Office for National Statistics
Regional	Scenario where there is higher population growth outside the Southeast
RoE	Rest of Europe

RoW	Rest of World
SAF	Sustainable Aviation Fuel
SE	Southern Europe
Technology Development	Scenario representing potential further developments in technology with respect to decarbonisation
Terminal passengers	A passenger who joins or leaves an aircraft at an airport

1. Executive summary

Introduction

1.1. This document sets out the Department for Transport (DfT) 2026 forecasts for air passengers, aircraft movements and CO_2 emissions for UK airports. The Department's forecasts are a long-term strategic look at UK aviation and are used for the following purposes:

- Informing future aviation strategy and policy, including aviation decarbonisation.
- Informing national aviation policy e.g., on airport expansion.
- Feeding into other government departments and the wider aviation sector.

1.2. The set of forecasts presented in this document are an update to the forecasts published in 2017. Additionally, in 2022 DfT published the Jet Zero emission forecasts and illustrative scenarios as part of the Jet Zero Strategy.

1.3. This document is designed to sit alongside the modelling framework document[1] which explains how the DfT Aviation Model works. Readers of this document with queries regarding the operation and methodological underpinnings of the model, in the first instance, should reference the modelling framework. The focus of this document is to clarify the input assumptions used, how the scenarios were developed, and the results of the model outputs.

Background

1.4. In January 2025, the Government confirmed its support for delivering a third runway at Heathrow Airport, recognising the role that expansion can play in strengthening the UK's connectivity, supporting economic growth and enhancing long-term competitiveness. To support this policy development, the Government invited potential scheme promoters to submit proposals and, in parallel, committed to review the Heathrow Expansion National Policy Statement (HENPS). Following the assessment of submitted proposals, the Government concluded in November

---

[1] https://www.gov.uk/government/publications/aviation-modelling-framework

2025 that the Heathrow Northwest Runway scheme promoted by Heathrow Airport Ltd offered the most credible and deliverable option to inform the remainder of the HENPS review.

1.5. At the same time, the Government continues to prioritise aviation decarbonisation. This includes accelerating progress on low and zero-emission fuels, supporting innovation across efficiencies and carbon-reduction technologies, developing carbon markets and greenhouse gas removals (GGRs) to address residual emissions. The government has been clear that any airport expansion proposals need to demonstrate that they can be delivered in line with the UK's legally binding climate change commitments. Progress on SAF, airspace modernisation and development of new technologies will support the sustainable growth of the sector.

1.6. This Aviation Forecast provides the updated demand, capacity and CO_2 emissions projections required to support that policy framework, including the HENPS. It replaces previous forecasting outputs and provides an evidence base to inform longer term strategic policy. This document can be read alone, but can also be read as a technical document which provides context on the approach and methodology used to create the forecasts which sit within HENPS.

The aviation market

1.7. Passenger numbers at UK airports have grown steadily since 1950, reaching almost 300 million in 2025. The COVID-19 pandemic disrupted travel patterns and demand fell sharply in 2020 and 2021, though passenger numbers recovered rapidly and by 2025 had exceeded pre-pandemic levels. Air Transport Movements (ATMs) have seen a slower recovery. This reflects a shift towards larger aircraft, and stronger recovery on international routes - where flights typically carry more passengers - than on domestic routes.

1.8. Passenger traffic from UK airports to European destinations has remained high, with destinations in Southern Europe seeing a stronger recovery post-pandemic compared with other parts of Europe. Much of this growth has been driven by low-cost carriers. Outside of Europe, recovery has been stronger on routes to non-Organisation for Economic Co-operation and Development (OECD) member countries, while passenger numbers travelling to OECD destinations remain below 2019 levels.

1.9. Heathrow, Gatwick, Stansted and Manchester remain the UK's major international gateways, with Heathrow alone serving passengers on nearly 200 regular international routes. Among the largest UK airports, Glasgow and Edinburgh regularly serve the most domestic routes.

1.10. The proportion of passengers travelling for business has reduced over time. In 2019, 19% of passengers travelled for business, compared to 13% in 2024.

The aviation model

1.11. The Department continues to develop, maintain and operate a comprehensive aviation model. It comprises a suite of interrelated components to produce forecasts for demand at the national level, passengers and aircraft at the larger UK airports and the CO_2 emissions associated with aircraft departures from UK airports.

1.12. The modelling suite is made up of several linked modules. First, national demand is estimated using economic analysis and econometric techniques. This feeds into the airport accessibility and allocation models, which distribute passenger demand across individual airports and routes. Finally, the CO_2 model uses these allocations, along with operational assumptions, to produce a full forecast of UK aviation CO_2 emissions.

1.13. The model has undergone a significant number of updates and improvements since 2017, most notably:

- In the economic demand model, the Department re-estimated the long-run elasticities of demand with respect to price and income. These updated elasticities were published following academic review in 2022[2]. Market definitions and global region groupings were also refined to ensure consistency with the updated econometric specification.

- The carbon pricing methodology has undergone a comprehensive review. The model now utilises differentiated assumptions for the UK Emissions Trading Scheme (UK ETS) and the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) carbon prices across global regions to better reflect their respective policy design and coverage in each region.

- Cost components have also been reviewed. The demand model now explicitly incorporates Sustainable Aviation Fuel (SAF) using assumptions developed by DfT which are aligned with the UK SAF mandate. SAF uptake and pricing assumptions are reflected within the air fare module to capture the demand impacts of changes in the jet fuel mix. In addition, the non-fuel cost component of fares has been updated using more granular and recent data from an external provider.

- Updated post-pandemic Civil Aviation Authority (CAA) UK airport data, together with revised long-term economic determinants from the Office for Budget Responsibility (OBR), the OECD and the International Monetary Fund (IMF), have permitted updated long-run passenger demand projections. With national aviation demand having returned to pre-pandemic levels and several years of post-COVID-19 observed data now available, the model no longer applies a temporary recovery override to represent short-term demand recovery.

- The 2024 CAA UK airport data are used as the base year for demand calibration ensuring the model reflects aircraft and route networks post-COVID.

---

[2] https://assets.publishing.service.gov.uk/media/6235a5378fa8f540edba36f5/econometric-models-to-estimate-demand-elasticities-for-the-national-air-passenger-demand-model.pdf

- The Department has re-estimated the logit parameters and model form for the passenger airport choice model. The airport choice model segments, geography and behavioural value of time have also been updated.

- The Fleet Mix Model (FMM) has been integrated into the National Air Passenger Allocation Model (NAPAM) calculation of ATM demand, enabling route-level forecasting of the future fleet. Once the aircraft types are assigned to each route and year, the model determines the number of forecasted ATMs served by each aircraft type. Previously, fleet allocation occurred downstream of the ATM airport and route allocation stages and was applied only at an aggregate national level.

- The base-year fleet has been updated using observed 2024 route-level fleet data and fleet age distributions from CAA UK airport data and Cirium fleet data.

- Alignment of base year CO_2e emissions with observed 2024 aviation bunker fuel figures (international and domestic), ensuring aviation emissions baseline reflects the latest reported fuel-uplift activity

- Integrated functionality to model hydrogen fuel burn for future zero emission aircraft (ZEA) within the CO_2 Model.

1.14. The purpose of these forecasts is primarily to inform longer term strategic policy for example; HENPS or SAF, rather than to provide detailed forecasts at each individual airport in the short term - commercial and local information not reflected in these national strategic forecasts could be significant at airport level in the short term.

1.15. This Aviation Forecast provides the updated demand, capacity and CO_2 emissions projections required to support that policy framework, including the HENPS. It replaces previous forecasting outputs and provides an evidence base to inform longer term strategic policy.

Passenger demand and ATM forecasts

1.16. The presentation of the air passenger forecasts as demand growth scenarios reflects the inherent uncertainty in forecasting to 2050. A series of supporting sensitivity tests on the key economic inputs provide further evidence on the potential variability around the underlying economic inputs.

1.17. Forecasts are made for demand constrained by airport capacity limitations, such as passenger limits or aircraft movement limits. Capacity constrained forecasts form the primary basis of the Department's appraisal and decision-making processes.

1.18. After allowing for all runway and terminal constraints including Heathrow expansion, passengers at UK airports in 2050 are forecast to reach 491 million in the Current Trends[3] scenario, with a lower range of 412 million and an upper

---

[3] Chapter 2 of this document provides a full explanation on the use of scenarios within the model.

range of 510 million[4]. “The ‘Current Trends’ scenario serves as the central case for these forecasts. It implies an average annual growth rate of 2.0% for the central case, with a lower range of 1.3% over the period 2024–2050 and an upper range of 2.3% over the period 2024–2048. This compares with an observed average annual growth rate of 2.1% on the period 2000–2024.

CO_2 forecasts

1.19. The evidence base, model input and assumptions for CO_2 emissions have continued to be updated since the 2022 Jet Zero Strategy, resulting in revised forecasts of the CO_2 emissions trajectory to 2050. The numbers presented here are the most up-to-date at the time of production and are presented on a lifecycle basis. We continuously evolve our evidence base, and present updated estimates in relevant policy publications.

1.20. Current decarbonisation abatement measures result in forecasted CO_2e emissions of 41.1Mt by 2050 in the central Current Trends scenario, with a lower range of 34.2Mt and an upper range of 44.3Mt. The lower and upper ranges are defined by low and high demand growth assumptions. In a scenario where there are further developments in technology and operational efficiency to reduce carbon emissions from aviation (the Technology Development scenario), CO_2e emissions are forecast to be 28.1Mt by 2050.

1.21. Various carbon emission trajectories for aviation are produced for several purposes, using different accounting methodologies. Further detail on this is covered in the Chapter 7.

---

[4] The upper-bound ‘High Growth’ scenario terminates in 2048; consequently, its average annual growth rate is calculated over the period ending in 2048, whereas the central and lower-bound scenarios are estimated through 2050. More details are provided in the chapter 6 of this document.

2. Introduction

2.1. This document sets out the DfT 2026 forecasts for air passengers, aircraft movements and CO_2 emissions at UK airports. The forecasts have a base year of 2024. They supersede the last set of forecasts published by the Department in October 2017[5].

2.2. This set of forecasts follows a scenario approach[6], whereby DfT designed scenarios that capture the range of uncertainty that impacts forecasts for air passenger demand, ATMs and CO_2 emissions.

Scenarios

2.3. Each scenario in these forecasts is designed to be a plausible outcome for passenger demand, with no scenario designed to be more likely than another. To design these scenarios, DfT considered existing guidance on uncertainties within transport demand forecasting.

2.4. The following six scenarios are presented in these forecasts:

- Current Trends - a scenario which uses the central economy inputs and presumes passenger behaviour does not change from current trends and patterns, this is the DfT core scenario.

- High Economy - a scenario which presumes passenger behaviour follows existing trends and strong economic growth has a significant positive effect on passenger demand.

- Low Economy - a scenario which presumes passenger behaviour follows existing trends, and weak economic growth constrains the growth of passenger demand

---

[5] https://assets.publishing.service.gov.uk/media/5e8dec2786650c18c9666633/uk-aviation-forecasts-2017.pdf

[6] Common analytical scenarios data book - GOV.UK

- Regional - a scenario whereby population growth in the UK remains consistent with current trends, but the regional distribution of that growth is altered so more population growth occurs outside of Southeast England.
- Behavioural - a scenario which considers how environmental concerns and new ways of working may change passengers' likelihood to fly.
- Technology Development - a scenario which represents the impact of potential further developments in technology, particularly with respect to decarbonisation.

Nature and purpose of forecasts

2.5. The DfT forecasts serve a number of purposes. For example they:

- Estimate the passenger demand and aircraft movements in illustrative scenarios to inform future aviation strategy and a range of policies.
- Can be used by government and airports to inform decisions whether new airport capacity is needed, where it should be located, and what the environmental impacts would be.
- Provide estimates for a range of CO_2 emissions from aviation activities within the model to inform government net zero and wider decarbonisation policy.
- Can be used by other government departments, their agencies, and others working independently of the aviation sector.

2.6. The purpose of these forecasts is primarily to inform longer term strategic policy rather than providing detailed forecasts for each individual airports over the short term. There are inherent uncertainties associated with the long-term forecasting of travel demand – these uncertainties are exacerbated at the level of individual airports. These uncertainties include:

- Economic uncertainties associated with regional, national and international economic growth performance which have a significant impact on the decision to fly and the routes flown.
- Demographic and social changes – demographic shifts may alter airport choice and consumer preferences.
- Uncertainties on the commercial decisions within the industry – e.g., the frequencies airlines will allocate to routes, or the routes airlines choose to fly.
- Airport choice for passengers is highly dependent on the surface access time and cost of getting to an airport, and indeed whether a passenger chooses to fly.
- Unexpected events such as natural disasters, geopolitical conflicts, or public health crises.

2.7. At the airport level, the Department's forecasts may differ to those produced by the airport. Airport forecasts are often produced for different purposes, whose practitioners have access to a wider set of inputs than the Department. Individual airport forecasts are often used to inform business planning and performance – such information is particularly relevant in the short to medium term.

2.8. Individual airports also have access to commercial information which the DfT does not, for example, agreements with airlines to increase capacities or their route developments plans. Access to such information can significantly alter any estimate of routes available and potential traffic. This is particularly true for smaller airports, whereby individual routes or carriers can make a significant proportion of the traffic at that airport. In some circumstances, more recent airport-specific data and forecasts may be more appropriate to inform local planning decisions.

2.9. The Department recognises the value in publishing our airport level forecasts, so have included them in this publication. Publishing individual airport forecasts also ensures the department is transparent in its forecasting methodology and aids continuity with previous publications.

2.10. The Department aims to accurately reflect existing planning restrictions for airports. However, the forecasts should not be considered as a cap on the development of individual airports or be considered the maximum level of demand the sector may see.

Scope of these forecasts

2.11. This report explains the modelling outputs based on the scenarios developed by DfT. These forecasts have a base year of 2024. The results of these forecasts are presented annually, over the time period 2024 - 2050. The model forecasts:

- National air passenger demand for 2024-2050 allowing for airport constraints.
- Forecasted passenger numbers at selected UK airports.
- ATMs at selected UK airports.
- Passenger and ATM activity at four competing overseas hub airports.
- Measures of airline activity (distances flown and seat capacity).
- CO_2 emissions for aircraft departing from UK airports both international and domestic.

2.12. The aviation model does not model all UK airports, nor General Aviation activity. Airports within the scope of the Aviation Model are only those operating with regular international commercial passenger services in 2024. When forecasting international-to-international interlining passengers, the Aviation Model also models four competing overseas hubs. Note these forecasts do not forecast cargo demand, only air passenger demand. The Model does adjust for cargo ATM use of runway capacity. Please refer to DfT modelling framework document[7] for further detail on all these points.

Context of these forecasts

2.13. These forecasts are published to coincide with the Government's release of the HENPS, which is central to decisions on future runway capacity at Heathrow, regional connectivity and sustainable growth of the aviation sector.

2.14. The Department has updated its aviation modelling to reflect the latest evidence on passenger demand, environmental commitments and technological change. This update incorporates new data and policy developments since the last forecasts, ensuring alignment with the objectives on the HENPS.

Uncertainty in forecasting

2.15. This set of forecasts are standalone and present a set of scenarios for the reader to consider.

2.16. In May 2021, DfT published the first edition of its Uncertainty Toolkit within the Transport Appraisal Guidance (TAG). This toolkit presents users of the guidance with tools to reflect uncertainty within analysis. One of these tools is the Common Analytical Scenarios (CAS) which provides users with seven scenarios useful to reflect the future uncertainties of transport forecasting. These scenarios have been adapted and applied to the aviation sector within these forecasts, alongside a scenario which considers the central estimate for individual inputs.

2.17. Each scenario is designed to be a plausible outcome for passenger demand, aircraft movements and emissions. No scenario should be considered 'more likely' than another. The scenarios presented in these forecasts should therefore be considered as a reasonable range for the uncertainty in UK air passenger demand over the modelling period.

This document

2.18. The rest of this report is set out in the following way:

- Chapter 3 'Context: Past and Present' explains how UK aviation has changed since 2017.
- Chapter 4 'The Aviation Model Suite' describes the models and methodology used to produce these forecasts and explains how these have changed since forecasts were last published.
- Chapter 5 'Input Assumptions' outlines the assumptions and sources used for the inputs in scenarios.

---

[7] https://www.gov.uk/government/publications/aviation-modelling-framework

- Chapter 6 'Forecasts' describes the range of forecasts where demand is constrained by capacity considerations.

- Chapter 7 'CO_2 Emissions Forecasts' presents the CO_2 emissions forecasts associated with the scenarios.

2.19. Chapter 8 'Sensitivity Tests' presents a range of scenarios to assess how uncertainty in key assumptions affects aviation demand. A series of annexes provide a breakdown of additional validation information and economic input sources which are supplemented by a separate spreadsheet file of the tables that appear in this document. In addition to the data presented in this report, data files are available which provide fully disaggregated passenger and ATM outputs for the forecast years of 2030, 2040 and 2050.

3. Context: Past and Present

Data sources

3.1. The analysis in this section is based on the following sources:

- DfT analysis of CAA UK airport data, for passenger numbers, ATMs, and freight handled;
- DfT analysis of CAA Departing Passenger Survey data, for breakdowns of passenger numbers by journey purpose;
- Final UK greenhouse gas emissions statistics: 1990 to 2024, published by the Department for Energy Security and Net Zero, for data on aviation CO_2 emissions.

3.2. Figures derived from DfT analysis of CAA data may differ slightly from published CAA figures due to minor differences in definitions and data processing.

UK aviation: a historical view

3.3. Passenger numbers at UK airports have been growing steadily since 1950, with the exception of periods of decline due to the financial crisis and COVID-19 pandemic. 2025 saw record numbers of terminal passengers at UK airports, peaking at just under 300 million (Figure 3-1).

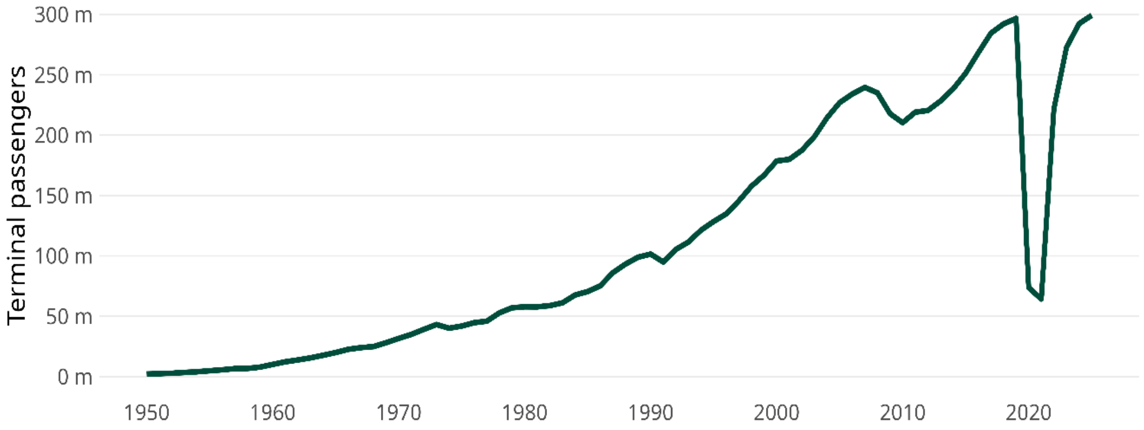

Figure 3-1: Terminal passenger numbers at UK airports, 1950 to 2025

3.4. ATMs have naturally grown responding to increasing demand, surpassing 2 million reported annually between 2011 and 2019 (Figure 3-2). However, since the pandemic, ATMs have stayed below their peak despite passenger numbers surpassing pre-pandemic levels in 2025.

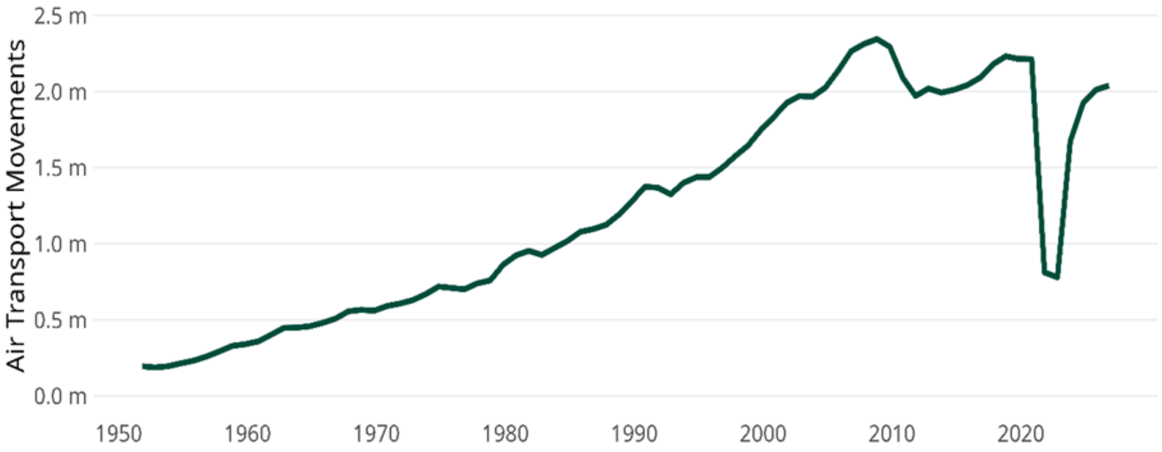

Figure 3-2: Air transport movements at UK airports, 1950 to 2025

3.5. Following a slight dip during the pandemic, freight volumes have now recovered to pre-pandemic levels, with UK airports handling a peak of 2.7 million tonnes of freight in 2025. In contrast to passenger numbers, freight volumes have remained at broadly similar levels since 2000 (between 2.0 and 2.7 million tonnes per year).

3.6. COVID-19 restrictions brought declining numbers of passengers and ATMs. Passenger numbers at UK airports fell to levels last seen in the mid-1980s, while ATMs fell to levels seen in the late 1970s. Tonnes of freight handled remained high due to the need to retain existing supply chain arrangements and ensure the continued supply of goods to and from the UK.

3.7. Since 1950, the only other sustained period of decline in aviation activity was linked to the global financial crisis in 2008.

UK aviation: 2017 to 2025

3.8. Data in the paragraphs that follow are drawn from the period 2017 (the last time these forecasts were published) to 2025. This section focuses on sector recovery and comparisons to 2019, the last year of 'normal' sector activity before the COVID-19 pandemic. The focus is on passenger numbers and ATMs as air freight is not modelled as part of the DfT Aviation Model.

Terminal passengers

3.9. Terminal passenger numbers at UK airports increased between 2017 and 2019, before declining sharply during the period when COVID-19 restrictions were in place. By 2024 terminal passenger numbers had almost recovered to 2019 levels and in 2025 total passengers at UK airports surpassed the total for 2019 (Table 3-1).

Year	London airports[8]	Non-London airports	Total
2017	171.1	113.3	284.4
2018	177.2	114.8	292.1
2019	181.0	115.7	296.7
2020	46.7	27.0	73.7
2021	38.3	26.0	64.3
2022	134.1	87.5	221.6
2023	168.0	104.7	272.7
2024	177.6	114.7	292.3
2025	179.2	120.0	299.2

Table 3-1: Terminal passengers at UK airports (millions), split by London and non-London airports, 2017 to 2025

Air transport movements (ATMs)

3.10. Overall ATMs at UK airports saw a slight year-on-year decrease between 2017 and 2019, and a steep decline in 2020 and 2021, before recovering from 2022 onwards (Table 3-2). ATM recovery has been slower than that of terminal passengers, because of a trend towards the use of larger aircraft, and stronger recovery on international routes, where flights typically carry more passengers, than on domestic routes.

Year	London airports	Non-London airports	Total
2017	1.12	1.11	2.23
2018	1.14	1.08	2.21
2019	1.15	1.07	2.21
2020	0.42	0.39	0.81
2021	0.37	0.41	0.78

---

[8] London Airports includes: Heathrow, Gatwick, Stansted, Luton, London City and Southend airports

2022	0.88	0.80	1.68
2023	1.03	0.89	1.93
2024	1.07	0.94	2.01
2025	1.08	0.96	2.04

Table 3-2: Air transport movements (ATMs) at UK airports (millions), split by London and non-London airports, 2017 to 2025

Where do passengers fly?

International passengers[9]

3.11. Most passengers travelling internationally from UK airports are flying to Europe. Prior to the pandemic, 14 million to 16 million per year more passenger traffic was to and from the Rest of Europe than Southern Europe (Figure 3-3). Post-pandemic, this pattern has reversed. Passenger traffic recovery has been much stronger on Southern Europe routes, with levels in 2025 14% higher than in 2019, compared to 9% lower than 2019 levels for Rest of Europe routes.

3.12. Outside of Europe, recovery in international passenger traffic has been stronger on routes to and from countries which are not members of the Organisation for Economic Co-operation and Development (OECD). International passenger numbers on OECD routes in 2025 were similar to 2017, and below 2019 levels. In contrast, passenger numbers on Rest of the World routes were around 20% higher in 2025 than in 2019.

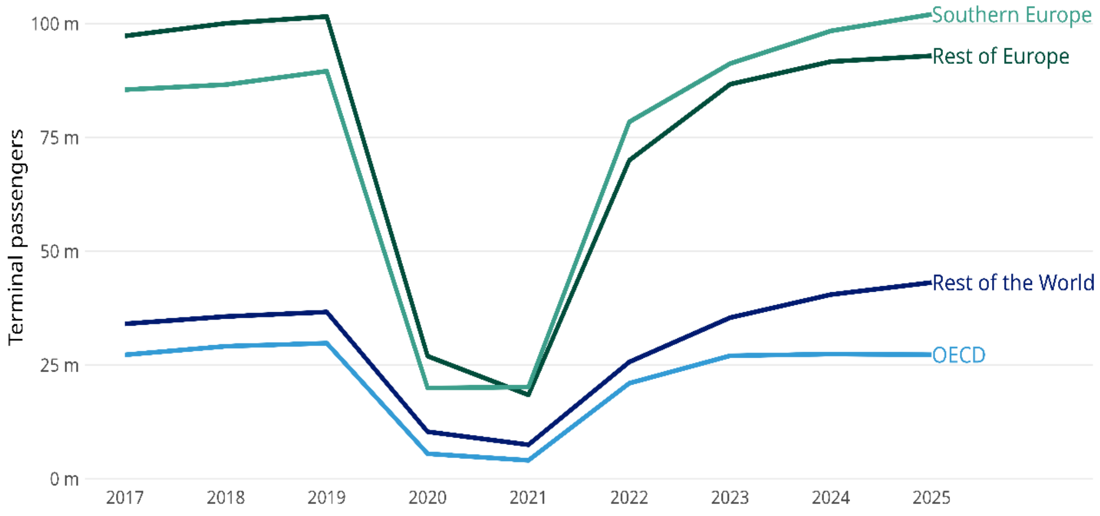

Figure 3-3: International terminal passengers at UK airports split by region of destination, 2017 to 2025

---

[9] The regions used for the purposes of the analysis of international passengers are the same as used in the DfT Aviation Model. European countries which are also members of the OECD are counted within their European region.

Domestic passengers

3.13. The UK's busiest domestic airport-to-airport route in both 2019 and 2025 was between Heathrow and Edinburgh. Almost 1.2 million passengers flew on this route in 2019 and close to 1.1 million passengers in 2025 (Table 3-3).

3.14. The second most popular route in 2025 was between Heathrow and Glasgow, serving around 959 thousand passengers in 2025.

Route	Passengers ('000s)
Heathrow - Edinburgh	1,090
Heathrow - Glasgow	959
Stansted - Edinburgh	722
Heathrow - Belfast City (George Best)	609
Heathrow - Manchester	604
Stansted - Belfast International	565
Heathrow - Aberdeen	555
Belfast International - Manchester	550
Belfast International - Edinburgh	518
Heathrow - Newcastle	478

Table 3-3: Number of passengers on top ten domestic routes in 2025[10]

Destinations regularly served

3.15. Of all UK airports, Heathrow serves the most airport destinations with a regular passenger service (Table 3-4). In 2025, Heathrow served 207 airports with a regular passenger service[11]. Gatwick and Stansted were in the second and third place respectively, with Gatwick serving 201 destinations, and Stansted serving 189. Of the airports listed, Glasgow and Edinburgh regularly served the most domestic destinations.

---

[10] To avoid double-counting passengers, we only consider departure records when calculating domestic air passenger figures at a route-level. For example, figures for the Heathrow - Edinburgh route include departing passengers reported by both airports, but don't include the equivalent arrival records for these same passengers.

[11] A "regular" service is defined as at least 51 departing passenger flights on an airport-to-airport route across the calendar year. This is an average of just under a return service per week (to account for occasional cancellations), though some services will be seasonal and only operating at certain times of the year.

Airport	Domestic[12] destinations	International[13] destinations	Total destinations
Heathrow	9	198	207
Gatwick	7	194	201
Stansted	4	185	189
Manchester	9	172	181
Edinburgh	18	117	135
Luton	6	116	122
Birmingham	6	108	114
Bristol	7	93	100
Glasgow	19	50	69
Liverpool (John Lennon)	3	55	58

Table 3-4: Top UK airports by number of regularly served airport destinations, 2025

Why do passengers fly?

3.16. To understand passenger journey purpose, we use data collected from surveys of departing passengers at selected UK airports[14] conducted by the CAA. This section includes data collected from airports that were surveyed in each year between 2017 - 2019, and 2022 -2024 periods. Surveys were paused between March 2020 and June 2021 due to the COVID-19 pandemic. Data is currently only available up to 2024.

3.17. Passengers travelling from UK airports travel mainly for leisure, with the proportion of leisure passengers increasing from 81% in 2017 to 87% in 2024 (Table 3-5).

3.18. Of the airports surveyed, East Midlands Airport has the largest proportion of passengers travelling for leisure (ranging from 93% in 2017 to 98% in 2024).

3.19. London City handles the highest proportion of business passengers (41% in 2024), followed by Heathrow (18%). In absolute terms, Heathrow dominates, with over half of business passengers at the selected airports using Heathrow.

3.20. The proportion of passengers travelling for business has reduced since the pandemic. In 2019, 19% of passengers travelled for business, while in 2024 the equivalent proportion was 13%[15].

---

[12] Domestic destinations exclude the UK Crown Dependencies - Jersey, Guernsey and the Isle of Man.

[13] International destinations are those outside of the UK, excluding flights to oil rigs.

[14] The airports in this analysis (Heathrow, Gatwick, Stansted, Luton, London City, Manchester, Birmingham and East Midlands) typically represent around 75% to 80% of passengers at UK airports but may not fully reflect the travel behaviour of the entire travelling population. For more details about the Departing Passenger Survey, please refer to the CAA's background information.

[15] Analysis of purpose for travel is based on the following Departing Passenger Survey question: "What is the chief purpose of your present trip?". Potential passenger replies are: Business, Package holiday, Visiting Friends and Relatives, Leisure studies and Leisure other.

Year	Business	Leisure
2017	19%	81%
2018	19%	81%
2019	19%	81%
2020	[x]	[x]
2021	[x]	[x]
2022	14%	86%
2023	14%	86%
2024	13%	87%

Table 3-5: Proportion of passengers traveling for leisure and business at selected UK airports, 2017 to 2024 ([x] indicates that data is not available)

How do passengers fly?

Operation type[16]

3.21. More terminal passengers at UK airports travelled on flights defined in the DfT Aviation Model as ‘scheduled’ than on flights defined as ‘charter’, ‘domestic’ or ‘low-cost Europe’ in both 2017 and 2025. In 2025, 147 million terminal passengers travelled on ‘scheduled’ operations, 109 million on ‘low-cost Europe’, 33 million on ‘domestic’[17], and 9 million on ‘charter’.

3.22. However, most of the growth in passenger numbers has been concentrated on ‘low-cost Europe’ operations. The number of terminal passengers on these services increased by 24% between 2017 and 2025. During the same period, passengers on ‘scheduled’ services remained at similar levels, whilst the figures for ‘charter’ (down 23%) and ‘domestic’ (down 16%) both decreased (Figure 3-4).

---

[16] Operation types align with those used in the DfT Aviation Model. The ‘low-cost Europe’ category covers scheduled flights operated by easyJet, Ryanair and Jet2.com (including subsidiaries) that fly to and from Europe. ‘Domestic’ flights are those operated within the UK (scheduled and charter). ‘Charter’ flights are non-scheduled international commercial flights and ‘scheduled’ is everything that is not ‘charter’, ‘domestic’ or ‘low-cost Europe’. Movements to/from oil rigs are excluded.

[17] In this context, to align with how passengers are treated in the DfT Aviation Model, each domestic passenger is counted as two ‘terminal’ passengers - once upon departure from the first UK airport and once upon arrival at the second.

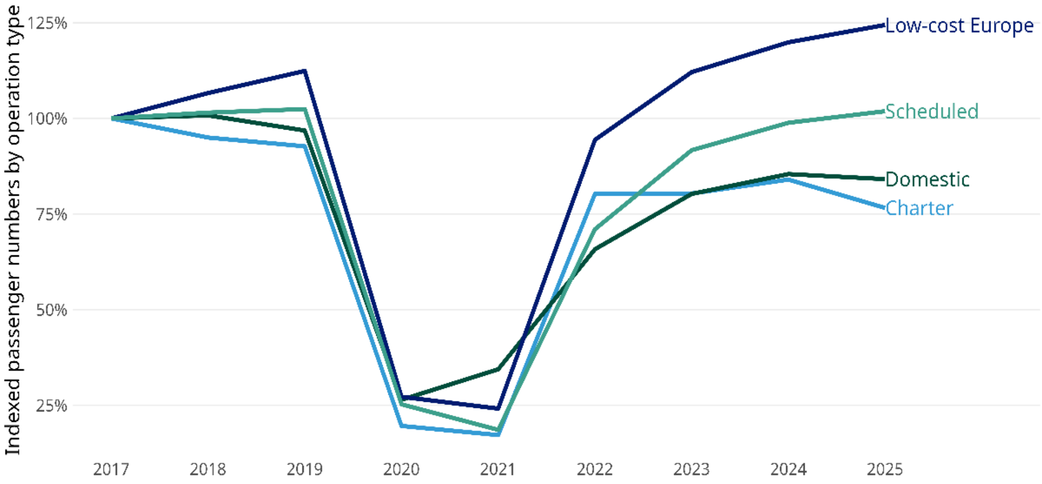

Figure 3-4: Terminal passengers at UK airports split by operation type, 2017 to 2025, indexed to a base year of 2017 = 100

Load factors

3.23. Load factors are a measure of aircraft capacity utilisation and calculated as the proportion of an aircraft's available seats filled with passengers[18].

3.24. Load factors on international and domestic routes have almost recovered to pre-pandemic levels. Load factors for international flights at UK airports were 83% in 2025, having declined to 56% in 2021. In 2019, before the pandemic, international load factors were at 84%.

3.25. For domestic travel, load factors are slightly below pre-pandemic levels, at 77% in 2025, compared to 79% in 2019. The largest decline was seen in 2020, when domestic load factors stood at 61%.

Aviation CO_2 emissions

3.26. In 2024 CO_2 emissions from UK civil aviation reached over 37 $MtCO_2e$. This was a 9% increase compared to 2023, but 3% below the 2017 peak. Most emissions are generated by international flights, with almost 97% of UK civil aviation emissions coming from international aviation (Figure 3-5).

---

[18] In this analysis, load factors are calculated based on the total number of annual passengers divided by the total number of annual available seats.

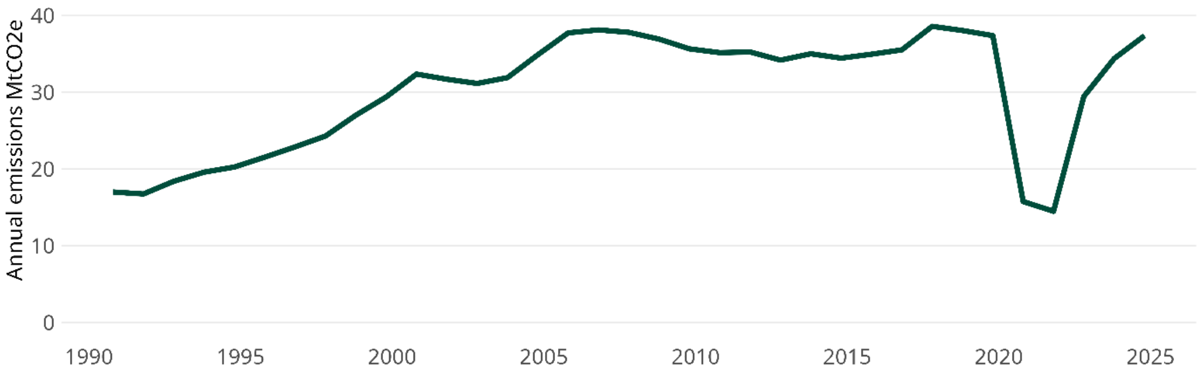

Figure 3-5: Emissions from UK domestic and international civil aviation, 1990 to 2024, $MtCO_2e$

4. The Aviation Model Suite

4.1. The Department applies the aviation modelling suite to forecast air passenger numbers, ATMs, and CO_2 emissions from UK aviation. The model encompasses the primary UK airports[19] and provides varying levels of granularity, ranging from national demand projections to airport-specific forecasts.

4.2. The modelling suite is divided into sub-modules. National Air passenger demand is first projected using an economic demand module (NAPDM), which applies econometrically estimated demand elasticities to link aviation demand to key drivers, including gross domestic product (GDP) and air fares. This produces forecasts of passenger demand at the national level for each modelled aviation markets over the forecast horizon. The airport accessibility model (NAAM) and the allocation model (NAPAM) then distribute the projected national demand to individual airports and routes, using behavioural parameters to represent how passengers choose between available options. Finally, the CO_2 emissions module applies aircraft and operational assumptions to estimate UK aviation CO_2 emissions based on the allocated passenger and ATMs forecasts.

4.3. The modelling framework[20] includes several sub-models, as shown in Figure 4-1. This chapter summarises the main models used for passenger, ATM and CO_2e emissions forecasting.

4.4. The aviation modelling framework details the entire modelling suite function, methodology and recent development. Please consult the framework for in-depth technical specifications and comprehensive background information.

---

[19] Section 4.23 details which airports are included within the model. These are airports that had regular international routes as of 2024.

[20] https://www.gov.uk/government/publications/aviation-modelling-framework

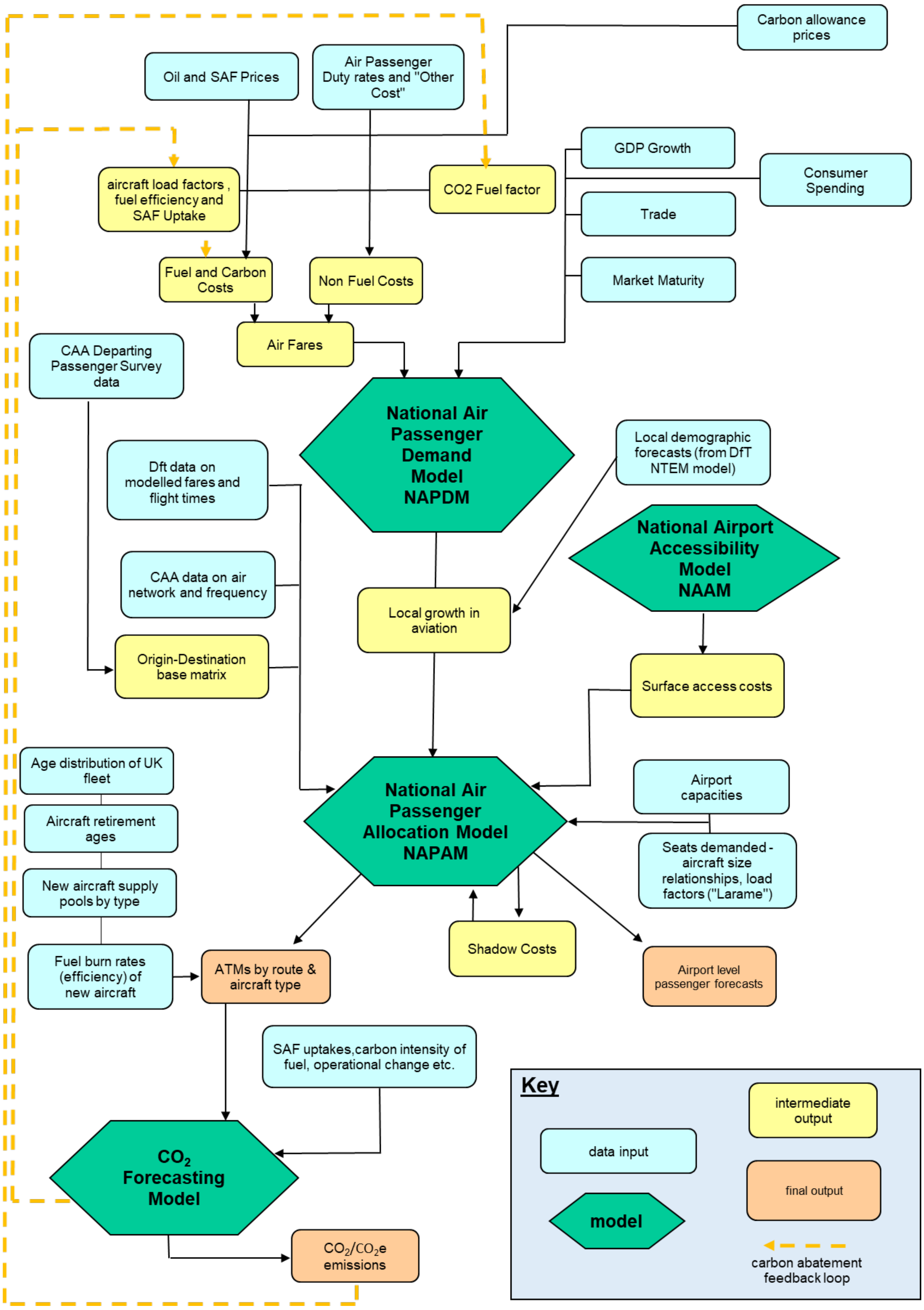

Figure 4-1: DfT Aviation modelling suite

NAPDM - National Air Passenger Demand Model

4.5. Passenger markets in NAPDM are defined using three dimensions: journey purpose (leisure or business), passenger residency (UK resident or foreign resident), and the global region of travel (i.e. the region to or from which the passenger is flying).

4.6. Five global regions representing international and domestic passengers are included:

- Domestic - short-haul UK.
- Southern Europe (SE) - short-haul destination in south of Europe e.g., Spain, Italy, Greece, Portugal, Turkey.
- Rest of Europe (RoE) - short-haul destination in Continental and Eastern Europe e.g., France, Germany, Poland, Netherlands, Denmark.
- OECD Countries (OECD) - long-haul OECD destination outside Europe primarily USA, Canada, Mexico, Japan and Australasia.
- Rest of World - (RoW) - long-haul not in the OECD region, mostly developing economies e.g. Algeria, Egypt, South Africa, Nigeria, China, India, Colombia, Brazil, Philippines, Jamaica.

4.7. For reporting and interpretation, markets are often grouped into short-haul and long-haul segments. Short-haul typically comprises Domestic, SE and RoE, while long-haul comprises OECD and RoW.

4.8. International passenger markets with either an origin or destination in the UK comprise 16 distinct markets. Additionally, there is one international-to-international transfer market, representing passengers who transit through the UK as a hub without the UK being their origin or final destination, as well as two domestic markets. This brings the total number of markets modelled in NAPDM to 19.

4.9. Table 4-1 lists the 19 NAPDM markets with their respective names.

International Passengers	SE	RoE	OECD	RoW
UK residents — Business	UBSE	UBRoE	UBOECD	UBRoW
UK residents — Leisure	ULSE	ULRoE	ULOECD	ULRoW
Foreign residents — Business	FBSE	FBRoE	FBOECD	FBRoW
Foreign residents — Leisure	FLSE	FLRoE	FLOECD	FLRoW
Transfer passengers	II (all regions combined)			

Domestic Passengers	Business	Leisure
UK residents	DomBus	DomLei

Table 4-1: International and Domestic aviation markets names in NAPDM

4.10. In March 2022, the Department published its aviation long-term demand elasticity paper[21]. These demand elasticities are applied for long-term passenger projections to each NAPDM markets (markets in Table 4-1). Changes in key economic drivers, such as UK and Foreign GDP growth (income effects) or air fares (price effects), increase or reduce forecast passenger demand in line with the relevant elasticity values for each market.

4.11. Across all markets, the income elasticity of demand is positive, meaning higher GDP growth is associated with higher passenger demand (and vice versa). NAPDM income elasticities vary between markets, and some markets are more responsive to GDP changes than others, often with less mature markets exhibiting greater responsiveness.

4.12. Some evidence shows that as aviation markets mature, the link between income changes and demand weakens[22]. To address this, adjustments are made to income elasticity, causing it to decrease gradually in all modelled markets over time. Thus, the same increase in GDP leads to smaller rises in national demand further along the model's timeline.

4.13. This maturity process unfolds progressively, with income elasticity of demand gradually declining from 2025 until it reaches 0.55[23] at full maturity in 2095. In the early stages, the effect of declining elasticity is limited, but it becomes more prominent over time. This is discussed in more detail in the chapter on Sensitivity Tests .

4.14. Fare elasticities are used alongside income-based demand forecasting. Aviation demand is considered a normal good where there is a negative relationship between fares and demand: when ticket prices go up, national aviation demand is expected to fall, and conversely, a decrease in ticket prices leads to an increase in aviation demand. How much demand reacts to fare varies between markets more than it does with income changes. Business travel and long-haul routes demand generally show less sensitivity to fare shifts compared to leisure trips and short-haul demand. Fare elasticities are applied equally to both UK-resident and foreign-resident markets, yet they differ based on the purpose of travel and global region.

4.15. NAPDM models fares across multiple markets. The fare module is based on the aggregation of four components: fuel costs, carbon costs, Air Passenger Duty (APD), and other costs. The components that vary most over the forecast period are fuel and carbon costs, reflecting assumptions on the jet-fuel mix (i.e., the share of SAF uptake versus kerosene) and carbon pricing. APD is largely held constant

---

[21] https://assets.publishing.service.gov.uk/media/6235a5378fa8f540edba36f5/econometric-models-to-estimate-demand-elasticities-for-the-national-air-passenger-demand-model.pdf

[22] See figure 2 in https://www.eurocontrol.int/publication/eurocontrol-aviation-outlook-2050

[23] When markets reach a Yed of 0.55 by 2095, it means that a 1% increase in GDP leads to a 0.55% rise in demand for that market, showing reduced sensitivity to economic growth. Most aviation markets have a price elasticity of demand (Yed) above 0.55, but a few markets have Yed below 0.55 at beginning of the modelling period. In that case elasticity isn’t adjusted and stays at starting level.

in real terms and is based on a weighted average of the APD band rates[24] for each NAPDM global region. “Other costs,” which represent most non-fuel aviation costs, are also broadly fixed in real terms over the modelling period, with a slight downward trend. These inputs are discussed in more detail in Chapter 5, section on Fare inputs.

4.16. The fare module should not be interpreted as a tool for predicting ticket prices for specific destinations, as it was not designed for that purpose. Instead, it provides an indicative long-term trend in average aviation costs (in real terms) for trips within each global region. Many commercial factors such as airline pricing strategies, competition, and short-term market conditions can significantly influence observed ticket prices, and these effects are outside the scope of the fare module.

4.17. The efficiency feedback loop between NAPDM and the CO_2 model allows the capture of efficiency improvements and their effects on fuel costs and, ultimately, demand. This provides a mechanism to represent the “rebound effect,” whereby technological efficiency reduces costs and can, in turn, stimulate additional demand.

4.18. NAPDM allocates national aviation demand growth to local districts through district-level population growth projections. It distributes NAPDM trips from national demand to individual UK-district defined in the National Trip End Model (NTEM)[25]. This allows NAPAM to take into account regional population growth projections that affect airport choice and viability of route networks, while maintaining consistency with the national trip totals.

4.19. The district growth module also allows NAPDM to capture changes in the spatial distribution of the UK population over time. District-level shares of demand are driven by projected population change, such that districts with higher forecast population growth receive a greater proportion of each market’s demand growth.

4.20. Figure 4-2 summarise the structure of NAPDM, providing an overview of its inputs, the calculations carried out, and the outputs generated by the model.

---

[24] https://www.gov.uk/guidance/rates-and-allowances-for-air-passenger-duty#rate-bands

[25] District-level population growth projections in NAPDM are sourced from DfT’s NTEM model, which forecasts UK origin-destination growth up to 2051. NTEM's district zones align with those in the allocation model, making DfT NTEM suitable for population projection purposes for these forecasts.https://www.data.gov.uk/dataset/11bc7aaf-ddf6-4133-a91d-84e6f20a663e/national-trip-end-model-ntem

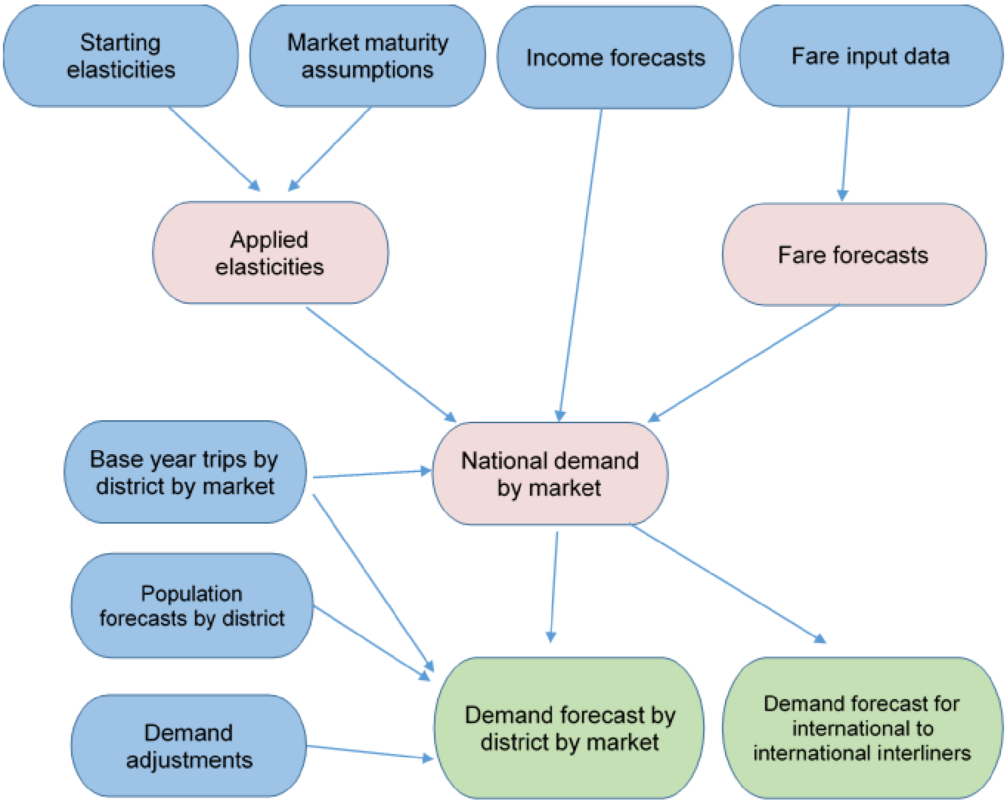

Figure 4-2: NAPDM module structure

NAPAM - National Air Passenger Allocation Model

4.21. The NAPAM forecasts passenger demand at 29 airports throughout the UK and four competing overseas hubs. NAPAM takes national forecasts of the underlying demand for air passengers to, from and within the UK from the national NAPDM forecast.

4.22. It forecasts how passengers might choose between the airports in reaction to their relative estimated attractiveness now and in the future. This choice takes into account airport capacity, surface journey accessibility (from NAAM), flight time, differentials in average annual fare and levels of air services.

4.23. As part of this process, it also translates passenger demand for different routes into ATMs, i.e., the demand for aircraft flights. Specific aircraft types for each route are forecast for use downstream in the CO_2 emissions modelling.

4.24. NAPDM provides local growth rates for aviation which are combined with an origin-destination base matrix to produce forecasts of unconstrained passenger demand for future years. This is fed into the airport choice one year at a time as determined by the year the iterative process calculations are performed upon (controlled by the airport capacity iterative process). Figure 4-3 shows a more detailed structure of NAPAM which is split into 2 distinct modules (or models) of airport choice and capacity constraint.

4.25. Figure 4-3 shows a more detailed structure of NAPAM which is split into 2 distinct modules (or models) of airport choice and capacity constraint.

4.26. The airport choice is based on logit model parameters that determine the relative attractiveness of a particular airport for a passenger based on origin, destination, flights available and surface access costs based on historical data of choices available and airports chosen. This produces passengers allocated by airport and air market and when combined with aircraft size Larame curves will also produce ATMs by route.

4.27. Airport capacity constraints are then considered whereby any airport exceeding its input airport capacity has a shadow cost added to decrease its relative attractiveness to passengers before passing through the airport choice calculations again. The capacity constraint works by first adding additional costs at the airport most overcapacity. It then recalculates the airport allocation and checks for any airports that overcapacity and again adds an additional cost to the airport most overcapacity.

4.28. This iterative process continues until the airport capacity module has determined that a solution has been found that satisfies the criteria (i.e., all airports below their capacity limits) for a single year before moving to the next year.

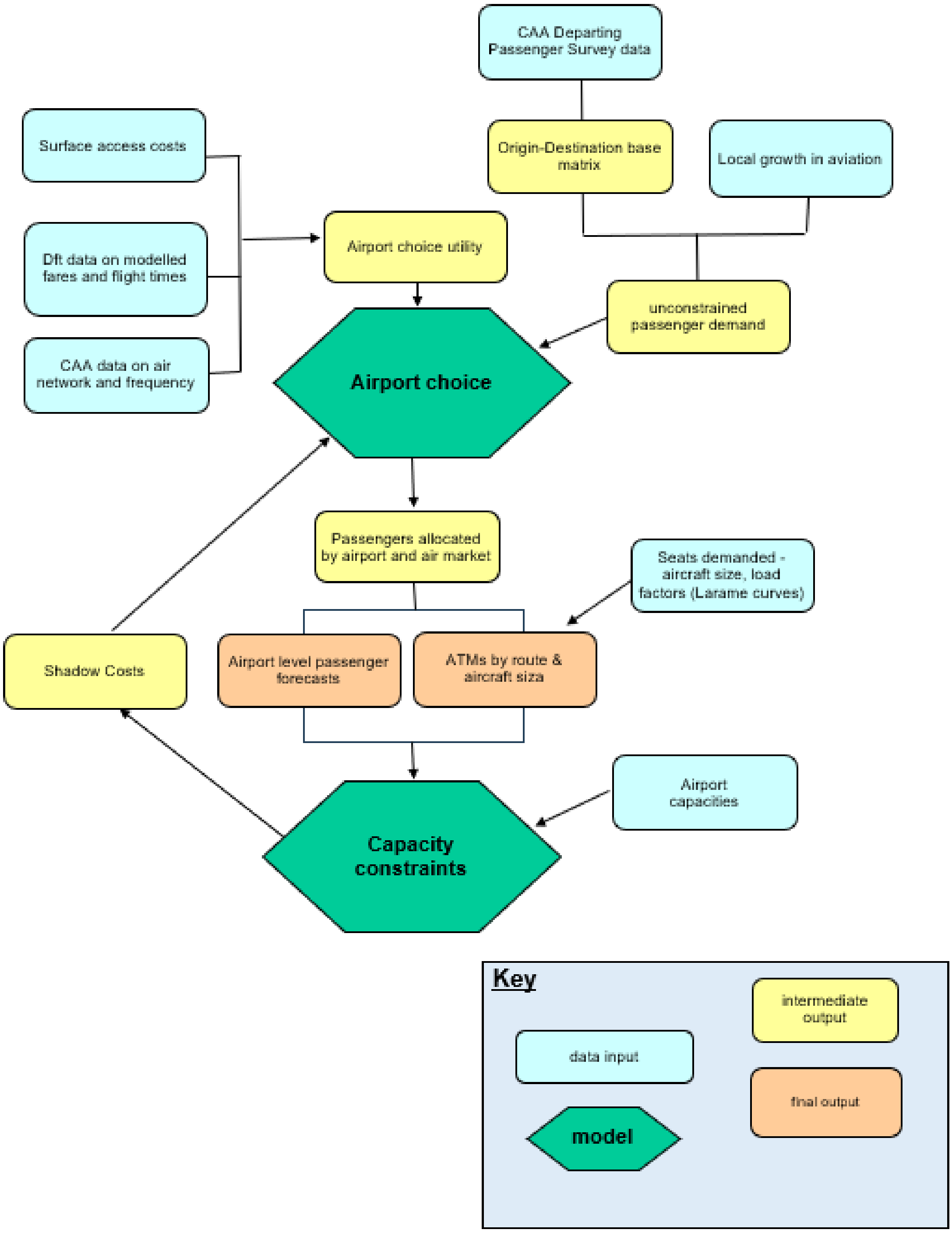

Figure 4-3: NAPAM module structure

Airports modelled in NAPAM

4.29. NAPAM models the busier mainland UK airports that had regular international commercial passenger air services operating in 2024, as shown in Table 4-2.

South East
Gatwick (LGW)
Heathrow (LHR)
London City (LCY)
Luton (LTN)
Stansted (STN)
Southampton (SOU)
Southend (SEN)
Norwich (NWI)

South West and Wales
Bournemouth (BOH)
Bristol (BRS)
Cardiff (CWL)
Exeter (EXT)
Newquay (NQY)

Scotland
Aberdeen (ABZ)
Edinburgh (EDI)
Glasgow (GLA)
Inverness (INV)
Prestwick (PIK)

North
Teesside (MME)
Humberside (HUY)
Leeds-Bradford (LBA)
Liverpool (LPL)
Manchester (MAN)
Newcastle (NCL)

Northern Ireland
Belfast City (BHD)
Belfast International (BFS)

Midlands
Birmingham (BHX)
East Midlands (EMA)

Overseas hubs
Amsterdam Schiphol (AMS)
Dubai (DXB)
Frankfurt (FRA)
Paris Charles de Gaulle (CDG)

Table 4-2: List of airports in the DfT Aviation model

Geographical definition

4.30. The Great Britain geography is split into 455 district-based ground origins as shown in Figure 4-4. The zoning follows 1991 census geography rather than current administrative boundaries to retain sufficient granularity.

4.31. The modelling treatment of Northern Ireland incorporates 37 zones on the island of Ireland and are modelled in the same way as the mainland UK airports.

4.32. The surface access journey costs from each district (zone) to each airport in the model are a key part of predicting future airport usage. Passengers, when choosing their preferred airport within NAPAM, take into account the time and money costs of accessing each airport. The detailed road and rail transport networks used to extract travel costs connecting all zones to all to airports are integrated into the Department’s aviation modelling suite through the National Airport Accessibility Model (NAAM2).

4.33. Further detail is provided in the modelling framework document[26].

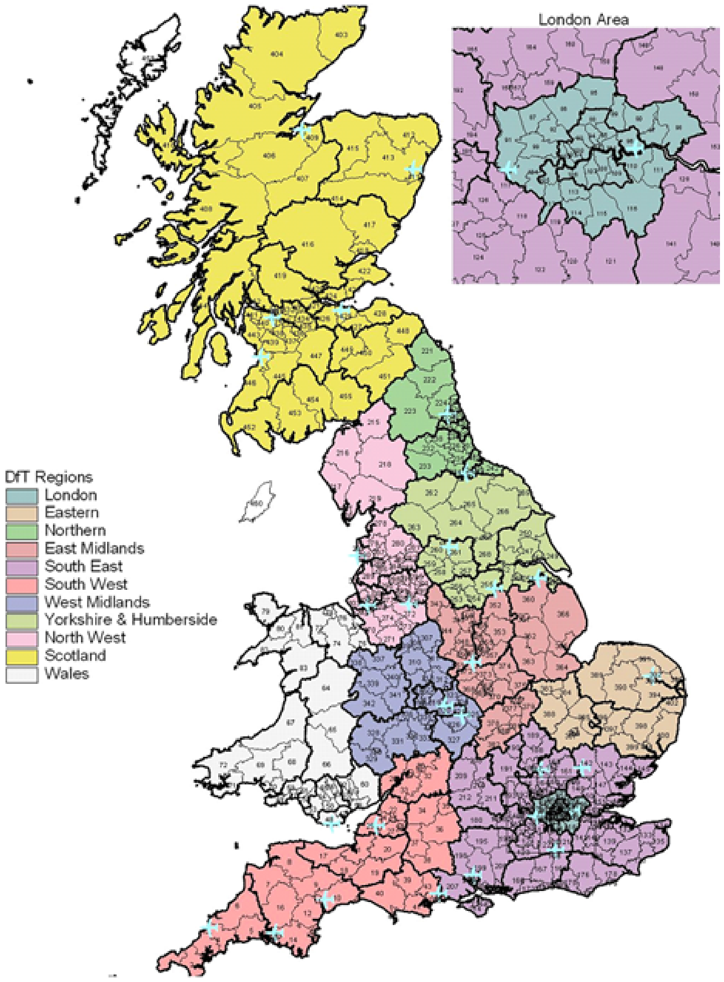

Figure 4-4: Great Britain district zones

4.34. International passengers are defined as those that travel to one of the 67 international zones as their ultimate destination. There are 42 international route group zones and 25 separate zones representing the largest European airports as shown in Figure 4-5. The model explicitly includes the option for passengers to transfer at a hub airport either in the UK or abroad, including Amsterdam, Frankfurt, Dubai or Paris.

4.35. The 42 ‘route group zones’ can each be further subdivided into a maximum of 30 possible destinations. This provides additional granularity that aids the process of producing the underlying forecasts.

---

[26] https://www.gov.uk/government/publications/aviation-modelling-framework

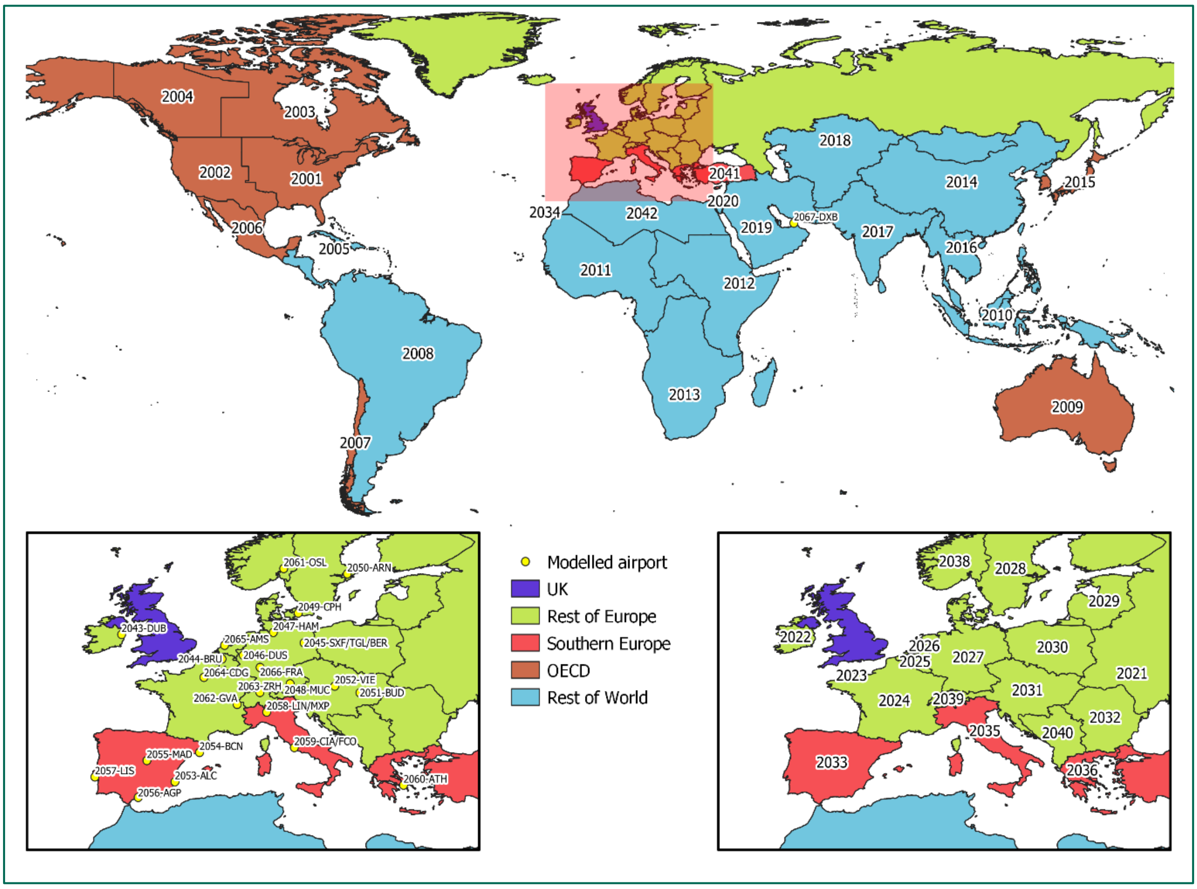

Figure 4.5: NAPAM international destination geography

Modelling the passenger's choice of airport

4.36. The NAPAM has been built to explain and reproduce passenger current choice of airport, as recorded in CAA Departing Passenger Survey data.

4.37. A passenger flight is usually one part of a journey, comprising several stages and modes, between different parts of the world. To understand how passengers choose between UK airports it is therefore necessary to consider not just the airports they are flying between, but the initial origin or ultimate destination of their journey in the UK.

4.38. A traveller’s choice of airport could therefore be determined by several factors, including:

- Initial origin (for outbound) or ultimate destination (for inbound) in the UK of their trip.
- The final destination in the UK or overseas.
- The location of airports in the UK.
- The availability of flights offered at each airport.

- The possibilities of transferring and making onward connections at UK and overseas airports.

- The travel time and other costs for accessing each airport by road and public transport.

- The traveller’s preference for services offered at each airport and their value of time.

4.39. The inclusion and strength of each factor in driving an airport’s share of demand is determined by estimating the choice model parameters for the logit model using data on passenger airport choices drawn from CAA Departing Passenger survey data. This involves using statistical techniques to determine which factors and the magnitude of their relative weighting to maximise the model’s accuracy in predicting current choices (see text box below). This means that the model aims to represent passengers’ actual, observed, airport choice behaviour.

4.40. A key stage in the forecasting process is to identify if there are distinct markets within which passenger demand can be expected to differ. In line with previous forecasts, passengers and airline markets are split between scheduled, low-cost carrier and charter flights. Within these markets, passengers are also split by their journey purpose and residency.

4.41. However, the logit choice model parameters have shown that there is no difference between the markets when considering variables that affect airport choice, e.g., frequency, fare, flight time and costs of getting go the airport. Therefore, the same logit model choice parameters are used for each airline market.

4.42. NAPAM segregates the underlying demand segments by airline market type of Scheduled, Low-cost carrier and Charter and in conjunction with the 16 international markets from NAPDM of journey purpose and destination zone results in 31 different segments as follows:

- Charter – divided into 4 destination regions SE, RoE, OECD, RoW (4 markets).

- Scheduled – divided into 4 residency and purpose of travel (UK Business, UK Leisure, Foreign Business, Foreign Leisure) and 4 destination regions SE, RoE, OECD, RoW (16 markets).

- Low-cost carrier – divided into 4 residency and purpose of travel (UK Business, UK Leisure, Foreign Business, Foreign Leisure) and divided into 2 destination regions SE, RoE (8 markets).

4.43. There are also 2 markets for domestic divided into purpose of travel (Business and Leisure).

- There is 1 market for International – international transfer markets that transfer from a foreign zone to another foreign zone via a hub airport (either a UK or Foreign hub airport).

Modelling Aircraft Movements (ATMs)

4.44. The ATM model forecasts the number of ATMs by aircraft size and load factor by route for each airport. It is important to understand the demand in terms of numbers of aircraft flights (ATMs) as well as the number passengers for four reasons:

- A key determinant of passenger choices is the frequency of service provided at different airport options. As such the projection of the number of flights influences passenger decisions.
- With demand projected to grow, forecast demand may exceed capacity at some airports. The limiting capacity could be the airport terminal, runway, or a planning constraint. Runway capacity is measured not by passenger numbers, but by the number of ATMs. The ATM model within NAPAM translates passenger demand into ATM demand at each airport, to allow comparison of demand with both passenger and ATM capacity constraints.
- It is important to predict when new routes will become available at particular airports, creating a new option for passengers to consider.
- Finally, predictions of ATMs and aircraft-kilometres by aircraft type on each route are required for estimating future aviation CO_2 emissions.

Shadow costs and constraining passengers and ATMs to airport capacity

4.45. NAPAM forecasts both passenger and ATM demand at each airport with ATM demand being a function of passenger demand, load factors and the modelled size of the aircraft on individual routes. Aircraft sizes, seats and load factors evolve over time in the forecasts based on historical evidence from observations.

4.46. The demand allocation components of NAPAM iteratively model the impact and interactions of capacity constraints on the numbers of air passengers, ATM numbers and their passenger loads at each UK airport. Where passenger demand at an airport exceeds capacity, the demand reallocation process takes place which increases the cost of using the airport. This results in demand falling at that airport until it is within its maximum capacity. This cost is known as a ‘shadow cost’, or ‘congestion premium’ and performs the function of limiting the number of passengers to capacity.

4.47. One of two types of shadow cost may be applied when an airport becomes congested. It may be a runway shadow cost, representing a charge per aircraft, which is shared between all the passengers, with its value depending on the average aircraft size for each route in a given year. Alternatively, a terminal shadow cost represents a charge levied equally on every passenger passing through the airport and does not vary by route.

CO_2 Emissions Modelling

Introduction

4.48. This section is comprised of three parts. These cover:

- The nature and purpose of modelling CO_2 emissions from UK aviation.
- The Fleet Mix Model component of the modelling suite.
- The Department's aviation CO_2 model.

4.49. Further details on the above sections can be found in the modelling framework document[27].

Nature and purpose of CO_2 forecasts

4.50. The Department's aviation CO_2 emissions forecasts are used to track and inform long-term strategy within UK aviation and climate change policy. These forecasts play a key role in supporting the UK Government's transport decarbonisation goals, as well as enabling industry to make decisions about their decarbonisation strategy.

4.51. The purpose of the forecasts is to capture the long-term trends in UK aviation CO_2 emissions. These are long-term, annual forecasts, meaning whilst they can capture the impact of some short-term effects, such as economic growth, they are not designed for predicting short-term deviations from trends through unforeseen recession or other shocks. They are also not designed to represent seasonal changes within year.

4.52. The CO_2 model covers passenger flights and freighter flights departing from all UK airports included in the Department's model (Figure 4-4), this includes all domestic flights within the UK and all international flights which depart from UK airports, irrespective of the nationality of the passengers or the carrier. Table 4-3 show what is covered by the aviation model when accounting for CO_2.

---

[27] https://www.gov.uk/government/publications/aviation-modelling-framework

Covered by the model	Not covered by the model
Domestic passenger flights within the UK	International flights arriving in the UK
International passenger flights departing the UK	Overflights passing through UK airspace
International freighter flights departing the UK	Airport ground support vehicles, equipment and infrastructure emissions in the airfield space
Ground emissions of an aircraft e.g., taxiing	Surface access emissions of passengers or freight to or from an airport
	General aviation (non-commercial) flights in UK airspace
	UK aircraft or carriers departing from a non-UK airport
	Military aviation

Table 4-3: Inclusions and exclusions of CO_2 emissions included in the forecast

4.53. The largest source of emissions within the aviation sector are emissions from fuel burnt for flights. There are four main drivers of these flight emissions:

- Total aviation demand and resulting ATMs - as forecasted by NAPAM.
- Total distance flown: this comprises the volume and average distance of flights from the UK, driven by demand of passengers and freight after accounting for airport capacity constraints.
- Fuel efficiency of the aircraft: how much fuel an aircraft requires to fly a given distance, with less fuel being used as both technology and operational efficiencies improve.
- Fuel type used: CO_2 emissions are produced by aircrafts burning fossil fuels, these emissions will fall as uptake of SAF and zero emissions aircraft increases.

4.54. In addition to carbon dioxide (CO_2), aviation operations also give rise to non-CO_2 climate effects. In this publication, aviation emissions are reported in CO_2e. While non-CO_2 effects are recognised as contributing to aviation's overall climate impact, the current modelling framework[28] does not have the capability to accurately quantify these effects. The Department continues to monitor and review the developing evidence base and analytical approaches in this area.

The Fleet Mix Model

4.55. The Fleet Mix Model (FMM) is contained within NAPAM in the aviation model suite, it is used to predict how the composition of the aircraft fleet serving UK

---

[28] https://www.gov.uk/government/publications/aviation-modelling-framework

airports might evolve over time. Changes in the types of aircraft used has a critical determination on aviation CO_2 emissions, because newer aircraft are generally more fuel-efficient.

4.56. The FMM starts from a base year that is calibrated to observed data from aircraft movement data at UK airports, with the most recent calibration being to CAA 2024 UK airport data. It applies assumptions on aircraft retirement and replacement to project how that fleet changes over the forecast period. The aircraft are assumed to retire after a fixed service life, with replacement aircraft drawn from a supply pool that reflects both aircraft currently in production and plausible future aircraft types. When the aircraft is retired its replacement will be one of the following;

- A new aircraft of the same type.
- A new aircraft of a pre-existing but different type.
- An aircraft of a new type.

4.57. Route specific fleet modelling allows a granular application of the fleet forecast turnover. Capturing the gradual nature of the change in the forecast period and the resulting efficiency improvements, without relying on any assumptions about specific airline purchasing decisions. DfT's aircraft model also retires aircraft that are currently in operation after they have been in service for 23 years based on historic data.

4.58. The fleet composition is determined on a route level and accounts for passenger demand, aircraft size, and load factors.

Modelling fuel burn and CO_2 emissions

4.59. Aviation CO_2 emissions are calculated by combining forecasts of aircraft activity with assumptions about fuel burn and fuel carbon intensity. For each forecast year, aircraft movements are represented by aircraft-kilometres flown, aircraft type and route. These are then converted into fuel consumption using aircraft-specific fuel burn relationships that vary with flight distance and phase of flight.

4.60. The CO_2 model takes ATMs at each airport split by route, aircraft type, and airline type, and then applies further assumptions to calculate emissions. The further assumptions are:

- The distance flown on each route.
- The fuel burn rate by aircraft type (i.e. litres of fuel per km).
- The load factor.
- The uptake of SAF by year.
- Aircraft fuel and operational efficiency improvements.

4.61. Other contributions to CO_2 which are not forecast by routes in NAPAM are calculated and added separately to the UK totals. This covers emissions from freight, auxiliary power units, and residual bunker fuels.

4.62. Freight is not extensively modelled. An assumption about the number of freighters is required as part of the modelling process as their presence has an impact on the capacity available to passenger aircraft. Freighter movement numbers are volatile with no clear pattern between years or airports. As such the modelling now assumes that movements remain unchanged from 2024 levels at individual airports. These are applied by airport by year, and their CO_2 is added to totals.

4.63. Auxiliary power units are small gas turbines which are typically mounted at the rear of an aircraft and provide electrical power among other things for the aircraft during ground operations, including when the main engines are not running. These produce small levels of emissions compared to the flight duration but nonetheless need to be accounted for.

4.64. The added residual is an uprating to account for the fact that the aviation modelling suite only represents 29 UK airports (see 4.25). The modelled CO_2e emissions for 2024 are adjusted to match the DESNZ published estimate of aviation emissions based on bunker fuel returns[29]. The difference in emissions is the residual that is taken forward for the forecast period to ensure the emissions from the non-modelled airports and flights are included.

4.65. The SAF uptake assumptions under the different scenarios are outlined in Chapter 5 (Input Assumptions). In the CO_2 Model it is assumed that SAF delivers 90-95% GHG emissions savings on average on a lifecycle basis relative to kerosene, varying over time and across uptake scenario[30].

4.66. The assumptions about future aircraft and operational efficiency between scenarios are outlined in Chapter 7 CO_2 Emissions Inputs.

---

[29] Final UK greenhouse gas emissions statistics: 1990 to 2024 - GOV.UK

[30] https://assets.publishing.service.gov.uk/media/66601969dc15efdddf1a872d/uk-saf-mandate-final-stage-cost-benefit-analysis.pdf

5. Input Assumptions

Introduction

5.1. This chapter outlines the assumptions and sources that underpin the inputs used in the scenarios, setting out how these inputs feed into the wider forecasting process.

5.2. The Aviation Model Suite is a sophisticated set of tools used to estimates air passengers, ATMs and CO_2 emissions for UK airports with routine scheduled international flights. Its inputs are drawn from several constituent models, each of which contributes to a different stage of the forecasting framework.

5.3. To project demand accurately, all inputs are validated against baseline observed data before being used to generate forecasts.

5.4. For modelling purposes, where possible, observed data are drawn from official sources and are often aggregated into specific categories (e.g. NAPDM markets, world region, SPASM Zone), rebased, averaged and processed. They fit a specific description that is compatible within the model. Thus, historical figures may closely approximate observations, but some degree of differences might exist.

Current Trends Inputs

5.5. The Current Trends scenario is the core scenario and draws on the latest projections for the principal determinants of air passenger demand, like GDP, population, trade, and fuel prices. It assumes that the relationships between these key demand drivers will continue in line with historical trends, current policies and the available evidence.

5.6. The Current Trends scenario provides the baseline for all scenarios presented in this publication. Given the inherent uncertainty associated with projecting multiple variables, alternative scenarios are also set out later in this chapter. These alternative scenarios represent variations on the Current Trends approach, generally retaining the same inputs and sources while adjusting a limited number of assumptions and/or the level of specific inputs (e.g., lower or higher oil prices). Accordingly, the input assumptions and figures presented below apply across all scenarios unless stated otherwise in the Definition of core scenarios or in the Sensitivity Tests sections.

NAPDM Inputs

5.7. NAPDM forecasts national aviation demand through key drivers which are:

- Economic growth and income.
- Air fares.
- Population Growth for UK district level distribution of demand.
- Market Maturity Assumption.

5.8. This section focuses on the sources of inputs and figures for the Current Trends scenario i.e. the central scenario in this publication. The methodology of how these inputs are measured and the relationship between demand, income and fares is detailed in the modelling framework[31] document. Further figures and supplementary tables are available in Annex B: Data tables.

5.9. Demand is projected at the national level for each market segment (e.g., Leisure Domestic) and then distributed at district level using the national trip end model (NTEM). Thus, most of the inputs have a national or international scope. For example, the UK GDP input is real national UK GDP and not regional gross value added. The Demand Matrix input and local growth sections give more details on how national demand is distributed to UK local district in NAPDM.

5.10. The sources cited in this chapter were the most recent and readily available at the time of writing and producing the forecasts. Any changes to these sources would impact the forecasts and the figures shown below.

Income and Economic Growth Inputs

GDP and Consumer expenditure

5.11. A key driver of national aviation demand is national income growth. Econometric analysis shows that as GDP grows, aviation demand also grows in the same direction. This relationship is the income elasticity of demand; further details on incomes elasticities and their use in the aviation model can be found in the modelling framework document, and details on their derivation in the technical documentation[32].

5.12. For modelling purposes, because real GDP figures are standardised, widely available, forecasted and updated annually for many countries and world regions, GDP is used as the main income variable for the UK and foreign markets.

---

[31] https://www.gov.uk/government/publications/aviation-modelling-framework

[32] https://assets.publishing.service.gov.uk/media/6235a5378fa8f540edba36f5/econometric-models-to-estimate-demand-elasticities-for-the-national-air-passenger-demand-model.pdf

Alongside the GDP, consumer expenditure and trade indices are also used but are assumed to grow at the same rate as GDP in the long-term.

5.13. Short-term UK GDP (up to 2030) and consumer expenditure are directly sourced from Office for Budget Responsibility (OBR) publications, while longer-term projections draw on a range of sources. Specifically:

- Up to 2030: UK GDP and consumer expenditure are sourced from the OBR publication produced alongside the November 2025 Autumn Statement[33].
- 2030 to 2074: UK GDP projections are sourced from the March 2025 OBR publication on long-term economic determinants[34].
- From 2074 onwards: GDP is projected using the May 2025 DfT TAG Databook, drawing on working-age population growth assumptions from the ONS 2021-based interim national principal population projections[35].
- Consumer expenditure is assumed to grow in line with GDP from 2030 onward.

5.14. Foreign GDP growth projections are divided into the four international NAPDM regions. These regions are Southern Europe (SE), Rest of Europe (RoE), OECD and Rest of World (RoW), more details on international regions can be found in the modelling framework documentation[36].

5.15. Projections of GDP growth from 2024 to 2030 are based on the IMF publication World Economic Outlook (WEO) (October 2025)[37]. Beyond 2030, the forecasts are based on the OECD's Economic Outlook. GDP projections for each NAPDM region are calculated as weighted averages based on the proportion of traffic between the UK and individual countries. For example, the GDP growth for Spain and Greece in the SE region would be weighted by the volume of UK-Spain and UK-Greece traffic, respectively.

5.16. Econometric analysis identified trade as a statistically significant factor affecting demand in several markets (refer to the elasticity technical paper for specifics about these markets[38].). Since trade (imports and exports) is closely linked to GDP and as it's challenging to gather long-term data for each country individually, the model applies the same growth rate to both the trade variable and GDP. Figure 5-1 presents indexed projections of real GDP growth for the UK and each NAPDM international region.

---

[33] https://obr.uk/efo/economic-and-fiscal-outlook-november-2025/

[34] OBR Long-term economic determinant- March 2025

[35] TAG data book - GOV.UK

[36] https://www.gov.uk/government/publications/aviation-modelling-framework

[37] IMF World Economic Outlook https://www.imf.org/en/publications/weo/issues/2025/10/14/world-economic-outlook-october-2025

[38] https://assets.publishing.service.gov.uk/media/6235a5378fa8f540edba36f5/econometric-models-to-estimate-demand-elasticities-for-the-national-air-passenger-demand-model.pdf

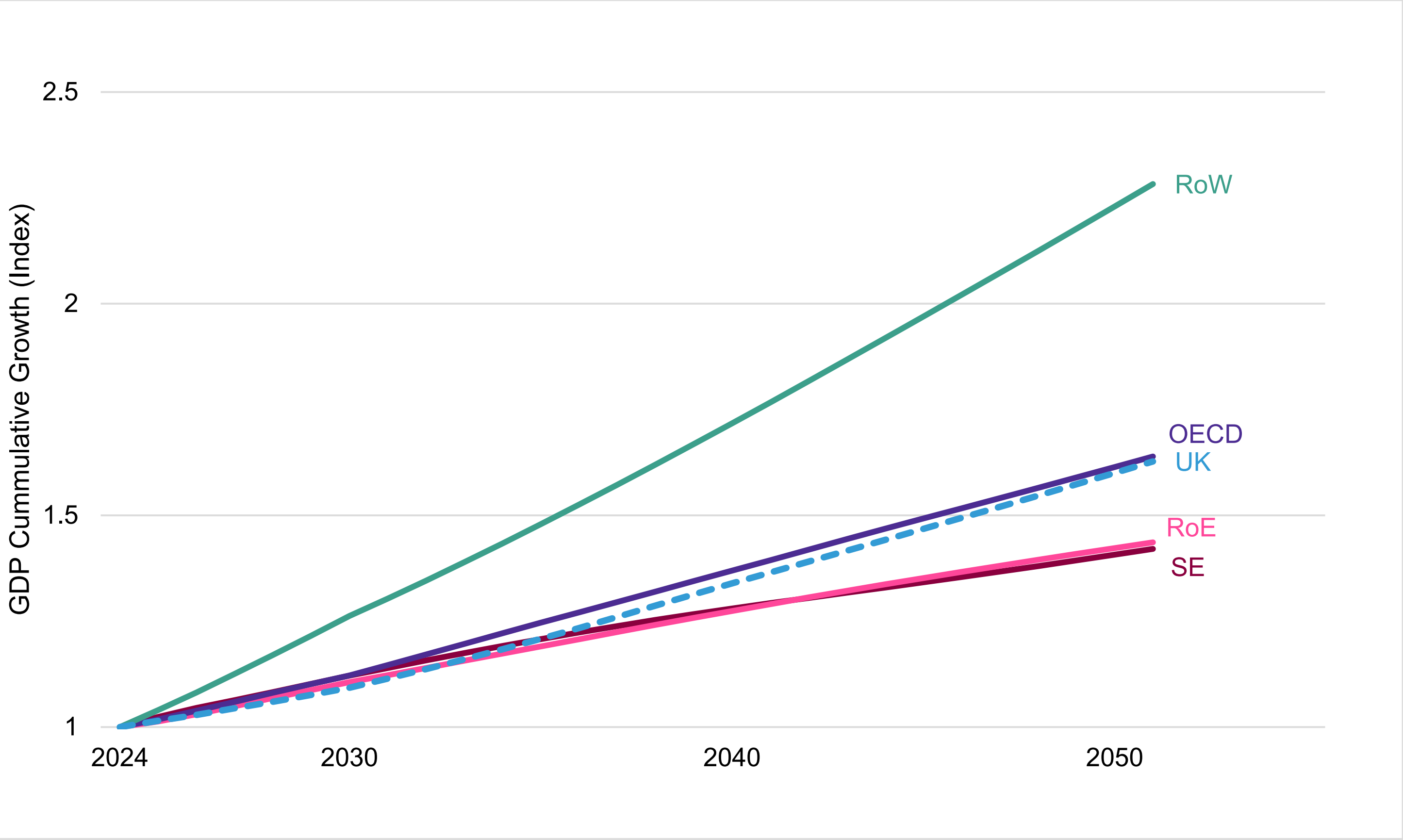

Figure 5-1: Index of Real GDP Growth by NAPDM region (2024 =1), Central growth scenario

Fare inputs

5.17. Similar to income, air fares also have a significant impact on national aviation demand. In equal conditions, when fares increase, the demand for aviation diminishes, and conversely when fares decrease, air passenger demand increases. Not all NAPDM markets are equally sensitive to air fares; for example, business markets are less responsive to price changes as travel decisions may not be primarily driven by price or budget constraints. This relationship between price and demand is detailed in the modelling framework document[39] and the derivation can be found in the technical documentation for elasticity.

5.18. Fares are composed of four distinct components that are estimated separately and aggregated to form an average total fare per market. These components are:

- Fuel Cost.
- Carbon Price.
- APD.

---

[39] https://www.gov.uk/government/publications/aviation-modelling-framework

- Other Costs.

5.19. All fare inputs, except APD, are estimated on a per seat-kilometre basis. APD is added as a tax per passenger as the last component to derive the total fare per passenger.

5.20. Many inputs are available in original data sources at a different price base year or at current market prices, for modelling purpose these prices must be rebased to 2024 real Great British Pounds sterling (£GBP). This approach is necessary in a bottom-up methodology where different components are aggregated, ensuring prices are in the correct format and that the same unit of value is used. Additionally, general inflation in the economy may impact input prices beyond their intrinsic value. Rebasing to real constant 2024 £GBP allows us to control for the effects of general price inflation and focus on the fundamental input price trends. GDP deflator is the unit used to rebase prices to their 2024 base year in this model[40].

Fuel Cost

5.21. Fuel cost represents the largest variable cost as a share of total fare. It is derived from oil prices that are based directly on DESNZ 2024 fossil fuel forecast[41]. DESNZ central forecast suggests oil price will rise from $82 in 2024 to $92 per barrel by 2040 (price were rebase to 2024 real US Dollar using US GDP deflator). Historical data relating to spot fuel prices are based on the Cost, Insurance and Freight (CIF) jet fuel wholesale price series provided by DESNZ. The Jet fuel CIF series exclude certain cost (e.g., costs incurred within airports) which are captured within the ‘Other Cost’ component.

5.22. The base year uses observed Jet fuel CIF prices from Bloomberg data provided by DESNZ. Kerosene prices for later years are forecasted using linear regression coefficients derived from the relationship between historical jet fuel and crude oil price data. See the modelling framework documentation for more details on kerosene prices forecast methodology[42].

5.23. The US dollar to pound sterling exchange rate assumption is used to convert prices of oil and kerosene in £GBP as oil prices are expressed in dollar terms in DESNZ forecasts. The yearly exchange rate is based on the average £GBP to $USD exchange rate in a full calendar year. The figures are sourced from the OBR Economic and fiscal outlook from November 2025. The model applies an exchange rate of 1.28 $/£ in 2024, increasing to 1.35 $/£ in 2030. Due to lack of data after 2030, the exchange rate is assumed to remain constant at 1.35$/£ until the end of the modelling period.

---

[40] https://assets.publishing.service.gov.uk/media/5a7c7360e5274a5590059f34/GDP_Deflators_User_Guide.pdf

[41] https://assets.publishing.service.gov.uk/media/66f3e1a8080bdf716392e855/2024-Fossil-Fuel-price-Assumptions-Publication.pdf

[42] https://www.gov.uk/government/publications/aviation-modelling-framework

5.24. The introduction of the UK SAF mandate[43] placed an obligation on fossil jet fuel suppliers to increasingly blend in SAF in their Jet Fuel mix[44] [45]. Hence, for consistency, the modelling of fuel cost includes both kerosene and SAF cost.

5.25. SAF affects the CO_2 emissions per trips as it has an impact on the carbon intensity of fuel (the amount of CO_2 emitted per tonnes of Jet Fuel used on a lifecycle basis). It is thus used by airlines and enforced through the Mandate to help the aviation sector to achieve environmental targets.

5.26. In fare modelling, SAF uptake and price affect demand by changing total jet fuel cost. As SAF is significantly more expensive than kerosene (in the current framework) the more SAF there is in the fuel mix, the more fuel cost increases.

5.27. The UK SAF Mandate obligates the supply of SAF in the UK fuel mix by setting a greenhouse gas (GHG) savings target which increases each year, requiring tradeable certificates from supplying SAF to meet the obligation. Assuming SAF achieves 70% lifecycle GHG savings compared to fossil jet fuel, SAF will make up 2% of UK aviation fuel in 2025, rising to 22% in 2040. If SAF achieves a higher lifecycle GHG saving compared to fossil jet than 70%, the Mandate can be met with fewer volumes, making up a lower percentage of the fuel mix while achieving the same GHG savings target.

5.28. The SAF mix modelled for these forecasts delivers, on average, more than 70% lifecycle GHG savings and therefore less physical SAF volume is needed to achieve the same mandated GHG-reduction outcome. Therefore, in the Current Trends scenario, the share of SAF in the fuel mix for all outbound flights[46] follows the UK SAF Mandate, starting with 2% in 2025 and then increasing to 17% of the Jet Fuel mix in 2040. From 2040 onward the uptake is held constant at 17% in line with current legislation. These uptake figures are consistent with meeting the Mandate targets in full.

5.29. The total fuel cost per seat km is the weighted average of SAF prices and kerosene prices relative to their percentage in the fuel mix. The average kerosene price per tonne in the model in 2025 after accounting for the hedging parameter is approximately £600. For SAF the average price per tonne in 2025 is approximately £1,600. It should be noted that given SAF industry is still in the early stage of development: we are constantly working to update our evidence base, and the prices are highly uncertain.

5.30. To calculate the cost per seat-kilometre the model accounts for the average fuel efficiency per markets. Such costs fluctuate over time as these are affected by

---

[43] https://www.gov.uk/government/collections/sustainable-aviation-fuel-saf-mandate

[44] https://www.icao.int/SAF

[45] https://www.iata.org/en/programs/sustainability/sustainable-aviation-fuels/

[46] The NAPDM region is an important factor in estimating the average SAF fare per trip. As the SAF mandate only affects UK outbound flights, SAF uptake must be weighted to get the average return fare per return trip. This is particularly relevant for long-haul markets (OECD and RoW) whereas the European Union has announced a policy similar to the SAF mandate, which would make the average uptake of SAF on the inbound and outbound legs close. Therefore, in the fare modelling for the Domestic, SE and RoE regions, the uptake factor is maintained at 1, while for the long-haul regions OECD and RoW the factor is set to 0.5 (i.e. uptake is divided by 2). See EU SAF framework announced: https://transport.ec.europa.eu/transport-modes/air/environment/refueleu-aviation_en

volatile and changing factors such as crude oil prices, SAF prices and fuel efficiency improvements (see 5.41).

Carbon Cost

5.31. Carbon cost currently represents a small share of total fare per trip but is expected to increase in line with aviation sector decarbonisation policy. All flights within the UK and outbound flights to the European Economic Area (EEA) and Switzerland are covered by the UK ETS. The inbounds flights from these states are covered by the EU ETS. Thus, in the model, short-haul markets (Domestic, SE and RoE) apply the projected UK ETS prices.

5.32. The 193 member states of the International Civil Aviation Organization (ICAO) agreed in 2016 to implement a global carbon pricing mechanism for international aviation CO_2 emissions: the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)[47]. CORSIA aims to limit net emissions from international flights to a level 15% below the 2019 pre-COVID peak. The UK is one of 88 countries participating in the scheme since it began in 2021 and the first offsetting obligations were accrued in 2024. 130 countries are now participating and in 2027 it will extend to flights between all countries (except those that are exempt). CORSIA's primary contribution to emissions reductions comes from offsetting rather than unit price. As they occur 'out of sector', those reductions are not reflected in the forecast, only the effect of the CORSIA unit price is reported. From Carbon Budget 6, when international aviation emissions are first included, the government also intends to account for CORSIA credits purchased by UK airlines for UK departing flights where we are satisfied that they meet high integrity principles[48].

5.33. The demand model uses CORSIA prices to cover long-haul NAPDM regions (OECD and RoW). CORSIA prices per tonne of CO_2 emitted in the Current Trends scenario are much lower than UK ETS prices and do not increase as much. This is partly due to CORSIA Emissions Units (CEUs) representing more cost-effective abatement (supply side), and because airlines (due to the effect of the pandemic) have not begun accruing offsetting obligations until 2024 and will not have to meet those obligations until early 2028 (demand-side). Nascent demand may mean less upward pressure on prices, and to date there are still only a small (but growing) number of CEUs available for purchase, hence large uncertainty over prices. Other scenarios considered how CORSIA might develop towards higher prices (see Technology Development scenario).

5.34. The carbon price applied in the Current Trends scenario is based on DESNZ traded carbon value publication from 2024[49]. UK ETS market traded carbon values are set to £37/tonnes of CO_2 in 2024 increasing to £124/tonnes of CO_2 by 2050. For the same scenario, DfT "low" CORSIA price assumption is used and sets CORSIA carbon price to £17/tonnes of CO_2 in 2024, rising to £30/tonnes of CO_2 in

---

[47] https://www.icao.int/environmental-protection/CORSIA/pages/default.aspx

[48] https://assets.publishing.service.gov.uk/media/6901dfae71b575684c3cf78a/carbon-budget-and-growth-delivery-plan-technical-annex.pdf, paragraph 12

[49] https://www.gov.uk/government/publications/traded-carbon-values-used-for-modelling-purposes-2024/traded-carbon-values-used-for-modelling-purposes-2024#scenarios

2050. The CORSIA "low" price series is used in the Current Trends scenario to reflect the fact that the scheme is currently agreed only up to 2035. When extending the modelling period to 2050, a conservative approach is adopted to reflect uncertainty regarding the future development of CORSIA and ensure that Current Trends assumptions remain aligned with its current design.

5.35. CORSIA does not apply to all international aviation emissions. Under the scheme, offsetting obligations apply only to emissions above 85% of 2019 international aviation emissions baseline. To represent the share of flight emissions that falls within the scope of CORSIA, the model applies a global sectoral CO_2 growth factor. In principle, the calculation would distinguish between the Sectoral Growth Factor (SGF) (growth in all emissions in scope of CORSIA) and Individual Growth Factor (IGF) (growth in emissions for individual operators); however, the current modelling framework does not permit separation of sectoral and individual contributions. In addition, calculation of CORSIA offsetting obligations uses the SGF up to 2032 and is dominated by the SGF (85%) from 2033-2035. For this reason, the SGF is applied alongside the assumed CORSIA carbon price per tonne to the CORSIA-covered international regions (OECD and Rest of World). This more closely reflects the proportion of emissions expected to be subject to CORSIA compliance costs, and therefore the costs that may be reflected in fares. It is worth noting that these regions (OECD, RoW) include states which do not participate in CORSIA, but emissions from these states are likely to be a very small proportional of global emissions.

5.36. Under the Current Trends scenario, the sectoral growth factor applied in the model RoW and OECD regions increases from 16% in 2024 to 53% in 2050. This implies that, for a given modelled trip, 16% of associated CO_2 emissions are treated as within the scope of CORSIA in 2024, rising to 53% by 2050. By contrast, in ETS markets the scheme is assumed to apply to all emissions, except for emissions associated with eligible SAF, which are treated as offset in accordance with the modelling assumptions set out in 5.37.

5.37. Fuel and carbon costs are influenced by both fuel efficiency and the carbon intensity of fuel. Improvements in fleet and operational efficiency, and reductions in the carbon intensity of fuels by opting for SAF with reduced lifecycle emissions, help decrease emissions per passenger-kilometre. Consequently, an increase in the carbon price per tonne of CO_2 over time may be partially offset by higher fuel efficiency and/or increased uptake of SAF in the future. For the UK ETS and EU ETS, the model applies a 100% SAF emissions saving factor. In practical terms, this assumes that the eligible share of SAF in the jet fuel mix is fully credited against ETS obligations[50]. This treatment reflects the operation of the schemes as represented in the fare model, rather than lifecycle emissions accounting as SAF can entail emissions across its production and transport chain. This is consistent with IPCC guidance for accounting for emissions from renewable fuels. Under CORSIA, SAF is not treated as zero-rated unlike under ETS. Consequently, when determining the volume of emissions to be offset in CORSIA, all emissions

---

[50] Eligible SAF is currently 'zero-rated' in the UK and EU ETS. The UK ETS Authority consulted earlier this year on the treatment of SAF in the UK ETS: www.gov.uk/government/consultations/uk-emissions-trading-scheme-treatment-of-sustainable-aviation-fuel

associated with SAF production are accounted for, using the fuel's lifecycle CO_2 emissions.

5.38. Within the fare modelling, the carbon intensity of a fuel is adjusted differently across schemes. For a given SAF share in the jet fuel mix, a larger reduction in carbon intensity is applied in ETS-covered markets (Domestic, Southern Europe, and Rest of Europe) than in CORSIA-covered markets (OECD and Rest of World). As noted in paragraph 5.37, this adjustment applies only to the calculation of offsetting requirements and does not affect reported CO_2 emissions within CO_2 Emissions Modelling.

5.39. Further detail on the CORSIA growth factor and the treatment of SAF within ETS carbon credit requirements is provided in the NAPDM carbon fare section of the modelling framework document[51].

5.40. Table 5-1 sets out the fuel and carbon cost per seat-kilometres per NAPDM region in 2024.

Fuel Efficiency

5.41. As stated in 4.29, fuel efficiency influences air fares. The modelling of future aircraft fleet affects both the fuel and carbon cost components of air fares, as newer aircraft generations deliver progressive improvements in fuel efficiency. Aircraft fuel consumption trends over time are forecast for each NAPDM region using outputs derived from the Fleet Mix Model (FMM) and CO_2 models. The modelling framework document[52] gives more details on the feedback loop between demand and efficiency.

5.42. Recorded fuel efficiency has improved materially in recent years. The FMM and the CO_2 model project further efficiency gains over the forecast period, with the scale of improvement varying by market to reflect differences in aircraft type and operational characteristics across the main forecasting regions.

5.43. Fuel efficiency on services to Rest of Europe (RoE) and Southern Europe (SE) is projected to be higher than on long-haul markets. This reflects the aircraft mix and operational characteristics of the long-haul sector, where a greater proportion of take-off weight is associated with carrying fuel for the flight itself, which reduces efficiency on a seat-kilometre basis. This effect is particularly evident for aircraft types with high fuel carriage requirements on very long routes (including, historically, aircraft such as the A380). Further detail on the FMM and CO_2 models is provided in CO_2 Emissions Modelling section and in the aviation modelling framework document[53].

---

[51] https://www.gov.uk/government/publications/aviation-modelling-framework

[52] https://www.gov.uk/government/publications/aviation-modelling-framework

[53] https://www.gov.uk/government/publications/aviation-modelling-framework

5.44. Figure 5-2 sets out fuel efficiency in use for NAPDM region in seat-kilometre per tonnes of fuel and Table 5-1 sets out the fuel and carbon costs.

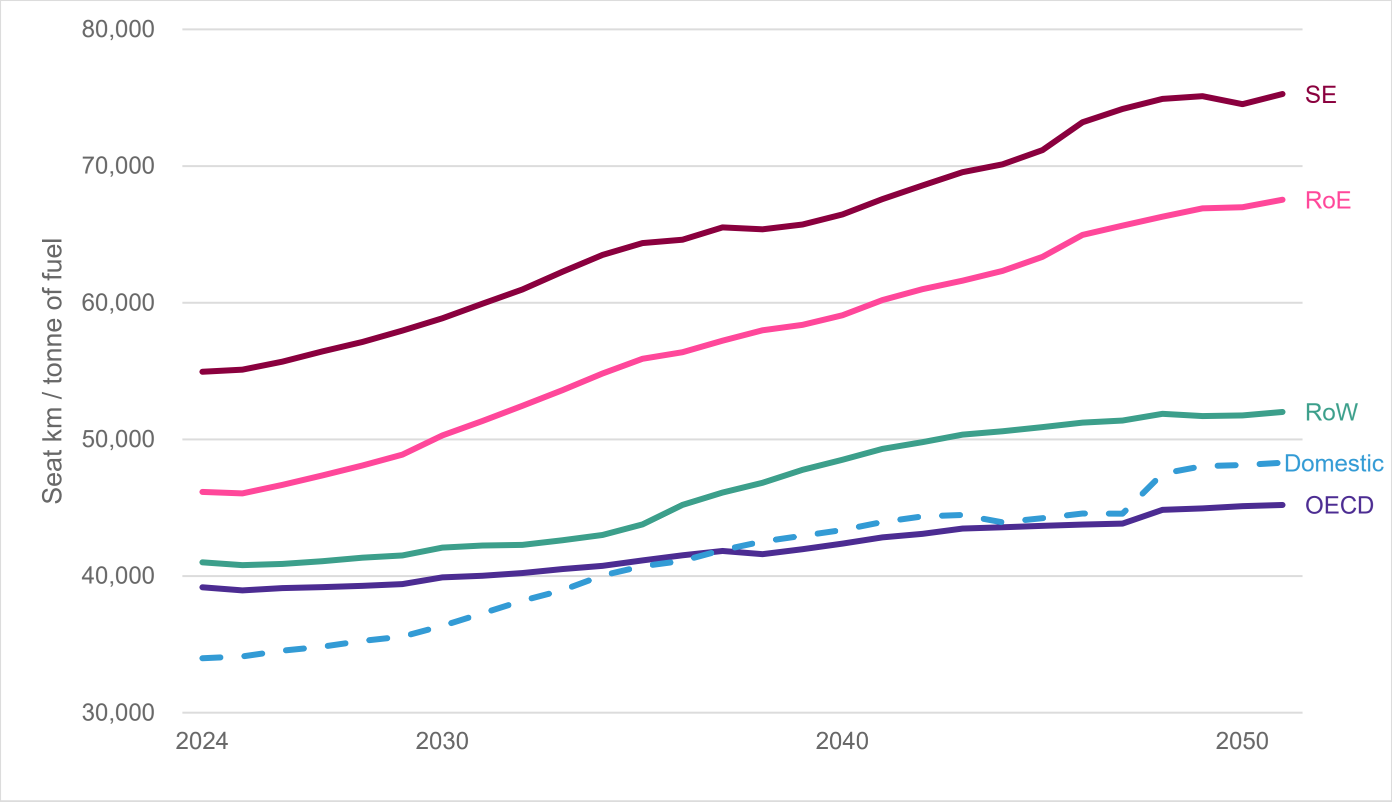

Figure 5-2: Fuel Efficiency per NAPDM Region in Seat Kilometres per tonne of fuel

	Fuel cost (Pence per seat-kilometre)	Carbon Cost (Pence per seat-kilometre)
Domestic	2.13	0.34
SE	1.32	0.21
RoE	1.57	0.25
OECD	1.83	0.02
RoW	1.75	0.02

Table 5-1: Fuel and Carbon cost in Pence in real 2024 £GBP (£1 GBP = 100 Pence) per ASK in 2024

Air Passenger Duty (APD)

5.45. APD is a tax levied on passengers and paid to HMRC. The tax amount depends on the distance flown (the band) and the passenger class seat (economy or standard rates). The rates and bands applied are published by HMRC and the APD fare is directly based on these figures[54].

5.46. The model uses CAA Departing Passenger Survey data to assign each NADPM region to a weighted average of APD bands based on distance of the origin-destination trip from/to the UK. Adjustments are also made to consider the average proportion of standard and reduced rate per trip and under-16s who are exempt from the duty. For example, RoW market is an average of bands A, B and C with band B having the strongest weight.

5.47. APD rates are kept constant in real terms throughout the modelling period after the latest available HMRC data and apply only to departures from UK airports. For international markets, the APD amount is therefore halved to represent the average APD per return trip. APD is not expressed on a seat-kilometre basis; instead, it is added as a fixed charge at the end of the fare-modelling aggregation process for each trip.

5.48. Table 5-2 sets out the APD amounts applied by NAPDM region.

	Air Passenger Duty (APD) Rates (in 2024 £GBP)
Domestic	7.0
SE	6.5
RoE	6.5
OECD	55.2
RoW	49.0

Table 5-2: 2024 Air Passenger Duty applied per trip in NAPDM

Other Cost

5.49. 'Other airline costs' are a major contributor to fare levels. It comprises of costs not included within the fuel, carbon and APD components. These costs primarily include aeronautical charges, fleet-related costs, labour costs, and sales and administration expenditure.

5.50. The methodology used to estimate the "other costs" component was updated in the most recent model version. Further detail is provided in the modelling framework document[55].

5.51. The non-fuel cost component is provided directly through RDC aviation's Apex database at a route level. The data is presented in £GBP as the average cost in available seat kilometre (CASK) of a return journey. The non-fuel cost per available seat kilometres is then aggregated at an NAPDM regional level using the destination country with a UK origin to ensure we capture the UK market cost.

---

[54] https://www.gov.uk/guidance/rates-and-allowances-for-air-passenger-duty

[55] https://www.gov.uk/government/publications/aviation-modelling-framework

5.52. Apex database does not distinguish costs by passenger type. As NAPDM markets are segmented by journey purpose (leisure and business), the International Passenger Survey stated prices are used to derive an adjustment factor reflecting the relative difference in “other costs” between business and leisure travel.

5.53. Business travellers are more likely to travel in premium seats and to choose more flexible and convenient flights and routes. This is consistent with lower fare elasticity for business passengers and implies a higher “other costs” component for business markets. Business passengers typically represent a smaller share of total trips; as a result, leisure “other costs” tend to have greater influence on the overall average “other cost” per trip.

5.54. Differences in “other costs” across markets also reflect variation in average trip length. On long-haul services, fixed costs are spread over a greater distance, resulting in lower non-fuel cost per available seat kilometre. This effect may be partially offset by differences in operator mix, including a higher prevalence of low-cost carriers on some short-haul markets.

5.55. Non-fuel costs can be volatile and are sensitive to the choice of base year. While forecasting these costs is inherently uncertain, they typically stabilise over longer periods and may return towards baseline levels following disruptions (for example, the COVID-19 pandemic).

5.56. The estimation approach is based on passenger costs and excludes non-fare revenues (for example, onboard sales) and profits. This is not expected to materially affect long-term trend analysis if profit margins and ancillary revenue remain broadly stable as a share of the total price over time, given that NAPDM focuses on relative changes in fares rather than precise fare levels.

5.57. The passenger cost approach may have a greater effect on business travel markets. The International Passenger Survey -based ratios used to estimate differences in non-fuel “other costs” by journey purpose are derived from observed ticket prices. These prices may reflect differences in airline profit margins between leisure and business travel, as well as genuine differences in service costs.

5.58. As the objective of this adjustment is to isolate cost differences rather than pricing behaviour, the resulting estimates may overstate non-fuel cost per available seat kilometre for business passengers where observed price premia are driven partly by higher margins rather than higher underlying costs[56] [57].

5.59. Table 5-3 sets out the "Other Cost" per NAPDM region and journey purpose.

---

[56] https://www.iata.org/en/iata-repository/publications/economic-reports/premium-traffic-and-revenue-are-back-on-track/

[57] The noise in the cost estimation of business passenger is not as problematic from a model perspective as most business markets are less price sensitive than leisure and thus business demand is not affected as much by price changes (see demand elasticity in the modelling framework).

	Other Cost Leisure (£ per seat-kilometre)	Other Cost Business (£ per seat-kilometre)
Domestic	0.104	0.210
SE	0.033	0.067
RoE	0.065	0.262
OECD	0.030	0.142
RoW	0.025	0.113

Table 5-3: Other Cost per NAPDM markets in 2024 real £GBP

5.60. In the air fare modelling, the non-fuel cost component is assumed to be the most stable element over time. While the 2017 aviation forecast publication[58] suggested that airlines' non-fuel costs declined over the two decades to the forecast base year (1997–2017), the available evidence indicates that this downward trend has largely stabilised since the 2010s. This stabilisation is supported by analysis of published financial information for operators such as IAG and easyJet. As shown in Figure 5-3, real non-fuel cost per available seat-kilometre decreased by around 0.4% per annum on average from 2007 onwards, with the COVID-19 period excluded due to pronounced cost volatility. On this basis, non-fuel costs are treated as stable in real terms, with the 2024 base year used to set the level applied across the forecast period.

5.61. To extrapolate the long-run trend, a logarithmic regression is applied to the historical series. The resulting projections imply a gradual real-terms reduction in non-fuel costs of approximately 0.05% to 0.1% per annum. This assumption is applied consistently across short-haul and long-haul markets, reflecting that the underlying cost data are observed at airline level and therefore typically capture carriers' operations across both market segments.

5.62. Figure 5-3 sets out observed historical average of non-fuel cost in real terms per available seat kilometre (for two UK airlines company[59].

---

[58] https://assets.publishing.service.gov.uk/media/5e8dec2786650c18c9666633/uk-aviation-forecasts-2017.pdf

[59] This chart is based on data extracted from International Airlines Group (IAG) and easyJet annual financial reports for each year shown. The metric used is non-fuel cost per seat-kilometre (reported in pounds sterling or converted to pounds where required).
- IAG annual reports: https://www.iairgroup.com/investors-and-shareholders/financial-reporting/annual-reports/
- easyJet reports and presentations: https://corporate.easyjet.com/investors/reports-and-presentations/default.aspx

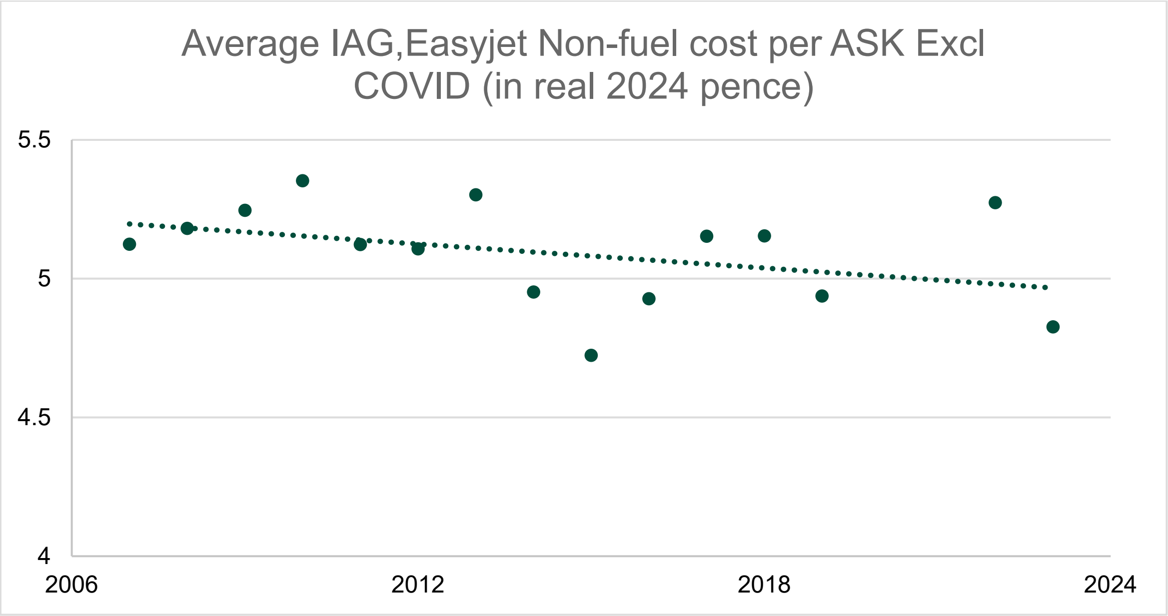

Figure 5-3: Average non-fuel Cost per available seat kilometres 2007-2023 excluding COVID years. Prices were rebased in real 2024 GBP (£1 GBP = 100 Pence)[60]

Load factor

5.63. As noted in 4.19, prices within the fare-modelling framework are expressed on an available seat-kilometre (ASK) basis, except APD. To derive an average price per trip, the price per ASK is converted to a passenger basis by dividing seat-kilometre by the load factor, constructing a price per passenger-kilometre (and, by aggregation over distance, a price per passenger trip). This reflects the principle that, as aircraft occupancy increases, a given cost or price per ASK is spread across more passengers, reducing the average price per passenger. Conversely, lower occupancy increases the average price per passenger for the same price per ASK.

5.64. Load factors are taken from outputs of the fleet and allocation models and are passed into NAPDM via the model feedback loop, consistent with the treatment of other operational assumptions (including fuel-efficiency assumptions, as set out in the modelling framework document[61]).

Average cost per trip

5.65. International Passenger Survey (IPS) data are used to estimate the average trip distance for each NAPDM regional market. The passenger-based cost (expressed per passenger-kilometre) is multiplied by the relevant average distance to derive

---

[60] UK GDP deflator was used to rebase stated prices in financial reports to 2024 real £. For IAG when the report expressed prices in € it was converted back to £ using the ONS times series for £/€ conversion rates. Each points shows the average price in pence per ASK for a given year between IAG group and EasyJet two of the biggest airlines group operating in the UK.

[61] https://www.gov.uk/government/publications/aviation-modelling-framework

an average cost per trip, after which APD is added to obtain the average fare for each NAPDM market.

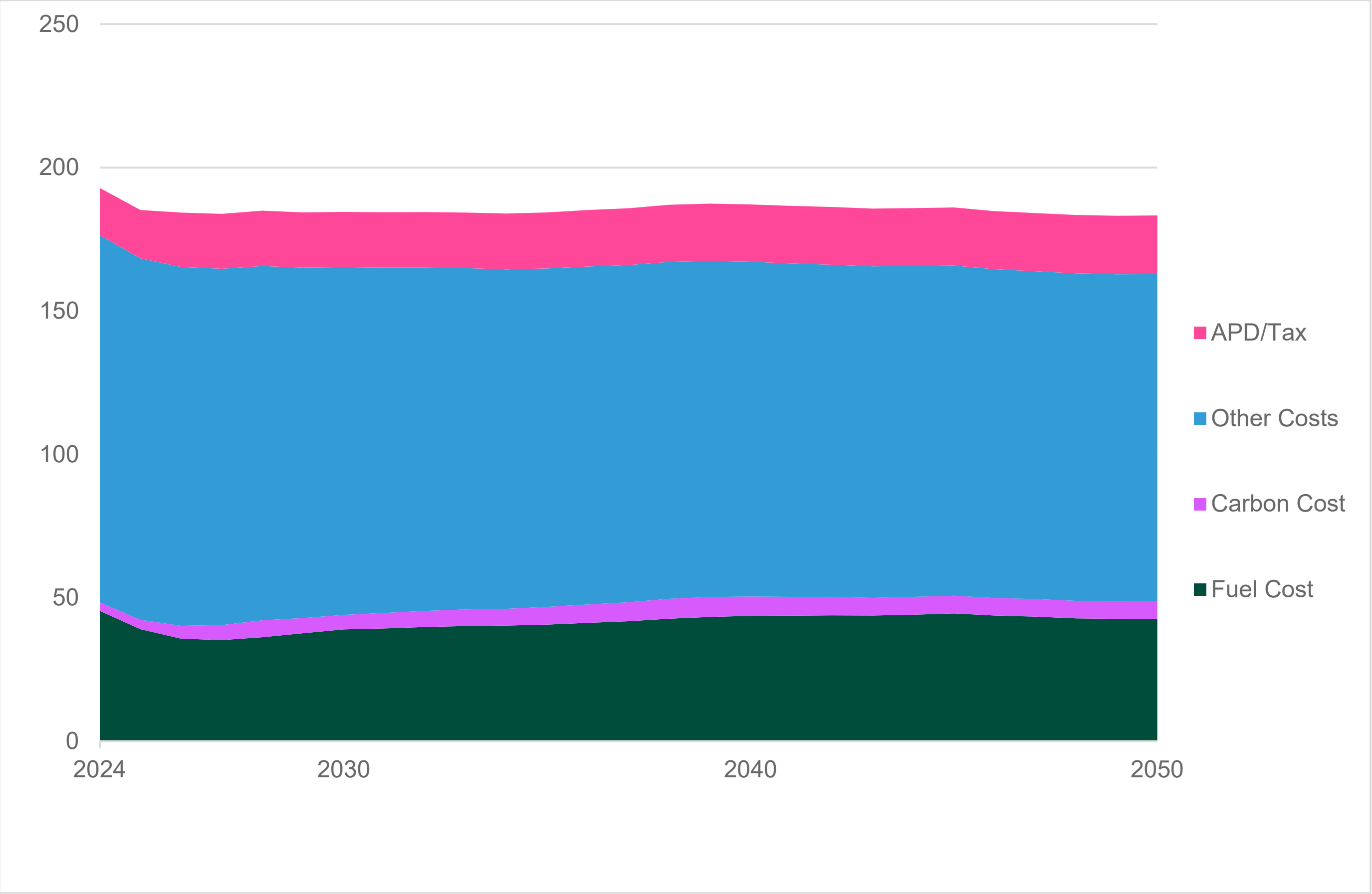

Figure 5-4: Weighted Average fare per trip in the Current Trends scenario in 2024 real GBP

5.66. Figure 5-4 presents the demand-weighted average fare across all NAPDM markets in real 2024 GBP Pound Stirling for a one-way trip, where weights are based on the number of trips in each market.

5.67. Table 5-4 sets out the average distance travelled for an NAPDM trip in each global region

	Average trip length (in kilometres) Leisure Markets	Average trip length (in kilometres) Business Markets
Domestic	444	455
SE	1649	1618
RoE	1009	696
OECD	6523	6022
RoW	5904	6558

Table 5-4: Average Distance per Trips per NAPDM Markets[62]

Demand Matrix input and local growth

5.68. NAPDM produces passenger demand forecasts at the national level. To generate inputs for the allocation model, these national demand forecasts are first disaggregated to UK district-level demand.

5.69. This disaggregation is undertaken using a base-year matrix that maps NAPDM passenger markets to zones within the National Airport Accessibility Model (NAAM)[63]. The base-year spatial distribution of demand across districts is assumed to remain fixed over time, with the exception of adjustments for population growth, which are discussed below. While the spatial distribution of demand is held constant, total demand within each NAPDM market is scaled to align with the base year observed market-level passenger totals.

5.70. The most recent observations used for this calibration are from 2024, drawing on CAA UK airport data and CAA Departing Passenger Survey data.

5.71. From 2025 onwards, national passenger demand by market is forecast using the NAPDM econometric demand module, following the methodology set out in the modelling framework document[64]. In earlier post-COVID model versions, an “onward override” was applied to represent the recovery path of individual NAPDM markets back to 2019 levels. As national demand returned to 2019 levels in 2024 and several years of post-COVID observations are now available, a recovery override is no longer applied. Instead, markets are assumed to grow in line with the estimated long-run elasticity consistent with pre-COVID trends (see the modelling framework document[65]).

---

[62] The average distance flown varies business and leisure markets, as indicated by the IPS data. This disparity likely stems from the distinct nature of these traveller segments who undertake journeys for different purposes, consequently not necessarily traversing identical routes within the same NAPDM region.

[63] For this set of forecasts, the base year is 2024. The district-level demand matrix is sourced directly from the National Air Passenger Allocation Model (NAPAM), which is calibrated to 2024 observed data. As a result, no pre-base year demand overrides are required within NAPDM, since the base years of NAPDM and NAPAM are aligned.

[64] https://www.gov.uk/government/publications/aviation-modelling-framework

[65] https://www.gov.uk/government/publications/aviation-modelling-framework

5.72. Demand is forecast at national level for each market. OBR forecasts of UK real GDP incorporate population projections within the underlying economic outlook; population is therefore not included as a separate driver of national demand in NAPDM. However, population change at district level is used within the spatial distribution process to adjust demand shares across UK regions over time, thereby modifying the base-year demand matrix distribution.

5.73. Population assumptions have been updated both within the OBR long-term economic determinants and within the National Trip End Model (NTEM), which is used to project changes in the spatial distribution of demand across UK regions. Under the Current Trends scenario, the model adopts the NTEM version 8.0 using “Core” population projection[66].

5.74. Table 5-5 sets out projected population growth by UK region from 2021 to 2050 and the implied population distribution under the Current Trends scenario. The underlying NTEM population projections are available at district level; however, for practicality the results are aggregated to UK regional level in this table. The figures are taken from the NTEM v8.0 Core population projection.

UK Region:	Annual Growth rate 2021-2050
South West	0.32%
Wales	0.00%
South East	0.21%
North West	0.18%
North East	0.06%
Yorkshire and The Humber	0.15%
West Midlands	0.31%
East Midlands	0.33%
Scotland	-0.10%

Table 5-5: Annual Growth rate of Population per UK region Current Trends

Local demand growth at the overseas hubs:

5.75. The inclusion of overseas hubs as capacity-constrained modelled airports within NAPAM requires an estimate of ‘local’ (point-to-point) demand at these airports. Incorporating local demand improves the forecasting of international-to-international transfer market at hubs and ensures that capacity constraints at key overseas airports are reflected within the allocation process.

5.76. Local demand at overseas European hubs is assumed to grow at the same rate as demand from foreign residents travelling to the UK, differentiated by NAPDM

---

[66] https://www.data.gov.uk/dataset/11bc7aaf-ddf6-4133-a91d-84e6f20a663e/national-trip-end-model-ntem

market. Accordingly, for Paris Charles de Gaulle (CDG), Amsterdam Schiphol (AMS) and Frankfurt (FRA), the foreign Rest of Europe growth rate is applied (FBRoE or FLRoE). Dubai is the only non-European hub represented in the model; for Dubai, local demand is assumed to grow in line with the foreign Rest of World market (FBRoW or FLRoW).

5.77. Annex B: NAPDM Input Sources lists each source and the corresponding years used in forecasting key demand drivers.

Consideration of DfT Guidance on Uncertainties and Forecasting

5.78. In 2021, the DfT published its uncertainty toolkit within the Department's Transport Analysis Guidance (TAG)[67]. This toolkit provides a framework for the analysis and presentation of uncertainties within transport appraisal, forecasting and analysis. The toolkit also provides practitioners with a view of when tools and techniques for evaluating uncertainty are appropriate, and guidance on proportionality in uncertainty analysis.

5.79. This framework stipulates that uncertainty is a core part of transport analysis given the long timeframes associated with transport analysis and how behavioural changes can significantly alter the outcome of analysis. As a result, the guidance explains that analysis should not focus exclusively on a single scenario and should consider a range on scenarios which illustrate the potential uncertainties for a given scheme or project.

5.80. One of the tools within the toolkit is the introduction of the CAS. These scenarios seek to facilitate consistency in transport forecasting by creating a framework that can be considered depending on the nature of a scheme or policy.

5.81. The CAS are national-level scenarios, this means the CAS are designed to reflect issues that cause uncertainties across the UK – not uncertainties for specific regions, entities, or specific groups in the transport system.

5.82. There are themes in the CAS that are not applicable to the aviation sector - such as mode share and behavioural issues for everyday journeys like commuting.

5.83. Nevertheless, the themes behind the CAS remain a useful aid when considering uncertainty within aviation forecasting. Key themes exist within the CAS which are applicable to the aviation industry:

- The impact of economic factors on passenger demand – activity within the aviation sector and key economic variables including GDP, trade and population growth are intrinsically linked.
- The time and monetary cost of getting to an airport is one of the fundamental drivers of airport choice. The location an individual lives in will impact both the time and monetary cost of getting to a specific airport. A redistribution of

---

[67] https://www.gov.uk/government/publications/tag-uncertainty-toolkit

the population will impact airport choice. This is of particular relevance given the capacity constrained nature of the UK airport system.

- Behavioural changes driven by environmental issues will likely affect a passenger decision on whether to fly or not.
- Technology development may alter demand if it mitigates the environmental impact of activity within the sector.

5.84. The CAS have been mapped to the aviation sector to identify a framework of 5 scenarios for consideration in uncertainty analysis and forecasting within aviation. To assess the impact of each of these uncertainty scenarios, it is useful to present a 'core' scenario, which uses the central inputs and makes no further assumptions about changes to passenger behaviour or preferences. Note, this scenario should not be considered the most likely outcome within the range of uncertainty presented. The scenario is simply a scenario that makes no assumption for specific uncertainties and uses the central estimates for inputs where possible. Therefore, no scenario should be considered ‘more likely’ than another.

Definition of scenarios

5.85. This section summarises the scenarios used for this set of forecasts and the economic and technological assumptions underpinning them. All scenarios are defined as variants of the central Current Trends scenario presented in the NAPDM Inputs section. The variants adjust key drivers: economic growth, fares, technological change and behavioural assumptions to show how changes in these underlying factors affect national aviation demand.

High and Low Economy scenarios

5.86. The High Economy and Low Economy scenarios represent two opposing trajectories for wider economic conditions.

5.87. Under the High Economy scenario, stronger domestic and international economic growth increases household incomes, alongside higher assumed population growth. These conditions increase UK air passenger demand among UK residents and stronger demand for travel to and from the UK among foreign residents. Oil prices are assumed to be lower than in the Current Trends scenario, reducing airlines’ fuel costs and providing an additional upward effect on demand.

5.88. The Low Economy scenario reflects weaker economic conditions that reduce air passenger demand compared to Current Trends. Domestic and international GDP growth is lower, alongside weaker growth in trade volumes. Population growth is also lower than under the Current Trends scenario. Oil prices are assumed to be higher, increasing airlines’ fuel costs relative to the Current Trends scenario and exerting additional downward pressure on demand.

5.89. In these High/Low Economy scenarios, technological development in the aviation sector is assumed to follow the Current Trends assumptions. Potential higher improvements in technology are captured separately through the dedicated Technology Development scenario.

5.90. Table 5-6 shows what are the differences in inputs between the Low/High Economy scenario and Current trends.

	GDP UK and Foreign difference to Current Trends (excl. Row)	GDP Foreign RoW difference to Current Trends	Oil Prices[68]
High Economy Scenario	+0.5 percentage points of yearly growth	+1 percentage points of yearly growth	Low DESNZ Oil Prices forecast (53$/bbl. in 2050 in 2024 real $)
Low Economy Scenario	-0.5 percentage points of yearly growth	-1 percentage points of yearly growth	High DESNZ Oil Prices forecast (120$/bbl. in 2050 in 2024 real $)

Table 5-6: Difference between the High/Low Economy scenario and the Current Trends scenario

Regional Scenario

5.91. Population growth is not modelled as a separate driver within NAPDM, as the effect of population on demand is reflected through the GDP growth driver. The Current Trends forecast adopts the central population assumption embedded within OBR GDP outlook. Similarly High and Low Economy scenarios assume higher and lower population projections. Under this approach, demand increases with GDP regardless of whether GDP growth arises from changes in GDP per capita or from population growth, reflecting the positive relationship between passenger demand and population growth.

5.92. The Regional scenario therefore applies the same national-level population assumptions as in the Current Trends scenario. The Regional scenario differs in how population is distributed across UK districts over time, which affects the spatial distribution of trips.

5.93. Specifically, this scenario assumes lower population growth in the South East of England than under Current Trends, alongside higher growth in the North of England and Scotland. These assumptions are based on the regional population scenario of NTEM v8.0[69]. Table 5-7 presents the implied regional population growth rates used in the Regional scenario and can be compared with Current trends growth rates from Table 5-5. Given the actual concentration of the population in the South East and the North West of England, the alternative growth rates are not sufficient to change the overall population ranking of UK regions. South East and the North West of England remain the most populated areas even

---

[68] There is inherent uncertainty in oil price forecasts due to the volatility, official sources of long-term oil prices trends provide a suitable platform for upper and lower limits that are deemed relevant to a long-term national forecasts.

[69] https://www.data.gov.uk/dataset/11bc7aaf-ddf6-4133-a91d-84e6f20a663e/national-trip-end-model-ntem

in the Regional scenario projection, although their shares of total UK population get marginally lower than under Current Trends.

5.94. Airport choice is influenced, in part, by the generalised cost of accessing an airport, including both time and monetary costs. The capacity-constrained nature of the airport system in the wider South East can therefore affect airport choice and the pattern of demand allocation. In this scenario, the national total level of unconstrained demand is similar to Current Trends; however, the distribution of demand across districts and airports differs slightly because of the alternative population distribution and its interaction with airport accessibility. All other assumptions are consistent with the Current Trends scenario.

UK Region	2021-2050
South West	0.32%
Wales	0.19%
South East	0.09%
North West	0.20%
North East	0.20%
Yorkshire and The Humber	0.20%
West Midlands	0.31%
East Midlands	0.33%
Scotland	0.19%

Table 5-7: Annual Growth rate of Population per UK region Regional scenario

Behavioural scenario

5.95. Behavioural scenario represents a structural shift in demand for selected markets arising from changes in travel behaviour. In this scenario, demand growth is reduced for some specific markets, with a particular focus on business travel and selected short-haul leisure markets. This approach differs from market-maturity parameters, which reduce the sensitivity of demand to GDP across all markets.

5.96. The behavioural adjustment is implemented as a factor applied to the modelled growth path over the period of interest. The adjustment factor gradually reduces growth relative to the Current Trends trajectory for a given market. For example, applying a factor of 0.85 to the UBSE market implies that demand gradually decreases and is 15% lower than it would otherwise have been under Current Trends, after adjustment (see Table 5-10).

5.97. These adjustments are intended to reflect potential changes in consumer behaviour, in light of emerging evidence on post-COVID shifts in business travel practices. This includes the continued use of remote and hybrid working arrangements, as well as a greater reliance on virtual meetings, which may substitute for some types of business travel. It is still too early to determine whether these changes represent a long-term shift in business travel behaviour. However, the adjustments provide an indicative view of UK aviation demand under a scenario where such changes persist.

5.98. The assumptions also account for increasing corporate focus on decarbonisation, including policies aimed at reducing or managing the carbon impacts of business travel (see Business Travel Survey 2025). In addition, a 5% downward adjustment is applied to short-haul leisure markets. This reflects the potential for modal shift from air to rail, where competitive and lower-carbon alternatives are available, consistent with evolving evidence of substitution in short-haul markets[70] [71].

5.99. Table 5-8 sets out the adjustment factor applied for each business market segment in the Behavioural scenario.

Residency	Region	Demand adjustment factor	Adjustment phase start year	Year full adjustment reached
UK resident	Domestic (D)	0.85	2025	2030
UK resident	Southern Europe (SE)	0.85	2025	2030
UK resident	Rest of Europe (RoE)	0.85	2025	2030
UK resident	OECD	0.95	2025	2030
UK resident	Rest of World (RoW)	0.90	2025	2030
Foreign resident	Southern Europe (SE)	0.85	2025	2030
Foreign resident	Rest of Europe (RoE)	0.85	2025	2030
Foreign resident	OECD	0.90	2025	2030
Foreign resident	Rest of World (RoW)	0.95	2025	2030

Table 5-8: Business Market Adjustment in Behavioural scenario

5.100. Table 5-9 sets out the adjustment factor applied for each leisure market segment in the behavioural scenario.

---

[70] Eurostar's Impact on Air Travel | Aviation Market Analysis | OAG

[71] https://www.sciencedirect.com/science/article/pii/S0739885923000446#sec7

Residency	Region	Demand adjustment factor	Adjustment phase start year	Year full adjustment reached
UK resident	Domestic (D)	0.95	2025	2040
UK resident	Southern Europe (SE)	0.95	2025	2040
UK resident	Rest of Europe (RoE)	0.95	2025	2040
UK resident	OECD	1.00*	2025	2040
UK resident	Rest of World (RoW)	1.00*	2025	2040
Foreign resident	Southern Europe (SE)	0.95	2025	2040
Foreign resident	Rest of Europe (RoE)	0.95	2025	2040
Foreign resident	OECD	1.00*	2025	2040
Foreign resident	Rest of World (RoW)	1.00*	2025	2040

Table 5-9: Leisure Market Adjustment in Behavioural scenario (*means no adjustment for that market)

Technology Development scenario

5.101. The Technology Development scenario represents a pathway in which technological progress, particularly relating to decarbonisation, is more ambitious than in the Current Trends scenario. Improvements in aircraft design and operational practices reduce the amount of fuel required per seat-kilometre. As a result, fuel efficiency (measured as seat-kilometres per tonne of fuel) increases relative to the Current Trends scenario, and trips require less jet fuel for the same level of output. The more ambitious operational and aircraft-technology efficiency measures adopted in this scenario yield an average annual saving of 1.3% in seat-tonnes per kilometre. This exceeds the 0.9% improvement projected under the Current Trends scenario.

5.102. However, the reductions in jet fuel consumption—and the associated fuel-cost savings driven by efficiency improvements—are outweighed by the higher expenditure due to increased uptake of SAF. Because SAF is assumed to remain more costly than conventional jet fuel throughout the projection period, the Technology Development scenario results in a higher average fuel cost per seat-kilometre as SAF penetration rises. Under this scenario, SAF uptake reaches 33% by 2050, compared with 17% under the Current Trends scenario.

5.103. The international policy environment is also assumed to be more stringent than in Current Trends. The scenario includes a stronger implementation of CORSIA, with carbon prices rising over time and reaching levels comparable to, or higher than, the UK ETS by 2050 (£192 per tonne of CO_2). As a result, international markets in scope of CORSIA (OECD and Rest of World) face higher carbon-related costs. Combined with ETS coverage in relevant markets, this implies that carbon costs increase across the NAPDM regions relative to the Current Trends scenario.

5.104. It is also assumed that CORSIA offsetting obligations become more ambitious, consistent with a policy framework aligned to net zero global aviation. Accordingly, the sectoral growth factor applied in the model under the Technology Development scenario increases progressively to 100% by 2050. In practical terms, this implies that, by 2050, all trip emissions in CORSIA-covered markets are treated as within scope of CORSIA in the Technology Development scenario, compared with 53% in the Current Trends scenario.

5.105. Overall, while technology and fleet improvements reduce fuel burn (and therefore emissions) per seat-kilometre, higher SAF costs and higher carbon prices increase airlines' operating costs and are assumed to be reflected in higher fares. These countervailing effects result in lower passenger demand in the Technology Development scenario than in the Current Trends case by 2050.

5.106. Figure 5-5 sets out fuel efficiency per NAPDM region in in the Technology Development scenario in seat-kilometre per tonnes of fuel.

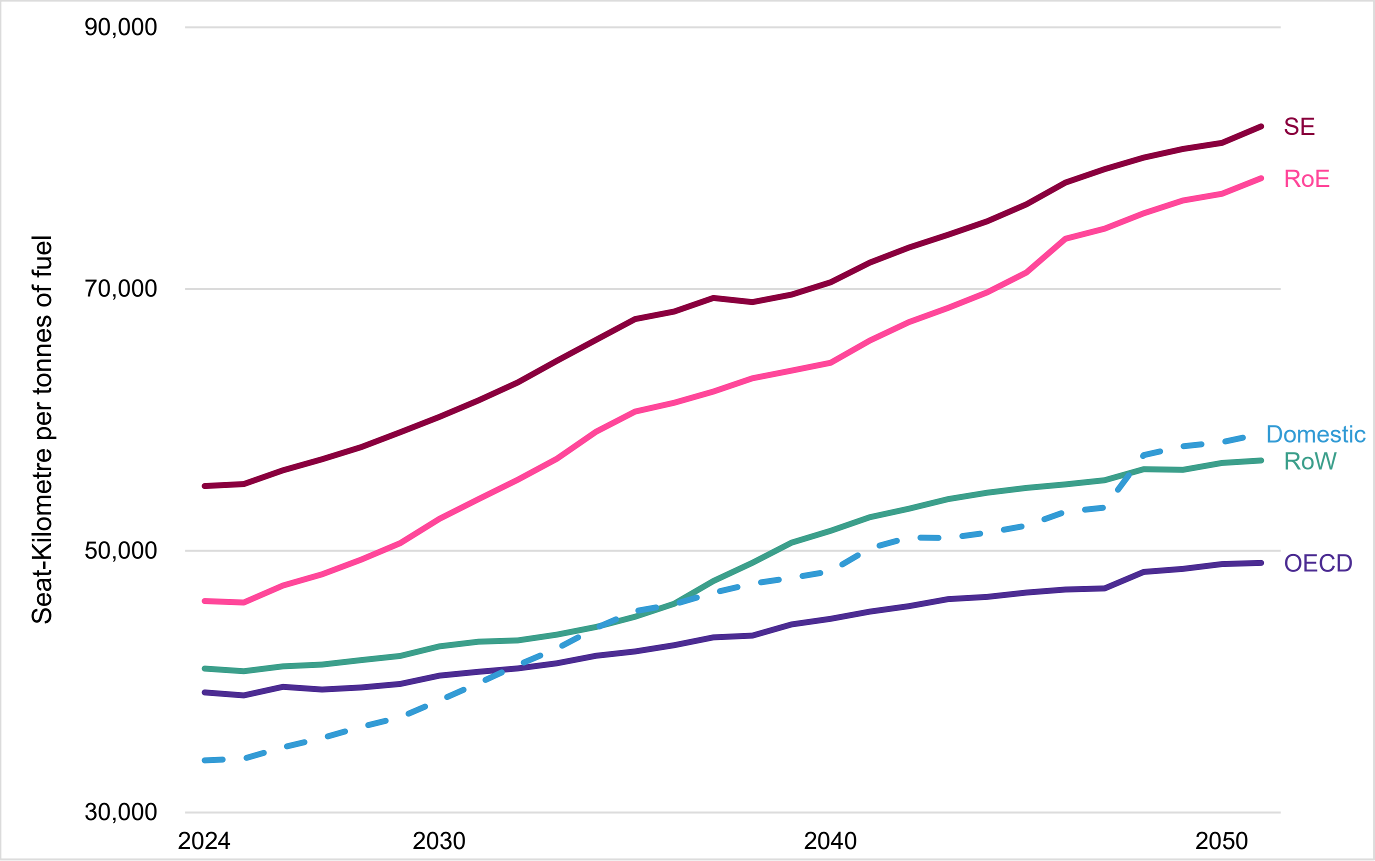

Figure 5-5: Fuel Efficiency per NAPDM Region in Seat Kilometres per tonne of fuel Technology Development scenario

5.107. Table 5-10 compares SAF uptake, Jet Fuel price, and Carbon Cost per tonne of CO_2 emitted between Current Trends and Technology Development scenarios in 2050.

Scenario	SAF uptake	£/ tonnes of Jet Fuel (kerosene + SAF mix)	CO_2 (£)/tonne UK ETS	CO_2 (£)/tonne CORSIA
Current Trends	17%	£ 953	£ 125	£ 17

Technology Development	33%	£ 1,345	£ 125	£ 191

Table 5-10: Difference in Carbon and Jet Fuel cost for outbound trips in modelled year 2050 between scenarios Technology Development and Current Trends

Summary of Inputs

5.108. The inputs for modelling the 6 scenarios can be summarised in Table 5-11 below.

	Features of the scenario
Current Trends	Central estimate for all model inputs and policy assumptions. No additional behavioural or technology shifts beyond standard inputs in the modelling framework. Provides the central trajectory against which all scenario variants are based.
High Economy	Stronger domestic and international GDP growth increases incomes, with a higher population growth and lower oil prices reducing airlines' fuel costs relative to the central case which all increase demand to travel. All other assumptions (technology, behaviour, policy coverage) are held as in Current Trends.
Low Economy	A low economy future with economic developments that lower the growth of air passenger demand. Notably low domestic and international GDP growth, low trade levels, reduced population growth and higher oil prices. All other variables held constant as in the Current Trends.
Regional	National population growth assumptions remain consistent with Current Trends for national demand forecasting. Population growth is redistributed across UK districts/regions (less concentrated in the Wider South East, higher growth elsewhere). This alters the spatial distribution of demand and airport allocation, while total national unconstrained demand remains unchanged.
Behavioural	Applies a targeted behavioural "penalty" to selected markets to reflect potential post-COVID shifts in travel behaviour. Reductions focus on business travel and some short-haul leisure markets (e.g., due to remote working and modal substitution). All non-behavioural assumptions (economy, technology, policy, costs) remain as in Current Trends.
Technology Development	More ambitious decarbonisation pathway: stronger improvements in fuel efficiency reduce fuel burn per seat-km. Higher SAF uptake (and higher SAF costs) and more ambitious carbon pricing/coverage increase airline costs and air fares. By 2050, CORSIA coverage is assumed to extend to full emissions in-scope (sectoral growth factor increasing to 100%), reducing demand compared to the Current Trends case.

Table 5-11: Description of the aviation forecast scenarios

Origin destination matrix

5.109. The ultimate origin and destination base demand matrix is based on CAA Departing Passenger Survey data conducted from 2011-2016. The data is controlled at route level to 2016 passenger flows on individual routes (UK airport to NAPAM zones).

5.110. This 2016 base matrix has been rebased and validated to 2019 passenger flows at a route level and used by DfT for a number of years. This is done separately for different segments e.g., journey purpose (Business/Leisure) and residency (UK/Foreign).

5.111. These forecasts further rebase and validate the demand matrix to 2024 passenger flows. The underlying ground origin zones of the base demand are unchanged from the underlying CAA Departing Passenger Survey data from 2011-2016.

Airport capacity

5.112. The input data for the route network, passengers carried, aircraft sizes, load factors and flight time by airport and destination are derived from the 2024 CAA UK airport data[72].

5.113. To produce constrained forecast NAPAM requires assumptions about both the terminal and runway capacities for each airport included in the model.

5.114. The overall principles adopted in these forecasts of defining annual airport capacities are based on current ATM and terminal capacities and approved airport expansions.

5.115. Table 5-12 shows a summary of the terminal capacity assumptions and Table 5-13 shows the runway capacity assumptions.

5.116. The terminal passenger capacity is the maximum number of passengers an airport's terminal and associated passenger handling infrastructure is assumed capable of serving a year.

5.117. Recently approved expansions to Luton, Stansted, London City and Gatwick are taken into account when developing an airport capacity scenario. When compared with the equivalent scenario from the 2017 forecasts there is therefore significantly more airport capacity in the Southeast.

---

[72] https://www.caa.co.uk/data-and-analysis/uk-aviation-market/airports/uk-airport-data/

	2025	2030	2035	2040	2045	2050
Gatwick	55	70	80	80	80	80
Heathrow	86	92	96	116	116	130
London City	7	9	9	9	9	9
Luton	21	28	28	28	32	32
Stansted	43	43	46	51	51	51
Southampton	3	3	3	3	3	3
Southend	5	5	5	5	5	5
Bournemouth	3	3	3	3	3	3
Bristol	12	12	12	12	12	12
Exeter	3	4	4	4	4	4
Newquay	1	1	1	1	1	1
Cardiff	3	5	5	5	5	5
Norwich	3	3	3	3	3	3
Birmingham	32	37	37	37	37	37
East Midlands	6	6	6	7	7	7
Humberside	2	3	3	3	3	3
Leeds Bradford	5	5	5	5	5	5
Liverpool	7	7	7	7	7	7
Manchester	38	38	38	55	55	55
Newcastle	9	9	9	9	9	9
Teesside	1	1	1	1	1	1
Aberdeen	6	6	6	6	6	6
Edinburgh	18	20	28	35	35	35
Glasgow	15	20	20	20	20	20
Inverness	2	3	3	3	3	3
Prestwick	3	3	3	3	3	3
Belfast City	8	8	8	8	8	8
Belfast International	23	23	23	23	23	23

Table 5-12: Airport passenger terminal capacity assumptions (millions)

5.118. The NAPAM uses the terminal capacity assumptions alongside tolerances to iterate to a solution that falls within acceptable bounds. The tolerances range from +0.2m to +1m for the upper bound and -2m to -0.4m for the lower bound.

	2025	2030	2035	2040	2045	2050
Gatwick	290	346	380	383	385	386
Heathrow	480	505	756	756	756	756
London City	111	111	111	111	111	111
Luton	171	190	209	213	213	213
Stansted	264	264	264	264	264	264
Southampton	150	150	150	150	150	150
Southend	53	53	53	53	53	53
Bournemouth	150	150	150	150	150	150
Bristol	86	86	86	86	86	100
Exeter	150	150	150	150	150	150
Newquay	75	75	75	75	75	75
Cardiff	128	150	150	150	150	150
Norwich	175	175	175	175	175	175
Birmingham	205	205	205	205	205	205
East Midlands	263	263	263	263	263	263
Humberside	150	150	150	150	150	150
Leeds Bradford	150	150	150	150	150	150
Liverpool	213	213	213	213	213	213
Manchester	362	400	500	500	500	500
Newcastle	226	226	226	226	226	226
Teesside	150	150	150	150	150	150
Aberdeen	200	225	225	225	225	225
Edinburgh	188	225	225	225	225	225
Glasgow	226	226	226	226	226	226
Inverness	150	150	150	150	150	150
Prestwick	150	150	150	150	150	150
Belfast City	48	48	48	48	48	48
Belfast International	260	260	260	260	260	260

Table 5.13: Airport ATM runway capacity assumptions (thousands)

5.119. As with terminal capacity the NAPAM uses the runway capacity assumptions alongside tolerances to iterate to a solution that falls within acceptable bounds. The tolerances for the upper bound are +/-1000ATMS.

CO_2 Emissions Inputs

5.120. Key carbon emission abatement measures considered within DfT modelling are:

- Carbon prices
- SAF uptake
- Operational efficiency
- Future aircraft entry into service (EIS) dates

5.121. A detailed discussion of Carbon Price and SAF uptake assumptions is provided in NAPDM Inputs section. This section focuses on describing the evidence base for the operational efficiency, and future aircraft fuel burn models and EIS dates.

Operational Efficiency Assumptions

5.122. In 2025, DfT commissioned the Aviation Impact Accelerator (AIA) at Cambridge University to explore the potential for operational efficiency improvements to reduce fuel burn and associated CO_2 emissions from the existing aircraft fleet between 2025 and 2080[73]. This work focused on measures that could be implemented through changes to flight operations, airspace management, and any ground activities, as opposed to changes to the technology or composition of the aircraft fleet.

5.123. The AIA modelling explores four scenarios—pessimistic, expected, optimistic and technical limit—reflecting increasing levels of policy ambition, technological maturity and operational uptake, with the technical limit representing a theoretical upper bound unconstrained by regulatory, financial or operational barriers. The expected scenario in the AIA modelling is implemented in the Current Trends scenario, and the AIA optimistic scenario is implemented in the Technology Development scenario.

5.124. The key findings indicate that operational efficiency can deliver material fuel and emissions savings, with the scale and composition varying significantly by flight distance and scenario. Short-haul flights have the greatest technical potential fuel savings (up to ~25%) because taxiing and other ground operations represent a larger share of total fuel burn; electric tugs and auxiliary power unit shutdown dominate impacts in higher-ambition cases. For long-haul services, potential savings are smaller overall but increasingly driven by in-flight measures, particularly air traffic management improvements and highly ambitious drag-reduction concepts such as formation flying, which only feature in the higher-ambition scenarios.

Future Aircraft Entry into Service Dates

5.125. A collaborative research project led jointly by DfT and the Aerospace Technology Institute (ATI) was commissioned in 2025 to update the evidence base on the expected fuel efficiency of future aircraft[74]. These are aircraft that are not yet formally announced by Original Equipment Manufacturers (OEMs), but who are developing technologies that may plausibly enter the fleet within the timeframe of the forecasts. The purpose of this evidence is to ensure that the aviation model reflects the most up-to-date understanding of future fleet technology. The work encompasses two future aircraft types:

---

[73] https://assets.publishing.service.gov.uk/media/693ace3eadb5707d9f33d607/Aviation-Impact-Accelarator-operational-efficiency-analysis.pdf

[74] https://assets.publishing.service.gov.uk/media/693acce3cfacd5e888491e11/Revised-fuel-efficiency-assumptions-for-future-aircraft-types-in-DfTs-aviation-modelling-suite.pdf

- Ultra-efficient conventionally powered aircraft, which either operate on kerosene or SAF or both. There are six aircraft class sizes relevant to the forecast period.

- Zero-emission aircraft, which produce zero-emissions at the tailpipe, operating on either hydrogen or electric power. There are four aircraft class sizes relevant to the forecast period.

5.126. As detailed in Table 5-14, the EIS dates for the future aircraft types varies for the Current Trends and Technology Development scenarios, as well as between fuel variants. Note that the Current Trends EIS dates are applicable to the High Growth, Low Growth, Regional and Behavioural scenarios.

Aircraft Type	**Seats**	**Fuel Variant**	**Current Trends EIS date**	**Technology Development EIS date**
Commuter	35	Ultra Efficient	2027	2027
		Zero Emission	2045	2035
Regional Turboprop	75	Ultra Efficient	2037	-
		Zero Emission	2057	2040
Regional Jet	120	Ultra Efficient	2037	-
		Zero Emission	2057	2040
Narrowbody	180	Ultra Efficient	2037	2035
		Zero Emission	-	2051
Widebody	300	Ultra Efficient	2040	2037
XL Widebody	425	Ultra Efficient	2054	2052

Table 5-14: Entry into service (EIS) dates for Ultra Efficient and Zero Emission future unknown aircraft

5.127. There is no variation in the assumed fuel burn performance of the future aircraft types between scenarios. This was decided following discussions with the ATI; OEMs are likely to target fuel burn improvement when developing new aircraft in order to provide savings to operators.

Comparison to the 2022 Jet Zero Strategy Assumptions

5.128. Since the publication of the Jet Zero Strategy (JZS) in 2022, there have been a number of changes in the underlying modelling assumptions which are discussed in the following section.

5.129. In the modelling suite, carbon cost assumptions are separated across two schemes: the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) and the UK Emissions Trading Scheme (UK ETS)[75]. Since the 2022 JZS, the underlying assumptions concerning these schemes have evolved, both in terms of carbon offsetting prices and how these are implemented in the model. The differences discussed here relate to changes in assumptions between publications, rather than differences between the schemes themselves.

5.130. The UK ETS prices used in the 2022 JZS were based on a linear increase from UK ETS auction prices at the time up to the Department for Energy Security and Net Zero (DESNZ) carbon values for appraisal for 2050[76], rather than on assumptions for traded carbon prices.

5.131. The appraisal value represents the monetised societal cost of one additional tonne of CO_2 within the UK appraisal framework. It acts as a disbenefit when emissions increase and a benefit when emissions fall compared to a baseline. In this sense, it reflects the “societal value” of CO_2 emissions[77] rather than the cost of those emissions to passengers.

5.132. As a result of these differing approaches, there is a substantial difference in the carbon prices applied to UK ETS-covered emissions in NAPDM between the Current Trends scenario presented in the 2022 JZS and the assumptions used in this publication. In 2050, the price applied to UK ETS emissions is projected to be £125.23 per tonne of CO_2 (2024 real prices) in this publication, compared with £436.44 per tonne of CO_2 (2024 real prices) in the 2022 JZS.

5.133. Differences in carbon prices for CORSIA-covered emissions are smaller. In both the 2022 JZS and this publication Current Trends scenarios, the assumed CORSIA price trajectory was derived by DfT and set at a substantially lower level than the UK ETS price. The main methodological difference in this publication, relative to the 2022 JZS, is the application of a Sectoral Growth Factor (SFG) to reflect that not all emissions are required to be covered under the scheme (see paragraphs 5.37 and 5.38). Under these assumptions, the effective carbon price applied to emissions in the CORSIA region in 2050 is £15.94 per tonne of CO_2 in this publication, compared with £42.97 per tonne of CO_2 in the 2022 JZS (both in 2024 real prices). In both cases, CORSIA prices remain an order of magnitude below UK ETS prices under the Current Trends scenario. More ambitious carbon pricing assumptions are explored in alternative scenarios (see Table 5-10).

5.134. Following the introduction of the UK SAF mandate, SAF costs have been explicitly incorporated into the National Air Passenger Demand Model (NAPDM). This change was introduced to capture the demand impacts associated with an increasing share of SAF in the jet fuel mix, reflecting the higher unit cost of SAF relative to conventional kerosene (see paragraph 5.26).

---

[75] https://www.gov.uk/government/publications/valuing-greenhouse-gas-emissions-in-policy-appraisal/valuation-of-greenhouse-gas-emissions-for-policy-appraisal-and-evaluation

[76] https://www.gov.uk/guidance/uk-emissions-trading-scheme-for-aviation-how-to-comply

[77] Market-traded carbon prices typically diverge from this value due to market frictions, imperfect information, or design features of carbon obligations

5.135. In the 2022 JZS, SAF uptake was represented within the CO_2 emissions module only and was not reflected in NAPDM. As a result, emissions savings from SAF were captured, but the corresponding impact on demand through higher fuel costs was not modelled. Because SAF is more expensive than fossil kerosene, the inclusion of SAF increases the average cost of the jet fuel mix. All else equal, this raises operating costs and exerts downward pressure on demand. At the same time, SAF reduces lifecycle CO_2 emissions per passenger and therefore lowers the volume of emissions subject to carbon pricing. This reduces the associated carbon compliance costs per tonne of fuel when SAF is included in the fuel mix (see paragraph 5.27).

5.136. In the Current Trends scenario, however, the net effect of introducing SAF into NAPDM is negative on demand. This reflects the fact that the increase in fuel costs associated with SAF outweighs the reduction in carbon costs, particularly given the relatively low carbon prices applied in CORSIA-covered regions. Under higher carbon price assumptions, this balance could reverse, and SAF uptake could result in a net cost saving. Further discussion is provided in the modelling framework document[78].

5.137. Under the Current Trends scenario, SAF uptake reaches around 17% by 2040, which is consistent with the SAF Mandate being met in full. This reflects the design of the Mandate, which is based on greenhouse gas savings rather than volumetric targets, with SAF typically delivering emissions reductions above 70%. Were SAF to deliver less greenhouse emissions reductions, this would mean greater volumes of fuel would be required to meet the SAF Mandate. Beyond 2040, uptake is assumed to remain broadly constant through to 2050.

5.138. In the Technology Development scenario, SAF uptake increases further to around 33% by 2050, always assuming SAF delivers more than 70% greenhouse gas savings emission reductions[79]. This higher level reflects continued but constrained growth in supply, based on current evidence on global SAF availability, including expected feedstock limits, technology deployment, and the pipeline of announced SAF production facilities.

5.139. In the 2022 JZS, SAF uptake in the Current Trends scenario was assumed to be lower than in this publication, with SAF accounting for 10% of the jet fuel mix by 2050 compared to 17% in this publication. However, because the demand impact of SAF was not modelled in the 2022 JZS, the effect on passenger demand was not reflected. In this publication, where SAF costs directly affect demand, the impact is more pronounced.

5.140. SAF prices are estimated at approximately £1,600 per tonne in 2024, rising to approximately £2000 per tonne in the 2040s (in 2024 real terms), compared to modelled kerosene price of £600 per tonne in 2025.

5.141. Table 5-15 presents the differences in carbon price and SAF uptake assumptions in the Current Trends and Technology Development scenario between the

---

[78] https://www.gov.uk/government/publications/aviation-modelling-framework

[79] The 2022 Jet Zero Strategy assumed on average 70% SAF lifecycle GHG savings. Under the SAF Mandate, higher assumed lifecycle GHG savings imply that a lower volume of SAF is required to deliver a given level of emissions reduction.

modelling conducted for the 2022 JZS and those used in this aviation forecast publication.

5.142. The CO_2 model evidence base has also undergone changes since the publication of the 2022 JZS. The two areas that have changed are the operational efficiency assumptions and the future aircraft assumptions, as set out in paragraphs 5.123 to 5.128.

Year	CO_2 (£)/tonne UK ETS Jet Zero	CO_2 (£)/tonne CORSIA Jet Zero	CO_2 (£)/tonne UK ETS Current Trends 2026	CO_2 (£)/tonne CORSIA with SFG Current Trends 2026	SAF Uptake Jet Zero[80]	SAF Uptake Current Trends 2026	SAF Uptake Technology Development 2026
2024	£ 94.67	£ 4.06	£ 37.37	£ 2.75	1%	1%	1%
2040	£ 304.99	£ 17.34	£ 129.27	£ 11.11	4%	17%	17%
2050	£ 436.44	£ 42.97	£ 125.23	£ 15.94	10%	17%	33%

Table 5-15: Comparison of Current Trends Carbon and SAF Prices between this publication’s Current Trends and Jet Zero Strategy 2022 publication (prices are in 2024 real GBP£)

5.143. The updated evidence base for operational efficiency assumptions, produced by the AIA, represents a material difference from those previously used in the 2022 JZS analysis. It replaces high-level, nationally averaged assumptions with a more granular, route-specific assessment of operational efficiency.

5.144. The 2022 JZS assumptions applied an average annual efficiency gain at the national level, with its central case scenario assuming a uniform 13.5% improvement in fuel performance across all routes by 2050 relative to 2030. In contrast, the new AIA analysis applies efficiency improvements at the route level. While domestic routes still show around 13% fuel efficiency improvement in the central scenario - broadly comparable to the previous assumption - the evidence indicates much lower potential on long-haul services, with all long-haul routes achieving less than 5% fuel improvement by 2050. This change reflects that certain operational measures (including those that are ground based) disproportionately benefit short haul flying.

5.145. The updated treatment of future unknown aircraft is made up of a reclassification of future aircraft sizes, updated fuel burn modelling, and revised EIS dates. Whereas the previous 2022 JZS evidence base distinguished two generations of

---

[80] SAF uptake was not represented in the 2022 Jet Zero Strategy (JZS) NAPDM. As a result, even where SAF uptake is lower under 2022 JZS modelling, there was no impact on demand because SAF was only incorporated in the CO_2 model. In this publication, SAF uptake is modelled consistently in both the demand model and the CO_2 model.

future ultra-efficient aircraft types, the updated evidence consolidates these into a single generation of plausible future ultra-efficient aircraft, as shown in Table 5-14.

5.146. The updated evidence base concludes that the introduction of multiple generations of similar aircraft within a short timeframe is unlikely. Previous analysis assumed two successive generations of ultra-efficient aircraft entering service in 2030 and 2040 respectively. However, this revised approach recognises that OEMs typically require a minimum of 20 years to recover development costs for a new aircraft programme, making closely spaced airframe generations commercially implausible. In addition, the fuel efficiency improvement of the 2030 generation of ultra-efficient aircraft compared to equivalent current airframes operating today was minimal, and the updated ultra-efficient provided by the ATI is comparable to the previous 2040 generation of ultra-efficient. The revised evidence avoids assuming unrealistically small efficiency gains between successive generations, which would undermine the commercial viability of updated aircraft.

5.147. Reflecting this revised understanding of manufacturer behaviour and technological progress, the updated assumptions depart from the 2022 JZS, which varied fuel burn performance while holding EIS dates constant for different scenarios. Instead, the updated assumptions apply differentiated and scenario specific EIS dates, recognising that OEMs do not launch multiple narrowbody and widebody programmes simultaneously. These changes to future ultra-efficient aircraft assumptions provide a more credible and robust basis for representing aircraft technological evolution within the forecast, although the impact on emissions forecasts is small.

5.148. The updated evidence base includes a more granular representation of zero-emission aircraft, aligned with the aircraft size classes used for the ultra-efficient aircraft (see Table 5-14). This allows for a more differentiated specification of EIS dates across aircraft types.

5.149. In the 2022 JZS modelling, zero-emission aircraft were not included under the Current Trends scenario. In the updated Current Trends scenario, the smallest zero-emission “commuter” aircraft is assumed to enter the fleet from 2045; however, its contribution to CO_2 abatement by 2050 is negligible. Under this publication Technology Development scenario, the assumed EIS dates are more pessimistic than in the previous evidence base, which assumed zero-emission narrowbody aircraft entering the fleet in 2040. In the updated assumptions, zero-emission narrowbody aircraft enters after the 2050 forecast period, thus reducing the estimated impact of zero-emission aircrafts.

6. Forecasts

Introduction

6.1. This chapter looks at the forecast demand once airport constraints are considered. Constrained forecasts are produced by inputting the underlying demand forecasts produced by the NAPDM into the NAPAM. Then aircraft (ATM) demand is calculated. Finally, both passenger and ATM demand are constrained to available terminal and runway capacity.

6.2. This chapter presents the forecasts constrained by runway and terminal capacities for Current Trends, Low Growth and High Growth scenarios. The forecasts are presented for approved airport plans and planned Heathrow expansion the government is consulting on in the HENPS.

6.3. In addition to the material in this document, separate data files are available relating to fully disaggregated passenger and ATM outputs.

Base year model validation (2024)

6.4. The forecasts have a starting year of 2024 where the model is calibrated to replicate CAA UK airport data. The process of comparing modelled outputs against observed data is known as validation. In NAPAM this assessment is undertaken at various levels of detail:

- Overall airport throughput of passengers and aircraft
- Passengers and aircraft travelling between individual airports and destination zones
- Passengers per ATM

6.5. These assessments are an important part of the quality assurance of the forecast results. The full set of validation exercises undertake which are made at the individual route for the 2024 base year are shown in further detail in Annex A: Additional Validation Information.

National Passenger and ATM forecasts for Low Growth, Current Trends and High Growth scenarios

6.6. Forecast terminal passenger demand in Figure 6-1 and Table 6-1 shows that after allowing for all runway and terminal constraints, passengers at UK airports are forecast to grow to 491 million passengers by 2050 in the Current Trends scenario with a lower range of 412 million passengers and an upper range of 510 million passengers[81].

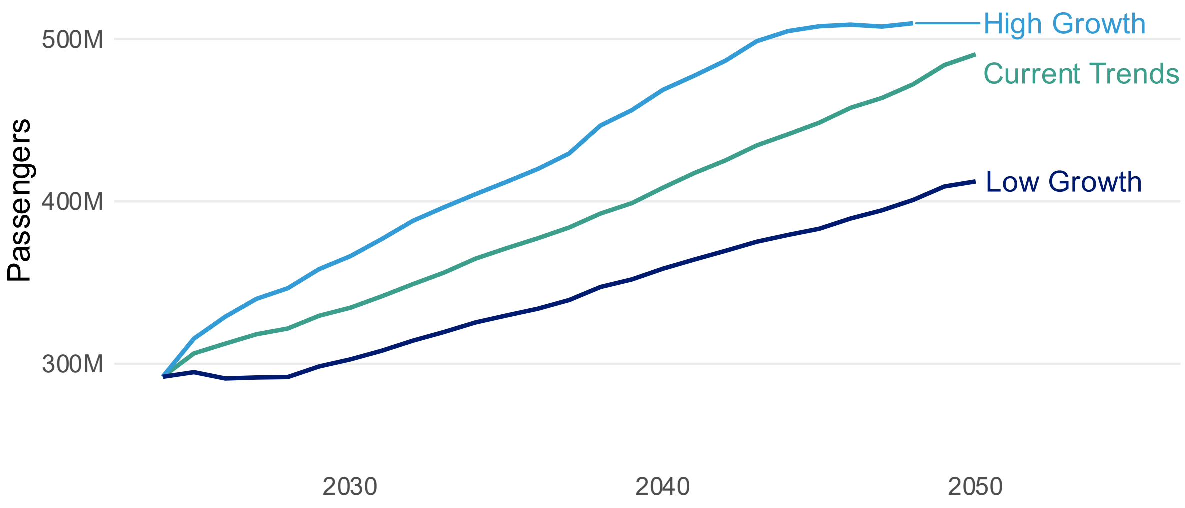

Figure 6-1: National passenger forecast for Low Growth, Current Trends and High Growth scenarios (millions)

	Low Growth	Current Trends	High Growth[81]
2024	—	292.0	—
2030	302.7	334.5	366.2
2035	329.8	371.2	412.1
2040	358.6	408.4	468.7
2045	383.2	448.5	507.8
2050	412.3	490.6	—

Table 6-1: National passenger forecast for Low Growth, Current Trends and High Growth scenarios (millions)

6.7. Forecast ATMs in Figure 6-2 and Table 6-2 show that after allowing for all runway and terminal constraints passengers at UK airports are forecast to grow to 2.8

---

[81] This value is the latest available year in the High Growth scenario (2048) and is provided for illustrative purposes and is not a direct comparison. This is because the DfT aviation model suite reaches a technical limit and cannot mathematically resolve high levels of demand within the capacity constraints placed upon it for these forecasts. Future developments are being considered by DfT in this area.

million ATMs by 2050 in the Current Trends scenario with a lower range of 2.4 million ATMs and an upper range of 2.9 million ATMs .

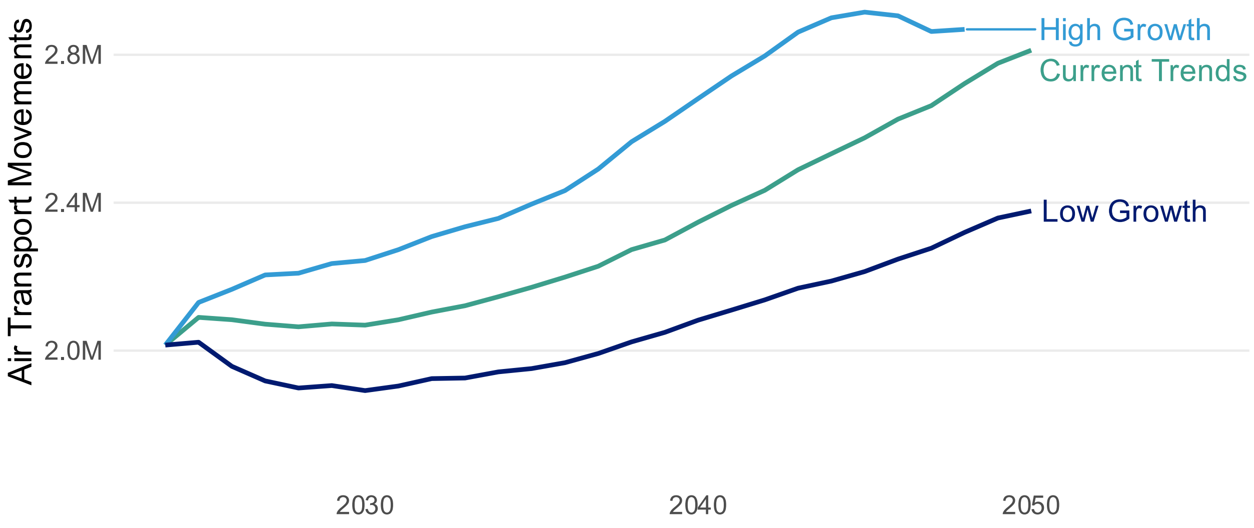

Figure 6-2: National ATM forecast for Low Growth, Current Trends and High Growth scenarios (millions)

	Low Growth	Current Trends	High Growth[81]
2024	2.0	2.0	2.0
2030	1.9	2.1	2.2
2035	2.0	2.2	2.4
2040	2.1	2.3	2.7
2045	2.2	2.6	2.9
2050	2.4	2.8	—

Table 6-2: National ATM forecast for Low Growth, Current Trends and High Growth scenarios (millions)

6.8. Figure 6-3 shows the growth in historic passenger numbers alongside forecasts. The annual average passenger growth between 2000-2019 (excluding COVID-19) was around 2.8%. The Current Trends scenario forecasts an annual average passenger growth of around 2.0% with an upper bound of 2.4% (High Growth scenario) and 1.3% (Low Growth scenario).

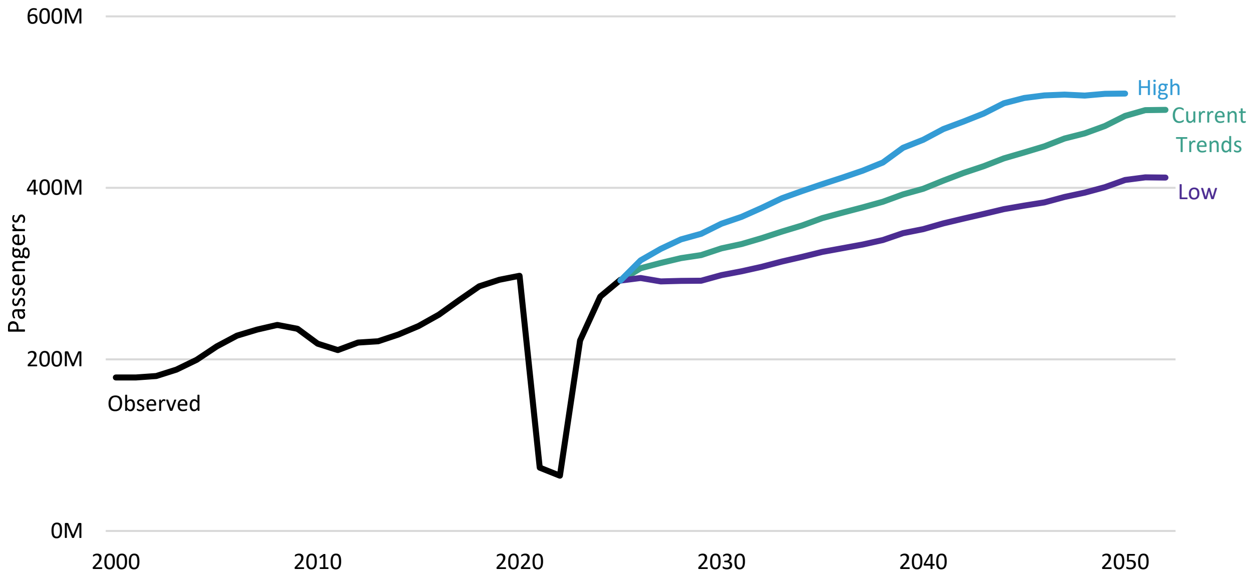

Figure 6-3: Historic and forecast national passenger numbers (millions)

National Passenger and ATM forecasts for alternative scenarios

6.9. Forecasts terminal passengers in Table 6-3 and Figure 6-4 show that passengers at UK airports are forecast to grow to 470 million passengers by 2050 in the Behavioural scenario (21m fewer than Current Trends) and 465 million passengers by 2050 in the Technology Development scenario (26m fewer than Current Trends).

	Current Trends	Behavioural	Technology Development
2024	292.0	292.0	292.0
2030	334.5	324.3	335.5
2035	371.2	356.3	377.3
2040	408.4	388.7	411.8
2045	448.5	428.1	431.1
2050	490.6	470.4	465.0

Table 6-3: National passenger forecast for Current Trends, Behavioural and Technology Development scenario (millions)

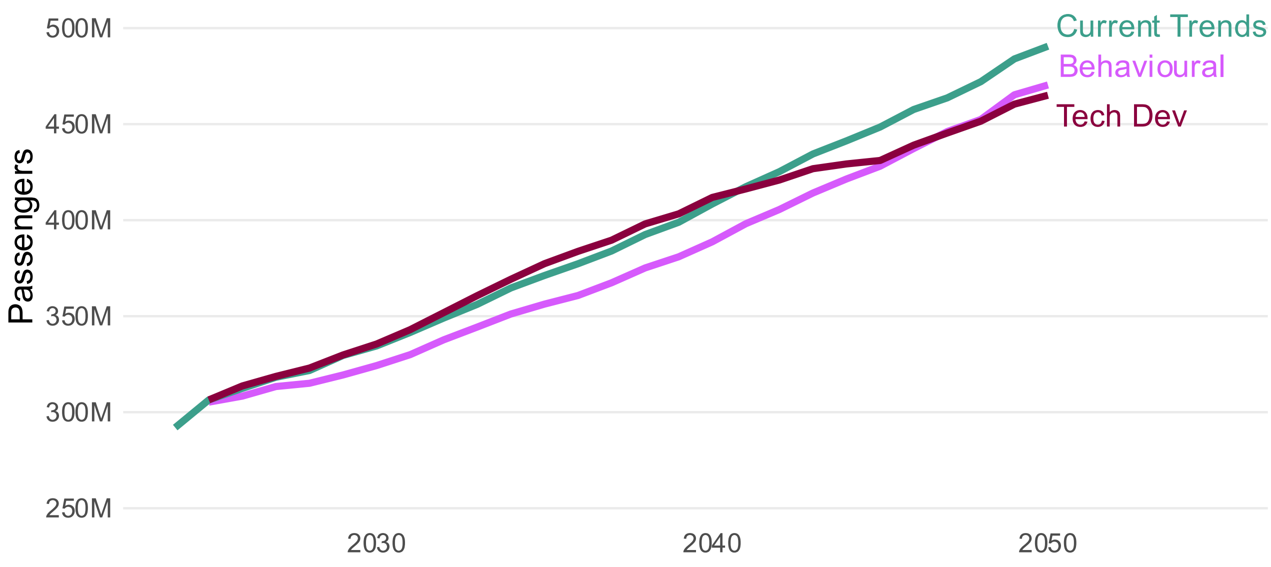

Figure 6-4: National Passenger forecast for Current Trends, Behavioural and Technology Development scenarios (millions)[82]

6.10. Table 6-4 shows the impacts of the Regional scenario on forecast passenger numbers, the national totals are similar as the same underlying national demand is spread across the regions differently. This results in 5m fewer passengers in the Southeast of England by 2050.

---

[82] The Regional scenario is not shown here as the national trend is the same as the Current Trends scenario.

	2024	2030		2035		2040		2045		2050	
	CT	CT	RG	CT	RG	CT	RG	CT	RG	CT	RG
Northern Ireland	9.2	10.8	10.8	12.3	12.3	13.5	13.4	14.8	14.7	16.1	16.0
Scotland	25.3	28.4	28.8	31.9	32.7	34.8	36.1	38.1	40.0	42.1	44.8
Rest of England and Wales	77.9	87.5	88.2	97.2	97.6	108.0	109.4	121.8	122.9	134.6	136.8
Southeast	179.6	207.8	206.2	229.8	228.9	252.2	249.0	273.8	269.9	297.8	293.1
National	292.0	334.5	334.0	371.2	371.5	408.5	407.9	448.5	447.5	490.6	490.7

Table 6-4: Regional passenger forecast for Current Trends and Regional scenario (millions)

Passenger forecasts by journey purpose

6.11. Table 6-5 shows that the UK leisure purpose accounts for around half of UK passengers and growth in this sector accounts for a large part of the national trend in passengers. Table 6-6 shows this rises to 60% if including Domestic Leisure and Charter) and shows that the majority of the aviation forecasts are driven by assumptions that affect leisure passengers.

		2024	2030	2035	2040	2045	2050
Business	Domestic	11.6	12.5	14.0	15.6	17.8	19.3
	International	9.7	10.6	11.4	12.2	12.9	13.6
	UK	16.2	17.4	18.3	19.2	20.0	20.7
	Total	**37.5**	**40.5**	**43.6**	**47.0**	**50.6**	**53.6**
Leisure	Domestic	16.9	19.4	22.3	25.2	28.4	31.5
	International	50.6	65.2	77.6	89.7	103.0	117.8
	UK	155.2	176.5	194.9	212.8	234.3	258.4
	Total	**222.7**	**261.0**	**294.9**	**327.6**	**365.7**	**407.7**
Charter	-	10.3	10.3	10.2	10.3	10.2	10.2
International Transfer	-	21.6	22.7	22.5	23.6	21.9	19.0

Table 6-5: Passenger forecasts by journey purpose for Current Trends scenario (millions)

	2024	2030	2035	2040	2045	2050
Business	37	40	44	47	51	54
Charter	10	10	10	10	10	10
International Transfer	22	23	22	24	22	19
Leisure	223	261	295	328	366	408
Total	292	335	371	408	448	491

Table 6-6: Passenger forecasts by journey purpose for Current Trends scenario (millions)

Airport Passenger forecasts

	2024	2030			2040			2050	
	Current Trends	Current Trends	High Growth	Low Growth	Current Trends	High Growth	Low Growth	Current Trends	Low Growth
Southeast									
Gatwick	43.9	52.5	64.1	41.2	68.0	79.5	47.4	78.1	56.8
Heathrow	83.7	93.6	91.7	92.8	115.7	116.6	116.9	130.4	130.1
London City	3.4	2.7	3.5	2.4	1.4	6.0	1.3	3.8	1.8
Luton	17.0	20.2	24.4	18.5	20.7	26.6	18.3	31.8	17.8
Southampton	0.9	1.0	1.1	0.9	1.3	2.5	1.1	2.7	1.3
Southend	0.3	0.7	1.1	0.6	0.3	1.2	0.2	0.5	0.2
Stansted	30.5	37.2	42.1	31.8	44.9	50.4	37.5	50.6	42.5
Total Southeast	**179.7**	**207.9**	**228.0**	**188.2**	**252.3**	**282.8**	**222.7**	**297.9**	**250.5**
Rest of UK									
Aberdeen	2.4	2.6	2.7	2.5	3.3	3.9	3.0	4.4	3.7
Belfast City	2.8	3.5	3.7	3.1	4.6	5.0	4.2	5.3	5.3
Belfast International	6.5	7.3	7.7	6.9	8.9	9.7	8.2	10.8	9.1
Birmingham	12.4	14.6	16.8	12.6	19.4	27.2	16.4	27.5	21.4
Bournemouth	1.1	1.2	1.3	1.1	1.3	2.2	1.1	2.2	1.4
Bristol	10.1	11.0	12.2	10.1	12.5	12.4	11.5	12.0	12.1
Cardiff	0.9	0.9	1.1	1.0	1.5	2.2	1.0	2.6	1.7
East Midlands	4.2	4.3	5.1	3.7	5.8	7.4	4.4	7.2	5.6
Edinburgh	13.9	16.4	17.7	14.9	20.0	23.4	17.3	24.2	19.9
Exeter	0.4	0.6	0.7	0.5	1.0	2.3	0.7	3.0	1.9

	2024	2030			2040			2050	
	Current Trends	Current Trends	High Growth	Low Growth	Current Trends	High Growth	Low Growth	Current Trends	Low Growth
Glasgow	7.7	8.2	9.3	7.6	10.0	11.4	9.1	11.9	10.2
Humberside	0.1	0.1	0.1	0.1	0.5	0.9	0.2	1.5	0.9
Inverness	0.6	0.7	0.8	0.7	1.1	1.1	0.8	1.2	1.0
Leeds/Bradford	4.6	3.9	5.0	3.5	4.8	4.7	4.0	4.8	5.1
Liverpool	5.6	5.7	7.4	5.3	6.3	6.9	5.7	6.8	5.8
Manchester	31.6	37.4	37.4	33.9	45.3	54.1	39.6	55.1	46.0
Newcastle	5.8	6.5	7.2	5.9	7.6	8.6	6.8	9.2	8.0
Newquay	0.4	0.5	0.5	0.4	0.6	0.6	0.5	0.7	0.6
Norwich	0.5	0.5	0.5	0.5	0.7	0.8	0.6	1.1	0.9
Prestwick	0.6	0.5	0.5	0.4	0.4	0.6	0.4	0.4	0.3
Teesside	0.2	0.2	0.3	0.1	0.8	0.6	0.5	0.9	1.0
Total Rest of UK	**112.4**	**126.6**	**138.0**	**114.8**	**156.4**	**186.0**	**136.0**	**192.8**	**161.9**
National Total	292.1	334.5	366.0	303.0	408.7	468.8	358.7	490.7	412.4

Table 6-7: Airport level passenger forecasts for High, Low and Current Trends scenario (millions)

6.12. Table 6-7 shows the passenger forecasts by airport for the Current Trends, Low Growth and High Growth scenarios. Across all scenarios the airports in the Southeast make up the majority of UK passengers

7. CO_2 Emission Forecasts

Introduction

7.1. This chapter provides forecast CO_2e emissions in relation to the forecasts presented in Chapter 6. Additional information on the isolated impact of each carbon abatement policy under the Current Trends and Technology Development scenarios is also provided.

7.2. All scenarios presented within this Chapter include approved airport plans (e.g., Gatwick, Luton, Stansted, London City) and planned Heathrow expansion. These scenarios do not include other airport expansions that have not received planning approval.

7.3. Emissions from SAF which feed into the forecasts presented in this chapter are estimated on a lifecycle basis. This reflects the approach taken in the Heathrow expansion appraisal, which considers the emissions impacts of SAF across the full fuel supply chain in order to provide a more complete assessment of SAF's overall emissions impact[83]. This differs from the sectoral accounting approach[84] used in cross-Government carbon budget planning reports, such as the October 2025 Carbon Budget and Growth Delivery Plan[85].

7.4. Under a sectoral accounting approach, which aligns with the international carbon reporting protocol that guides production of the UK's Greenhouse Gas Inventory, residual and policy savings estimates of aviation emissions do not account for the full fuel lifecycle. Instead, sectoral accounting follows defined accounting rules for low carbon fuels, where: SAF derived from biological feedstocks and power-to-

---

[83] This also aligns with the SAF emissions accounting approach used in the SAF Mandate cost benefit analysis https://assets.publishing.service.gov.uk/media/66601969dc15efdddf1a872d/uk-saf-mandate-final-stage-cost-benefit-analysis.pdf

[84] The sectoral modelling and lifecycle carbon modelling approaches are equally valid but serve different purposes. A sectoral modelling approach is necessary to minimise risk of double counting of emissions and savings across sectors and is primarily used when outputs are aggregated with and compared across different sectors (including for tracking overall economy-wide progress towards decarbonisation commitments). A lifecycle carbon modelling approach is necessary when assessing the overall climate impact of a policy or policies within an individual sector, including to ensure that decarbonisation policies do not simply displace emissions to other sectors.

[85] https://assets.publishing.service.gov.uk/media/6901d0c2a6048928d3fc2b55/carbon-budget-and-growth-delivery-plan-report.pdf

liquid pathways are “zero rated” under aviation’s totals, with emissions from their production accounted for under other sectors; and emissions from combustion of recycled carbon fuels are accounted for under aviation, with lifecycle savings attributed to other sectors.

7.5. Aviation emissions forecasts modelled on a lifecycle basis include emissions produced and sequestered at all stages of SAF’s supply chain. This includes feedstock production, fuel production, fuel processing, distribution and final combustion. This allows the full emissions impact of SAF to be reflected in the aviation forecasts directly. Lifecycle assessment is commonly used in economic appraisal to capture system-wide impact and is therefore applied in the Heathrow expansion analysis, and in the accompanying forecasts presented in this document.

7.6. The October 2025 Carbon Budget and Growth Delivery Plan[86] set out the Government’s plans to reflect Eligible Emissions Units purchased by UK-registered airlines for CORSIA compliance on UK-departing flights in the UK’s annual statement of emissions during the Carbon Budget 6 period. As the emission reductions and removals that these units represent occur outside of the aviation sector, and do not impact lifecycle emissions from fuel used, they have not been included within the Heathrow Expansion appraisal or the aviation CO_2e forecasts in this report.

National CO_2e emission forecasts for Low Growth, Current Trends and High Growth scenarios

7.7. Figure 7-1 and Table 7-1 show that the Current Trends decarbonisation abatement measures result in forecasted CO_2e emissions of 41.1Mt by 2050, with a lower range of 34.2Mt and an upper range of 44.3Mt[87]. The lower and upper ranges are defined by low and high demand growth assumptions.

---

[86] https://assets.publishing.service.gov.uk/media/6901d0c2a6048928d3fc2b55/carbon-budget-and-growth-delivery-plan-report.pdf

[87] This value is the latest available year in the High Growth scenario (2048) and is provided for illustrative purposes and is not a direct comparison.

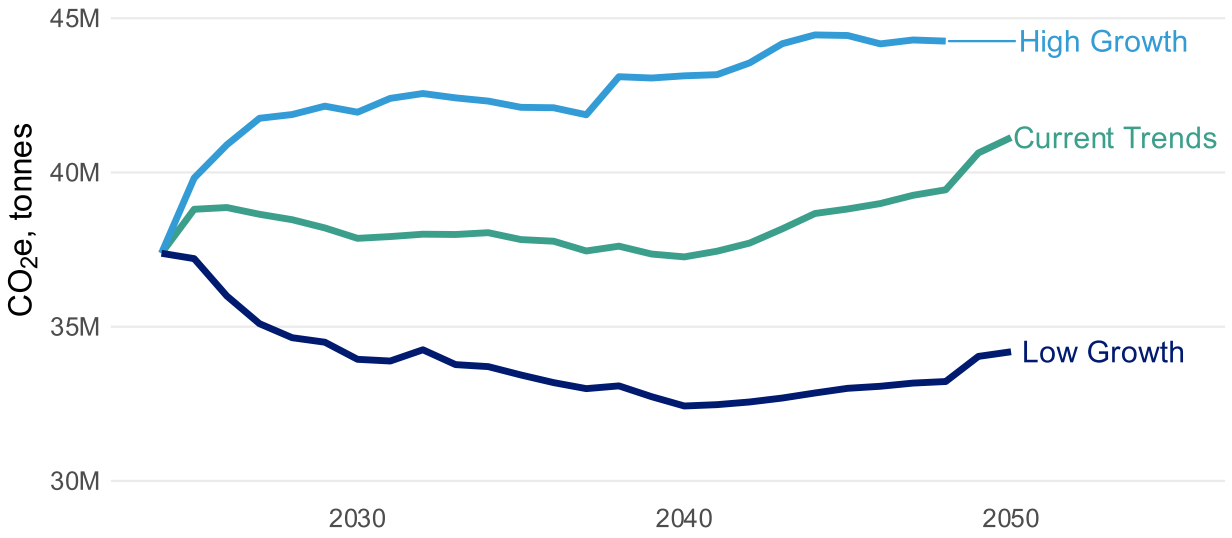

Figure 7-1: National CO_2e forecast for Current Trends, Low and High Growth scenarios ($MtCO_2e$)

	Low Growth	Current Trends	High Growth[88]
2024	37.4	37.4	37.4
2030	33.9	37.9	42.0
2035	33.4	37.8	42.1
2040	32.4	37.3	43.1
2045	33.0	38.8	44.4
2050	34.2	41.1	—

Table 7-1: National CO_2e forecast for Current Trends, Low and High Growth scenarios

---

[88] This value is the latest available year in the High Growth scenario (2048) and is provided for illustrative purposes and is not a direct comparison.

National CO_2e emission forecasts for alternative scenarios

7.8. Figure 7-2 and Table 7-2 show that CO_2e emissions are forecast to grow to 41.1Mt by 2050 in the Regional scenario (0.01Mt lower than Current Trends), and to 40.7Mt in the Behavioural scenario (0.44Mt lower than Current Trends). Both the Regional and Behavioural scenarios have input assumptions consistent with the Current Trends decarbonisation abatement measures.

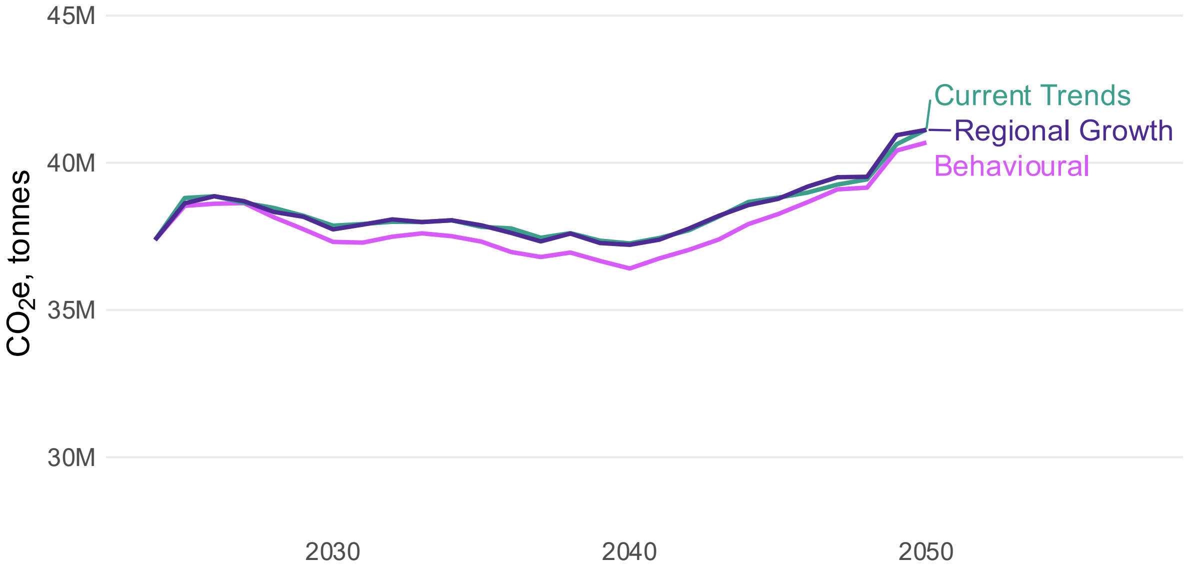

Figure 7-2: National CO_2e forecast for Current Trends, Regional and Behavioural scenarios ($MtCO_2e$)

	Behavioural	Current Trends	Regional Growth
2024	37.4	37.4	37.4
2030	37.3	37.9	37.7
2035	37.3	37.8	37.9
2040	36.4	37.3	37.2
2045	38.3	38.8	38.8
2050	40.7	41.1	41.1

Table 7-2: National CO_2e forecast for Current Trends, Regional and Behavioural scenarios ($MtCO_2e$)

National CO_2e emission forecasts for Technology Development

7.9. Figure 7-3 and Table 7-3 show that CO_2e emissions are forecast to decrease to 28.1Mt by 2050 in the Technology Development scenario (13.0Mt lower than Current Trends). Compared with the Current Trends scenario, the Technology Development scenario incorporates more ambitious carbon abatement measures, which are detailed in Chapter 5 Input Assumptions.

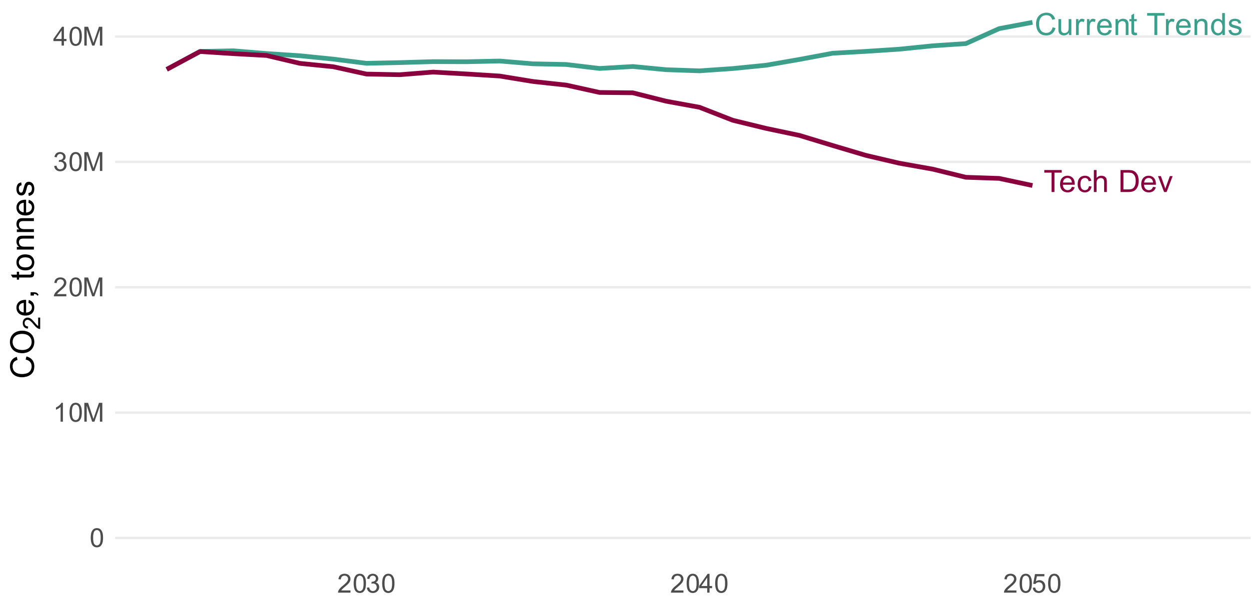

Figure 7-3: National CO_2e forecast for Current Trends and Technology Development scenario ($MtCO_2e$)

	Current Trends	Technology Development
2024	37.4	37.4
2030	37.9	37.0
2035	37.8	36.4
2040	37.3	34.4
2045	38.8	30.5
2050	41.1	28.1

Table 7-3: Comparison of CO_2e under Current Trends and Technology Development ($MtCO_2e$)

7.10. Figure 7-4 shows that both the Current Trends and Technology Development scenarios project higher emissions in 2050 than the comparable scenario forecasts published as part of the Jet Zero Strategy (JZS) in 2022[89]. In the 2022 JZS, CO_2e emissions were forecast to be 37.0 Mt by 2050 under the Current Trends scenario (4.10 Mt lower than the 2026 Current Trends forecast) and 19.3 Mt under the Technology Development scenario[90] (8.83 Mt lower than the 2026 Technology Development forecast), with residual emissions to be offset or removed to reach net zero.

7.11. As detailed in Chapter 5 Input Assumptions - Comparison to the 2022 Jet Zero Strategy Assumptions, a series of model and input assumptions updates has led to the increase in forecasted CO_2e emissions since the 2022 JZS publication. The increase is driven by revised assumptions around SAF uptake, which has reduced from 50% to 30% uptake in 2050, reduced lifecycle greenhouse gas savings from SAF (100% to 95%), as well as less optimistic operational efficiency assumptions, developed by the AIA (detailed in Chapter 5).

7.12. Comparison between the CO_2e forecasts presented and those published in the 2017 forecasts are not provided within this document and should be treated with caution. While the 2017 forecasts included high-level assumptions on fuel efficiency improvements and alternative fuels (described from page 52 of the 2017 published report[91]), the representation of these effects was relatively limited. Since then, there have been significant advances in both the modelling framework and evidence base, including the incorporation of a more robust set of operational efficiency assumptions and comprehensive modelling of SAF uptake. These carbon abatement measures were not fully reflected in the 2017 forecasts, meaning that differences in projected emissions reflect a combination of changes in modelling methodology, policy treatment, and underlying aviation demand. These factors interact in a way that makes it challenging to isolate the contribution of any single driver.

---

[89] Jet Zero strategy: delivering net zero aviation by 2050 - GOV.UK, https://www.gov.uk/government/publications/jet-zero-strategy-delivering-net-zero-aviation-by-2050

[90] In Jet Zero strategy Technology Development scenario most closely aligns with the high ambition scenario

[91] https://assets.publishing.service.gov.uk/media/5e8dec2786650c18c9666633/uk-aviation-forecasts-2017.pdf

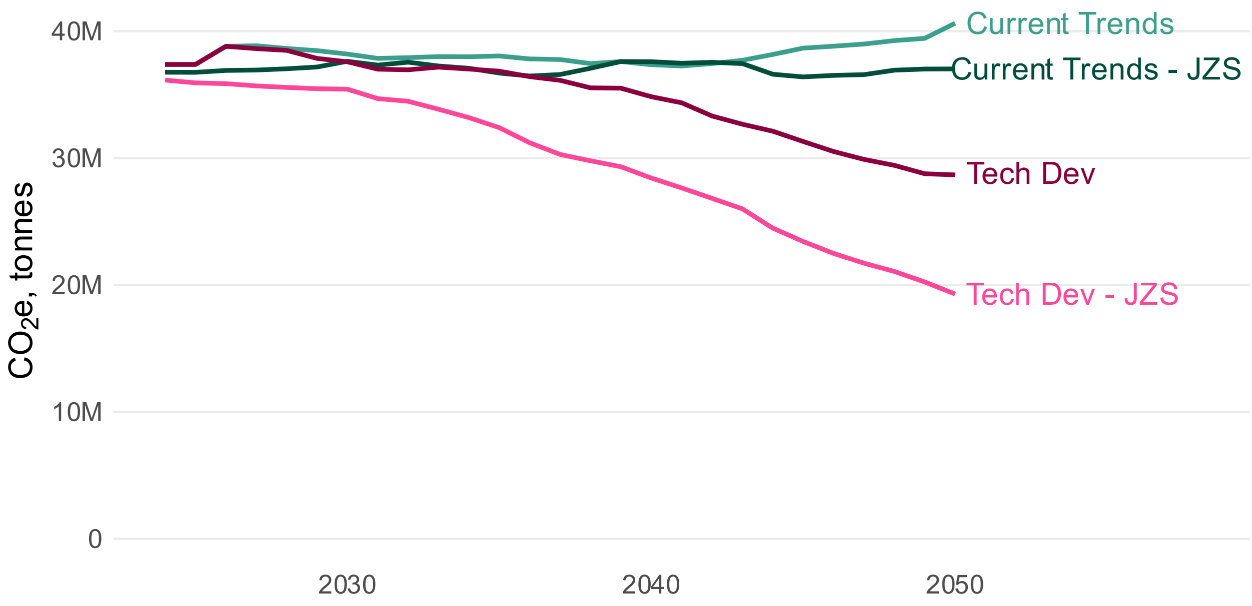

Figure 7-4: Comparison of Current Trends and Technology Developments scenarios with equivalent Jet Zero Strategy scenarios (MtCO$_2$e)

Impact of decarbonisation abatement measures

7.13. The following section sets out the impact of each decarbonisation abatement measure in isolation under both the Current Trends and Technology Development scenarios. The abatement measures described are consistent with the those described in Chapter 5 Input Assumptions, and are compared to a ‘policy off’ counterfactual, which assumes no improvement in operational efficiencies, no new aircraft types coming into service, and no carbon prices or SAF uptake.

7.14. In this section, ‘efficiency improvements’ refer to operational efficiency improvements, while improvements in aircraft fuel efficiency is captured under ‘future aircraft’. The ‘carbon prices’ wedge refers to the emissions reductions resulting from the demand impact of carbon pricing schemes (ETS and CORSIA).

7.15. As set out above, the Current Trends scenario results in forecast CO$_2$e emissions of 41.4 Mt by 2050. As per the 2022 Jet Zero Strategy, it is expected that residual emissions in 2050 will be offset or removed to achieve net zero aviation emissions. Figure 7-5 shows that SAF uptake has the largest impact on emissions abatement over the forecast period, reducing CO$_2$e emissions by 8.7 Mt by 2050. Other abatement measures have a more limited impact, most notably the introduction of zero-emission aircraft, where only the smallest aircraft class (“commuter”) is assumed to enter the fleet before 2050.

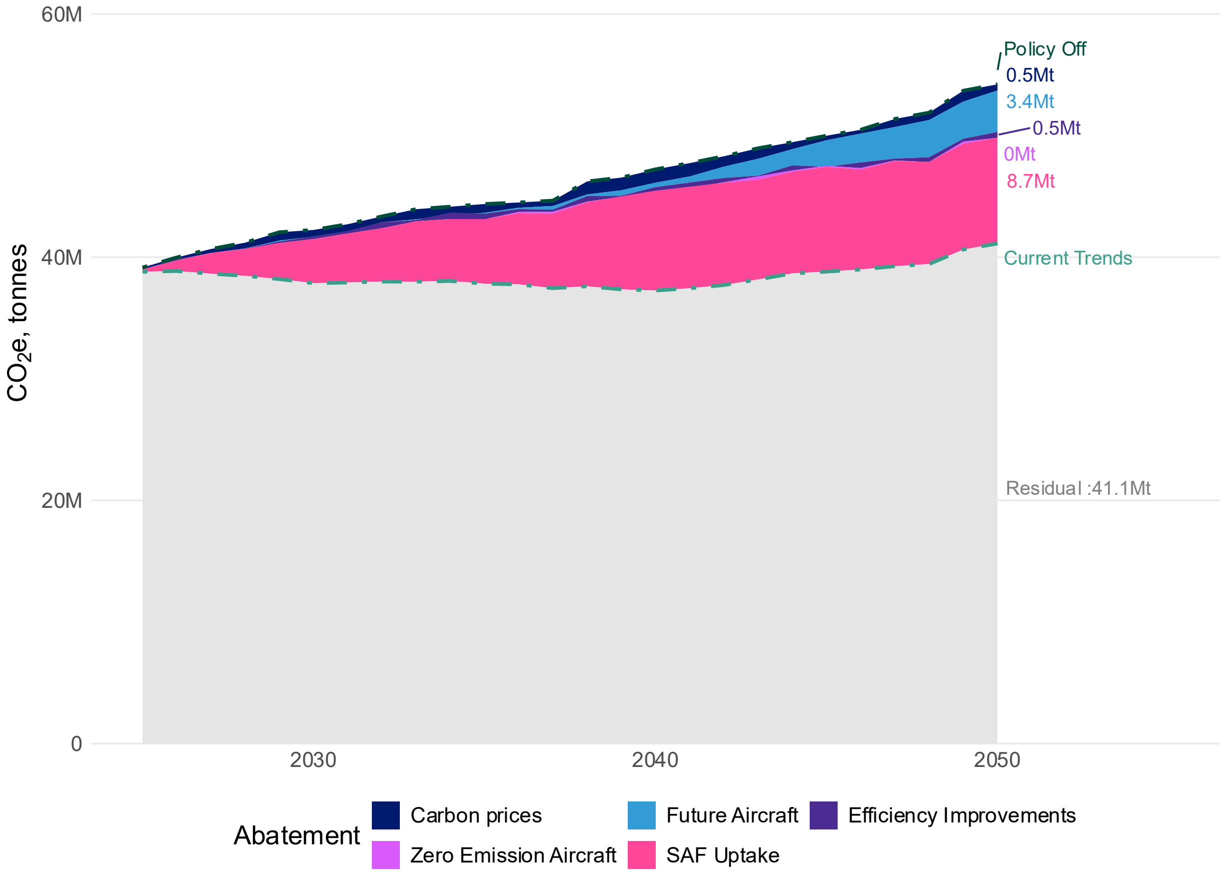

Figure 7-5: Impact of abatement options in the Current Trends scenario (MtCO2e)

7.16. Under the Technology Development scenario, forecast CO_2e emissions are 28.1 Mt by 2050. Figure 7-6 shows that as with the Current Trends scenario, the largest contribution to emissions reduction comes from increased SAF uptake, which reduce CO_2e emissions by 13.6Mt by 2050. Emissions are reduced to a greater extent than under Current Trends mostly due to the combined effect of higher carbon prices and more ambitious operational efficiency assumptions, which together deliver substantially larger CO_2e abatement over the forecast period. In 2050, emissions savings from future aircraft are greater under Current Trends than Technology Development, as future aircraft are replaced by zero emission aircraft in the latter.

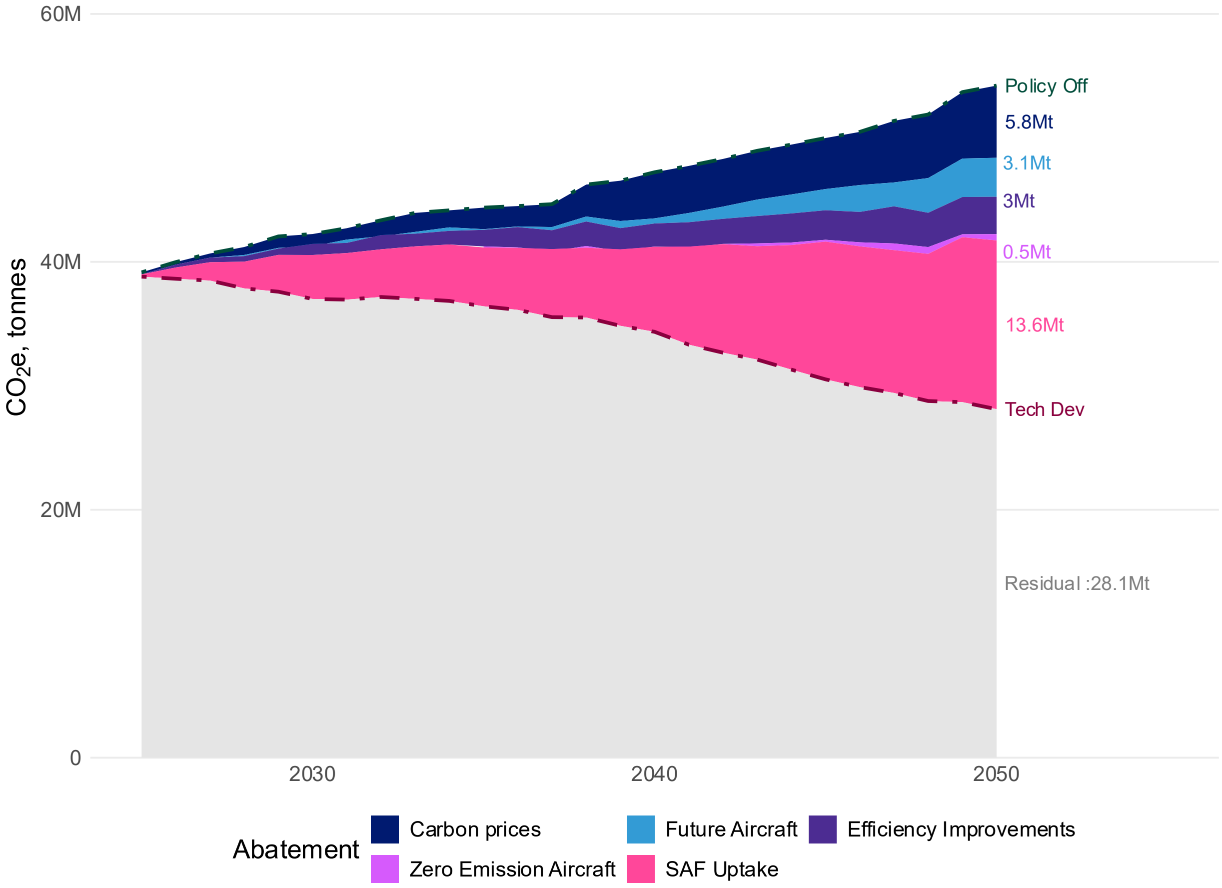

Figure 7-6: Impact of abatement options in the Technology Development scenario (MtCO2e)

7.17. Previously published abatement charts in the 2022 Jet Zero Strategy presented the impacts of future aircraft technology and operational efficiency assumptions as a single combined measure. In this assessment, these effects have been separated to clearly distinguish the contribution of each abatement measure and to improve transparency in how individual drivers of emissions reductions are represented.

7.18. It is important to note that the absolute savings by measure in megatons shown in this style of chart are not only impacted by the specific assumptions made about that measure, but also by all other input assumptions which impact underlying passenger and fuel demand. For example, reduced savings from fuel efficiency measures lead to higher estimates of fuel demand which result in higher estimated SAF uptake (and emission savings from SAF) because the mandate sets an obligation based on total fuel supplied.

7.19. Under the Current Trends scenario, zero emission aircraft are forecast to make up 3% of the fleet (share of ATMs) by 2050, consisting of up to 35 seat sized commuter aircraft. In the Technology Development scenario, the share of ultra-efficient future aircraft is smaller than under Current Trends, due to the earlier introduction of zero emission aircraft as shown in Figure 7-7. Under both scenarios, ultra-efficient aircraft begin entering into service in the early 2030s.

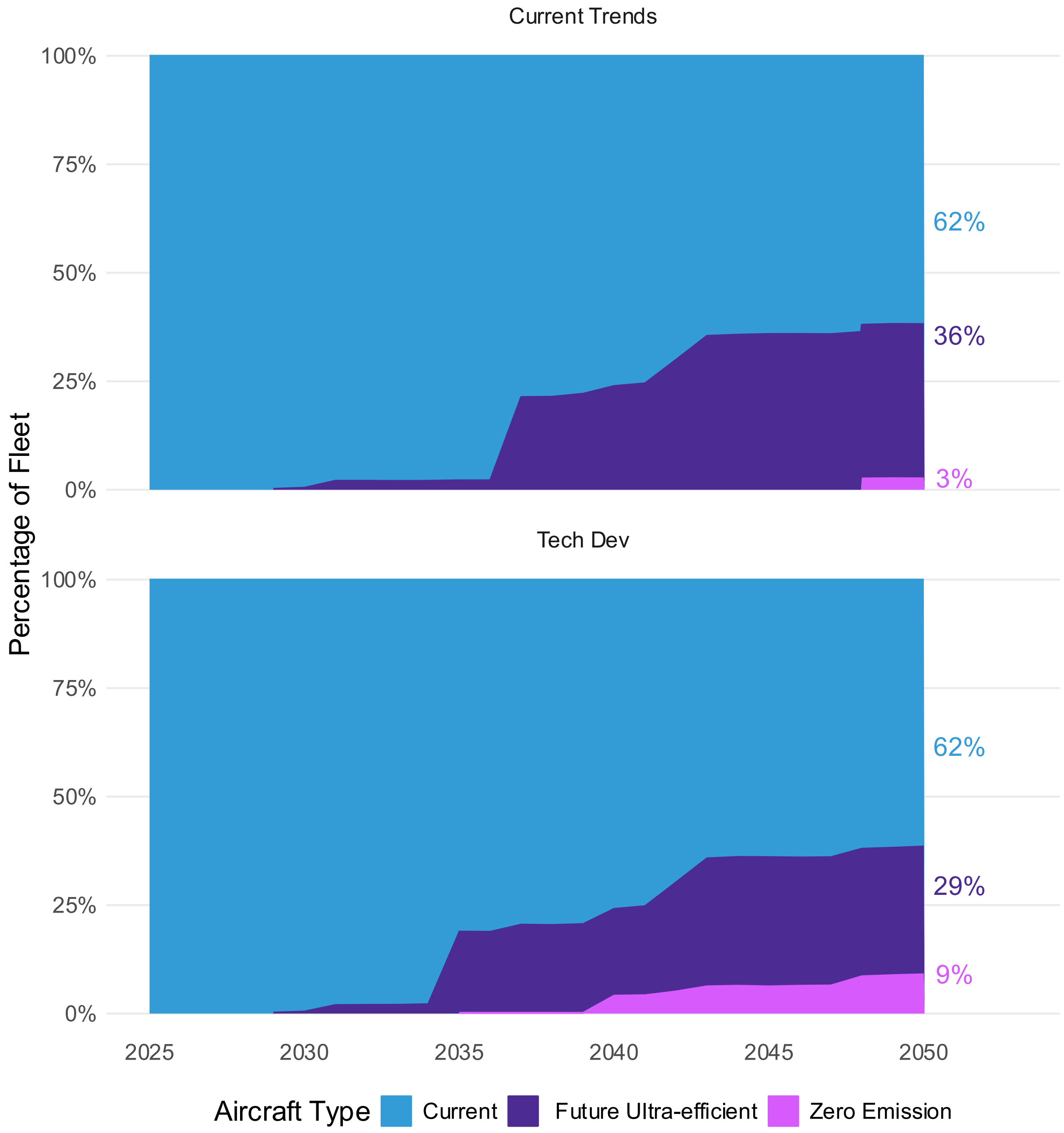

Figure 7-7: Fleet composition in the Current Trends and Technology Development scenarios

8. Sensitivity Tests

8.1. In addition to the six scenarios, the forecast publication includes a set of sensitivity tests. These are used to assess how uncertainty in key assumptions affects aviation demand.

8.2. Sensitivity testing is necessary because projections of economic growth, prices, elasticities, market maturity, fleet characteristics, fuel carbon intensity and allocation assumptions are all subject to uncertainty.

8.3. While the scenarios provide a reasonable set of alternative futures, they cannot cover the full range of values that the underlying demand drivers may take. Sensitivity tests therefore complement scenarios by isolating individual inputs and showing the direction and magnitude of their effect on demand.

8.4. Unless stated otherwise, each sensitivity test is constructed as a variant of the Current Trends scenario. Only the input under test is changed, with all other assumptions held constant, so that the incremental effect can be attributed to that single change.

Economic input assumptions

8.5. Economic inputs are among the primary drivers of unconstrained demand. Given an uncertain global environment and the increased frequency of macroeconomic shocks in recent decades (for example the 2008 financial crisis, the COVID 19 pandemic, and energy price shocks), it is important to quantify the sensitivity of forecast demand to plausible ranges around the central economic projections.

8.6. These sensitivity tests do not explicitly model a large, unexpected shock to the economy arising from discrete events such as a financial or COVID-19 that would typically generate sharp, short-term disruptions and V-shaped recovery profiles. The demand model is not well suited to assessing such events, as these are likely to introduce a structural break in the relationship between economic drivers and demand, for which long-run elasticities may no longer be appropriate.

8.7. Instead, the high and low sensitivity ranges should be interpreted as testing deviations from central forecasts that reflect alternative paths for cumulative growth in key inputs relative to expectations. While framed as systematic variations around the central case, these ranges can also be seen as capturing the average long-term impact of adverse or favourable shocks once their effects are smoothed over time.

8.8. Four sensitivity tests are performed to assess the impact of key drivers on demand: GDP (and income-related drivers), carbon prices, jet fuel prices, and market maturity. Each test varies one input within a defined range relative to the Current Trends scenario assumptions.

GDP, Consumption and Trade drivers

8.9. GDP is tested in isolation to distinguish its effect from other drivers. This differs from the High and Low Economy scenarios, where GDP changes occur alongside changes in oil prices and other macro variables. The high/low economic growth sensitivity scenario varies GDP-related growth such that by 2050 growth is ±25% higher/lower relative to the Current Trends scenario.

8.10. This range is intended to reflect plausible uncertainty around the Current Trends projections used in the model (see paragraph 4.7).

	Cumulative GDP changes to central %		Passenger Demand in MPPA			Demand Changes from Current Trends in %	
	Low	High	Low	Current Trends	High	Low	High
2024	0%	0%	292	292	292	0%	0%
2030	-6%	5%	309	335	355	-8%	6%
2040	-16%	15%	337	408	472	-17%	16%
2045	-21%	20%	346	448	511	-23%	14%
2050	-25%	25%	364	490	n/a[92]	-26%	n/a

Table 8-1: GDP Growth and Passenger demand changes from High/Low GDP sensitivity scenario and Current Trends

8.11. Table 8-1 presents the change in passenger demand resulting from varying GDP growth assumptions from the Current Trends scenario to the High and Low GDP sensitivity cases. Figure 8-1 illustrates the resulting range of demand outcomes across these scenarios.

8.12. By 2050, the Low GDP sensitivity scenario results in substantially lower passenger demand, with total passengers 26% below the Current Trends level. By contrast, in 2040 the High GDP sensitivity scenario shows passenger demand around 16% higher than the Current Trends scenario.

---

[92] This value is the latest available year in the High GDP sensitivity test scenario (2045). This is because the DfT aviation model suite reaches a technical limit and cannot mathematically resolve high levels of demand within the capacity constraints placed upon it for these forecasts. Future developments are being considered by DfT in this area.

8.13. The asymmetry between the upside and downside impacts reflects the presence of airport capacity constraints within the model. On the downside, lower economic growth directly reduces demand. On the upside, however, demand growth is increasingly constrained by available airport capacity, which limits the extent to which higher GDP growth can translate into higher passenger volumes. As a result, the reduction in demand under the Low GDP scenario is more pronounced than the increase observed under the High GDP scenario.

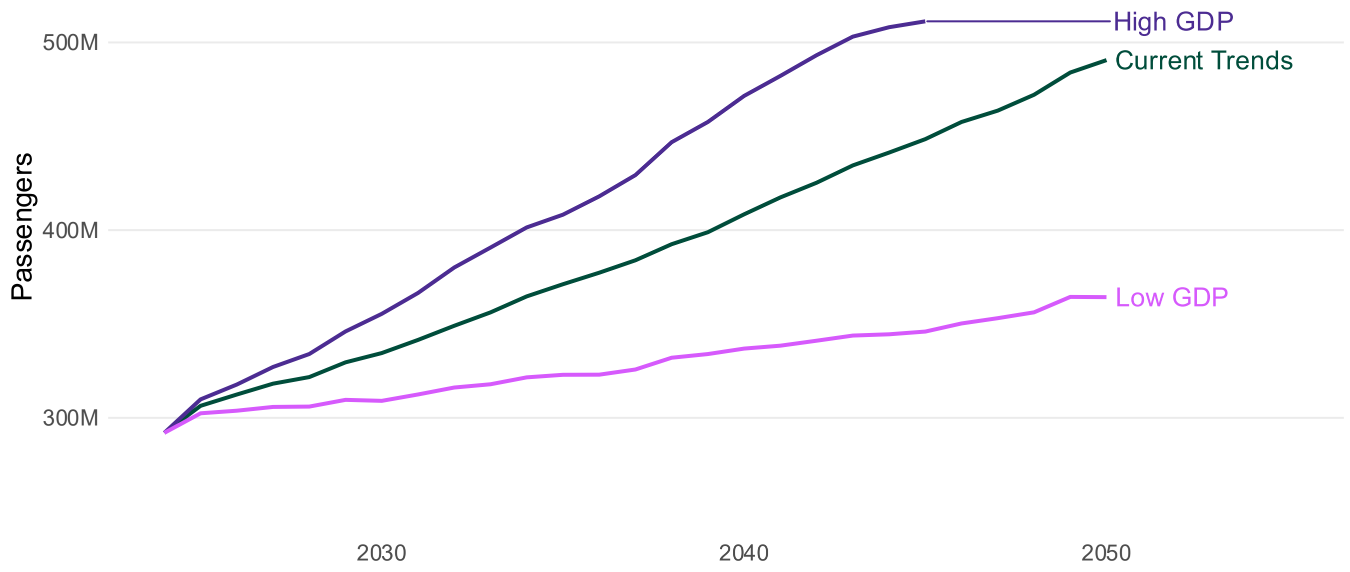

Figure 8-1: National Passenger from Current Forecast with High/Low GDP sensitivity scenarios

Jet Fuel Prices

8.14. Fuel prices represent a major component of airline variable operating costs and can account for around 20–30% of the total airlines expenses[93].However, the two main aviation fuel cost drivers: conventional jet fuel (kerosene) and SAF are both subject to considerable uncertainty. Kerosene prices are historically volatile[94] and can respond rapidly to changes in global supply and demand, while SAF prices remain uncertain because the industry is still developing and production technologies and supply chains are not yet mature.

8.15. Macroeconomic and geopolitical developments since the previous forecast publication in 2017 illustrate the extent of this uncertainty. Oil prices have experienced sharp increases and fall over short periods, reflecting events such as geopolitical shocks, disruptions to global energy markets, and the economic effects of the COVID-19 pandemic[95].

8.16. The forecasting framework is focused on long-run demand rather than short-term price fluctuations. The demand elasticities used in the model are long-run

---

[93] iata.org/en/iata-repository/publications/economic-reports/industry-statistics-fact-sheet-december-2023/
[94] IATA - Fuel Price Monitor
[95] 2022 Energy Crisis – Topics - IEA

parameters and therefore assume that changes in passenger demand adjust gradually over time rather than immediately[96]. In practice, airlines also use fuel hedging and other commercial mechanisms, as described in the modelling framework, which can smooth the short-term pass-through of fuel price changes into fares.

8.17. The sensitivity test therefore focuses on a sustained long-term change in fuel prices, rather than short-term volatility. Specifically, it tests the response of national aviation demand to a gradual and persistent change in kerosene and SAF prices, where jet fuel prices are approximately 40% higher or lower than in the Current Trends scenario by 2050.

8.18. Table 8-2 sets out the differences between the Low and High jet fuel price assumptions and the resulting changes in passenger demand relative to the Current Trends scenario. Figure 8-2 illustrates the range of demand outcomes between the High and Low jet fuel price sensitivity scenarios within the Current Trends framework.

8.19. By 2050, the Low jet fuel price sensitivity scenario results in passenger demand around 6% higher than in the Current Trends scenario. Conversely, under the High jet fuel price sensitivity scenario, passenger demand in 2050 is approximately 6% lower than Current Trends.

8.20. These results indicate that long-term passenger demand is less sensitive to changes in jet fuel prices than to changes in GDP. Jet fuel costs represent only one component of air fares and ticket prices. Under the High jet fuel price sensitivity, a sustained increase of around 40% in jet fuel prices by 2050 relative to Current Trends projections leads to a reduction in total passenger demand of around 6%. While smaller than the GDP sensitivity impacts, this effect is not negligible, particularly given that fuel price variations of this magnitude have been observed historically.

8.21. In addition, the reduction in passenger demand under higher fuel prices is moderated by airport capacity constraints within the model. Reductions in unconstrained demand do not always lead to proportional reductions in constrained demand.

---

[96] https://assets.publishing.service.gov.uk/media/6235a5378fa8f540edba36f5/econometric-models-to-estimate-demand-elasticities-for-the-national-air-passenger-demand-model.pdf

	Jet Fuel Price per Tonnes of fuel (2024 GBP£)			Passenger Demand in MPPA			Demand Changes from Current Trends in %	
	Low	Central	High	Low	Current Trends	High	Low	High
2024	£ 724	£ 724	£ 724	292	292	292	0%	0%
2030	£ 623	£ 705	£ 739	342	335	331	2%	-1%
2040	£ 647	£ 901	£ 1,059	436	408	394	7%	-4%
2050	£ 585	£ 953	£ 1,316	519	490	461	6%	-6%

Table 8-2: Jet fuel cost and passenger demand changes from High/Low Jet Fuel Price sensitivity scenario and Current Trends

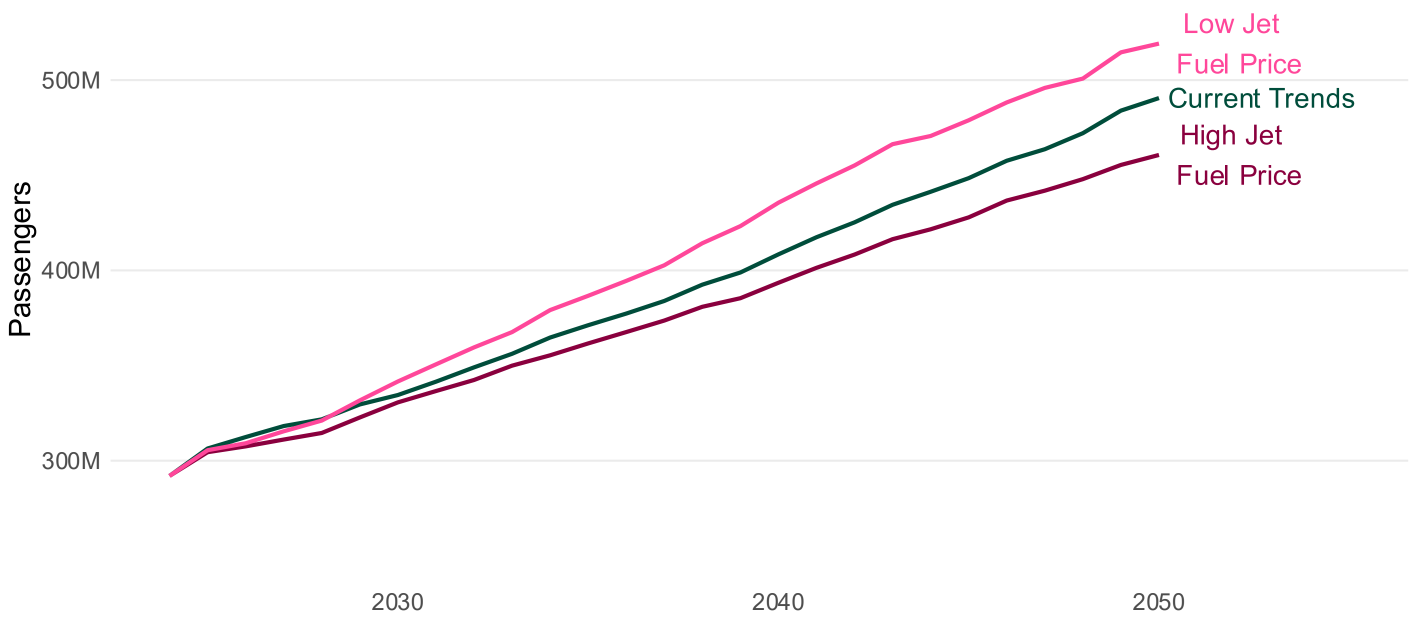

Figure 8-2: National passengers from Current Trends forecast with High/Low Jet Fuel Price sensitivity scenarios

Carbon Cost

8.22. Aviation is one of the highest CO_2 emitting sector in the UK and globally. To address this, various decarbonisation policies have been developed at the international level, within the UK, and across the aviation sector to reduce the industry's carbon footprint[97].

8.23. Carbon pricing schemes are an important policy tool there are two main schemes that apply to the UK aviation sector are the UK ETS[98] and ICAO's CORSIA[99]. Both schemes have been discussed in 5.31 and are modelled within NAPDM.

---

[97] https://www.gov.uk/government/publications/about-the-saf-mandate/the-saf-mandate-an-essential-guide

[98] https://www.gov.uk/guidance/uk-emissions-trading-scheme-for-aviation-how-to-comply

[99] https://www.icao.int/environmental-protection/CORSIA/pages/default.aspx

8.24. However, these carbon pricing schemes are subject to ongoing policy development, and international negotiations in respect of CORSIA. Given this and the long-time horizon of the forecasts, it is difficult to know how they will evolve and future prices are highly uncertain. Both CORSIA and the UK ETS could evolve in ways that raise carbon prices and hence could produce higher carbon cost for passengers or alternatively developments might result in reduced price signals. Such uncertainties are particularly relevant for CORSIA, for which long-term impact depends heavily on international cooperation and the future of the scheme beyond its current 2035 expiry.

8.25. The UK Emissions Trading Scheme (UK ETS) is now aligned with net zero objectives, and carbon prices are expected to increase over time. At the time the scenarios in this publication were developed, the carbon prices used for UK ETS were based on DESNZ traded carbon values assumptions published in 2024[100]. Since then, DESNZ has updated its forecasts, with projected ETS prices now significantly higher than those assumed in this publication over the period 2040–2050[101].

8.26. To capture the full range of uncertainty in future carbon prices, “upper- and lower-bound” scenarios are tested.

8.27. The low carbon cost scenario is a run with no carbon costs and with every other assumption kept the same as in the Current Trends scenario. In this case, both the UK ETS and CORSIA regions within NAPDM face a carbon cost of zero.

8.28. In the high carbon cost scenario carbon prices are assumed to increase gradually so that they align with DESNZ’s carbon appraisal values[102] by 2035 (in 2024 real £). In this sensitivity run, all NAPDM regions and all associated emissions are assumed to face the full appraisal value.

8.29. The carbon appraisal value differs from the traded ETS carbon price projections from DESNZ[103] used in all core scenarios presented in chapter 5. See paragraph 5.132 for more information on carbon appraisal values

8.30. When carbon costs in the model are set equal to the appraisal value, it is equivalent to assuming that consumers fully internalise the societal cost of emissions. These appraisal values are significantly higher than the traded carbon prices used in the Current Trends scenario. In 2024 real terms, appraisal values reach 443 £/tCO_2 by 2050, whereas in the Current Trends scenario central DESNZ UK ETS forecast of traded carbon prices reach 125 £/tCO_2 and DfT CORSIA forecasts 30 £/tCO_2 by 2050.

---

[100] https://www.gov.uk/government/publications/traded-carbon-values-used-for-modelling-purposes-2024/traded-carbon-values-used-for-modelling-purposes-2024#scenarios

[101] https://www.gov.uk/government/publications/traded-carbon-values-used-for-modelling-purposes-2025/traded-carbon-values-used-for-modelling-purposes-2025

[102] https://www.gov.uk/government/publications/valuing-greenhouse-gas-emissions-in-policy-appraisal/valuation-of-greenhouse-gas-emissions-for-policy-appraisal-and-evaluation

[103] https://www.gov.uk/government/publications/traded-carbon-values-used-for-modelling-purposes-2024/traded-carbon-values-used-for-modelling-purposes-2024

8.31. Table 8-3 sets out the difference between zero-carbon and appraisal-level carbon prices (per tonne of CO_2), and the resulting change in passenger demand relative to the Current Trends scenario. Figure 8-3 illustrates the range of demand outcomes between the High and Low Carbon sensitivity scenarios within the Current Trends framework.

8.32. Under the Low Carbon sensitivity scenario, passenger demand follows a broadly similar trajectory to Current Trends. By 2050, total passenger demand is around 2% higher than in the Current Trends scenario. This relatively small difference indicates that carbon prices assumed under Current Trends have a limited impact on demand. This reflects the relatively low carbon prices applied in CORSIA-covered regions. More ambitious assumptions regarding carbon pricing are explored in the Technology Development scenario.

8.33. By contrast, under the High Carbon price sensitivity scenario, passenger demand in 2050 is around 16% lower than in Current Trends. This scenario illustrates the potential impact on national aviation demand if carbon prices are gradually increased to appraisal-level values, which are substantially higher than carbon prices set out in the Current Trends scenario.

8.34. The time profile of demand in the High Carbon price sensitivity scenario reflects the evolution of carbon prices over time in that scenario. Carbon prices increase rapidly between 2024 and 2035 as they converge towards appraisal levels, resulting in a pronounced reduction in demand during this period. Over this phase, the impact of higher fares driven by carbon costs is of a similar magnitude to the effect of GDP growth on demand. Beyond 2035, although appraisal carbon prices continue to rise in line with the DESNZ carbon valuation series, much of the demand response has already occurred. As a result, passenger demand resumes growth between 2035 and 2050, albeit from a lower base than under Current Trends.

	Price per Tonnes of CO_2e emitted (2024 real GBP£)		Passenger Demand in MPPA			Demand Changes from Current Trends in %	
	Low	High	Low	Current Trends	High	Low	High
2024	£ 0.00	£ 37.37	292	292	292	0%	0%
2030	£ 0.00	£ 127.41	341	335	318	2%	-5%
2040	£ 0.00	£ 381.89	432	408	349	4%	-15%
2050	£ 0.00	£ 443.20	502	490	413	2%	-16%

Table 8-3: Carbon Cost and Passenger demand changes from High/Low carbon sensitivity scenario and Current Trends

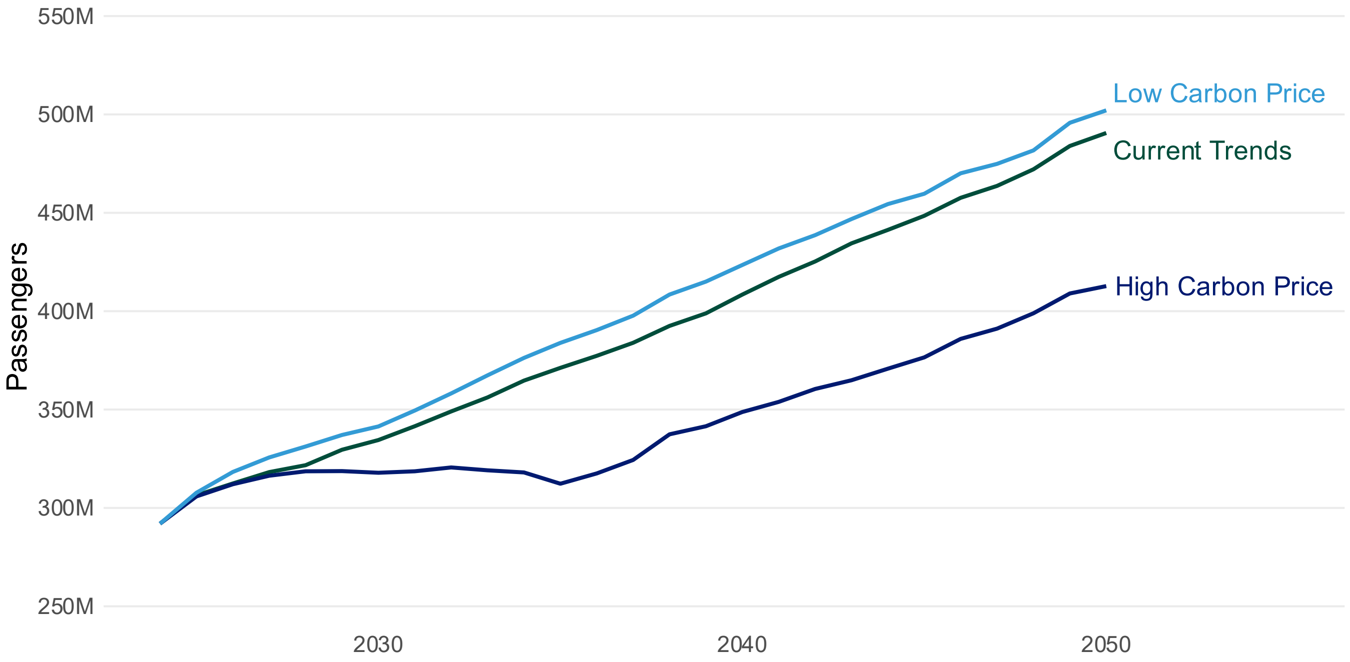

Figure 8-3: National Passenger from Current Forecast with High/Low Carbon sensitivity scenarios

Market Maturity:

8.35. As noted in paragraph 4.13, market maturity plays an important role in shaping how sensitive aviation demand is to income, and in our case to GDP growth. The elasticities of demand to income in NAPDM were estimated on dataset spanning from 1986 to 2017, a period characterised by rapid expansion in the aviation sector, driven by technological progress, growth in international tourism, and the liberalisation of airline markets[104]. These developments contributed to sustained growth in aviation activity and help explain, alongside GDP growth, the strong rise in passenger demand observed over the past four decades.

8.36. Given the uncertainty surrounding the future development of the aviation sector, the market-maturity parameter enables modelling of scenarios in which, as passengers' markets expand and mature, the marginal propensity to take additional flights declines. In the Current Trends scenario, income elasticities are assumed to decrease gradually from 2025 onwards, converging to a long-run value of 0.55 across all markets by 2095. Further detail on the implementation of this mechanism is provided in the aviation modelling framework documentation.

8.37. Market maturity may, however, evolve more rapidly than assumed under the Current Trends scenario. To reflect this, a sensitivity test is included in which aviation demand becomes considerably less responsive to GDP growth over time. Under this sensitivity, elasticities for each NAPDM markets are gradually phased

---

[104] Liberalisation of Air Transport (EN)

down from their respective starting values to 0.10 by 2095. In this case, a 10% increase in GDP would result in only a 1% increase in long-run aviation demand in that market when maturity is reached (in 2095).

8.38. Table 8-4 sets out the changes to the income elasticity parameter averaged across all markets and applied under the High Market Maturity scenario, reflecting a reduced sensitivity of passenger demand to GDP growth over time. Figure 8-4 compares passenger demand under the High Market Maturity scenario with the Current Trends scenario.

8.39. Adjustments to market maturity are introduced progressively, by 2050, passenger demand under the High Market Maturity scenario is around 3% lower than under Current Trends.

8.40. Over longer time horizons, the higher levels of market maturity have an increasingly pronounced effect. In this High market maturity scenario, unconstrained demand becomes largely insensitive to GDP growth by around 2095. However, within the scope of this document, which focuses on 2024-2050, the impact of increasing market maturity remains relatively modest. As a result, while the effect is visible towards 2050, it is less evident than in scenarios testing changes to GDP growth, fuel prices, or carbon costs.

	Average elasticity of demand to income applies across NAPDM[105]		Passenger Demand in MPPA		Demand Changes from Current Trends in %
	Current Trends	High Maturity	Current Trends	High Maturity	High Maturity
2024	1.15	1.15	292	292	0%
2030	1.11	1.08	335	333	0%
2040	1.02	0.93	408	403	-1%
2050	0.93	0.78	490	476	-3%

Table 8-4: Average elasticity to income and Passenger demand difference between High Market Maturity scenario and Current Trends

---

[105] This column presents the average income elasticity of demand (primarily GDP) across all markets. While this is an average, the elasticity applied in practice varies by market, in line with the values used in other scenarios in the document. The average is shown here for presentation purposes only.

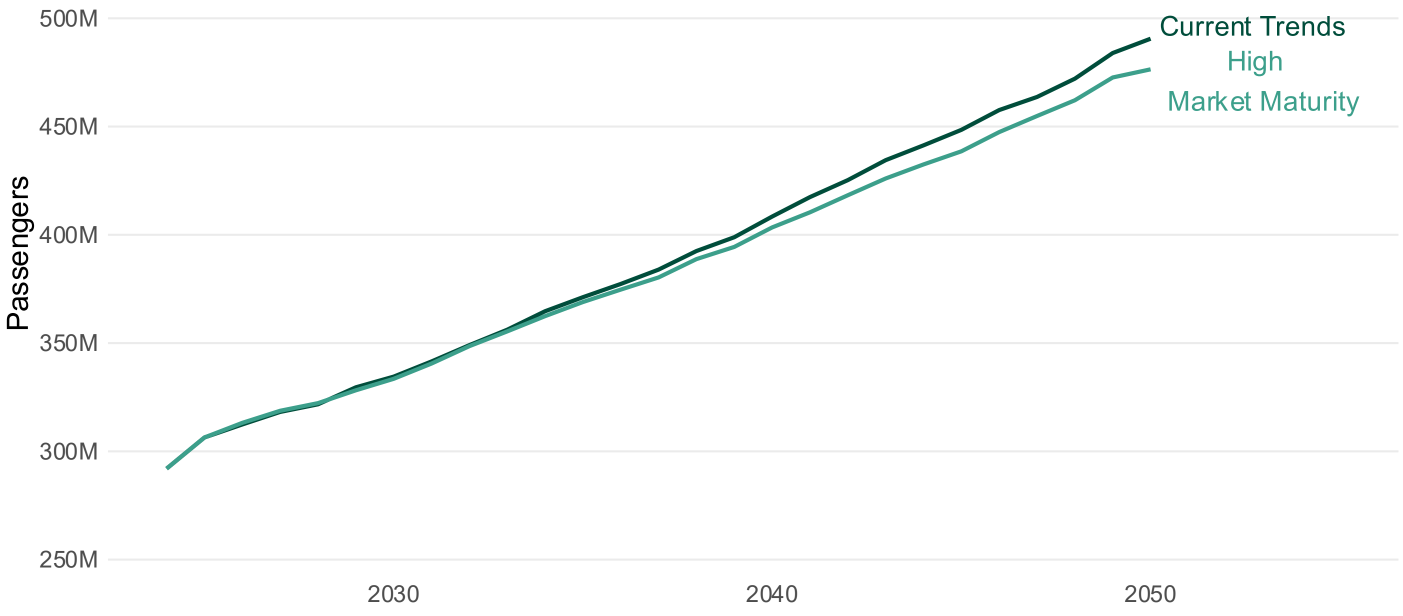

Figure 8-4: National Passenger from Current Forecast with High Market Maturity sensitivity scenario

9. Annex

Annex A: Additional Validation Information

9.1. The full set of validation exercises undertaken which are made at the individual route level for the 2024 base year are determined by significant passenger numbers on:

- Passengers on international and domestic
- Modelled ATMs on all routes
- Modelled passengers per Aircraft
- Transfer passengers at 4 UK hubs and 4 foreign hubs.

	Observed Passengers (millions)	Modelled Passengers (millions)	Difference (millions)	Difference (%)
Gatwick	43.2	43.9	0.7	2%
Heathrow	83.9	83.7	-0.2	0%
London City	3.6	3.4	-0.2	-5%
Luton	16.9	17.0	0.0	0%
Stansted	29.7	30.5	0.8	3%
Southampton	0.9	0.9	0.1	9%
Southend	0.3	0.3	0.0	-11%
Bournemouth	1.1	1.1	0.0	3%
Bristol	10.6	10.1	-0.5	-5%
Exeter	0.4	0.4	0.0	-1%
Newquay	0.4	0.4	0.0	7%
Cardiff	0.9	0.9	0.0	-2%
Norwich	0.4	0.5	0.0	9%
Birmingham	12.8	12.4	-0.4	-3%
East Midlands	4.1	4.2	0.0	0%
Humberside	0.2	0.1	0.0	-2%
Leeds/Bradford	4.2	4.6	0.4	8%
Liverpool	5.1	5.6	0.5	10%
Manchester	30.8	31.6	0.8	3%
Newcastle	5.1	5.8	0.6	12%
Teesside	0.2	0.2	0.0	-6%
Aberdeen	2.3	2.4	0.1	5%
Edinburgh	15.8	13.9	-1.8	-12%
Glasgow	8.1	7.7	-0.4	-4%
Inverness	0.8	0.6	-0.1	-19%
Prestwick	0.5	0.6	0.0	4%
Belfast City	2.4	2.8	0.4	15%
Belfast International	6.8	6.5	-0.3	-4%
	291.5	**292.0**	**0.5**	**0%**

Table 9-1: Validation of baseline modelled outputs against actuals (millions passengers)

	Observed ATMs (000s)	Modelled ATMs (000s)	Difference ATMs (000s)	Difference (%)
Gatwick	265.6	272.5	6.9	3%
Heathrow	482.1	483.0	0.8	0%
London City	48.9	46.0	-2.9	-6%
Luton	102.6	105.3	2.7	3%
Stansted	189.0	195.2	6.2	3%
Southampton	17.3	17.6	0.3	2%
Southend	2.0	1.8	-0.2	-11%
Bournemouth	7.2	7.3	0.1	2%
Bristol	71.1	67.7	-3.4	-5%
Exeter	6.2	6.0	-0.2	-4%
Newquay	5.5	6.0	0.5	9%
Cardiff	7.2	7.9	0.8	11%
Norwich	13.3	13.7	0.4	3%
Birmingham	88.2	87.9	-0.3	0%
East Midlands	45.5	45.5	0.0	0%
Humberside	5.3	5.9	0.6	12%
Leeds/Bradford	31.0	31.7	0.7	2%
Liverpool	35.5	40.1	4.5	13%
Manchester	190.0	195.5	5.5	3%
Newcastle	37.2	41.8	4.6	12%
Teesside	3.5	2.7	-0.8	-23%
Aberdeen	60.7	65.1	4.4	7%
Edinburgh	116.7	101.9	-14.8	-13%
Glasgow	67.6	66.9	-0.7	-1%
Inverness	10.3	9.8	-0.5	-4%
Prestwick	3.9	4.0	0.1	3%
Belfast City	30.4	34.3	3.9	13%
Belfast International	51.9	51.8	0.0	0%
	1,996	**2,015**	**19.1**	**1%**

Table 9-2: Validation of baseline modelled outputs against actuals (thousands ATMs)

	observed passengers per aircraft	modelled passengers per aircraft	Difference	Difference (%)
Gatwick	163	161	-2	-1%
Heathrow	176	175	-1	0%
London City	74	75	1	1%
Luton	168	164	-4	-2%
Stansted	166	164	-1	-1%
Southampton	49	53	3	7%
Southend	143	144	0	0%
Bournemouth	164	165	2	1%
Bristol	149	149	0	0%
Exeter	89	92	3	3%
Newquay	79	78	-1	-2%
Cardiff	123	109	-14	-11%
Norwich	74	76	2	2%
Birmingham	150	146	-4	-3%
East Midlands	157	157	1	0%
Humberside	46	38	-9	-19%
Leeds/Bradford	136	144	8	6%
Liverpool	147	143	-5	-3%
Manchester	163	163	0	0%
Newcastle	139	139	0	0%
Teesside	69	87	17	25%
Aberdeen	73	66	-7	-9%
Edinburgh	143	146	3	2%
Glasgow	139	134	-4	-3%
Inverness	105	90	-15	-14%
Prestwick	166	166	0	0%
Belfast City	79	80	1	2%
Belfast International	141	136	-5	-4%
	155	**153**	-1	-1%

Table 9-3: Validation of baseline modelled outputs against actuals (average passenger per aircraft)

Annex B: NAPDM Input Sources

Model Input	Period	Source
UK GDP and Consumption Expenditure, Growth Rates	2024-2030	OBR Autumn budget, November 2025
	2030-2060	OBR Long term economic determinant, March 2025
Foreign GDP Growth Rates	2024-2030	IMF World Economic Outlook, October 2025
	2030-2060	OECD Long-term baseline projections, September 2025
GDP Deflator Growth Rate	2024-2030	OBR Autumn budget, November 2025
ETS Carbon Prices	2024-2050	DESNZ Carbon Prices forecast for modelling purpose, November 2024
	2050-2060	Increasing by 1.5% a year, in line with DESNZ Carbon Appraisal Values post-2050
CORSIA Carbon Prices	2024-2050	DfT TAG databook May 2025 and CORSIA internal revision of Sectoral Growth Factor December 2025
	2050-2060	Increasing by 1.5% a year, in line with DESNZ Carbon Appraisal Values post-2050
SAF Uptake	2024-2050	DfT analysis based on aviation demand, GHG savings and SAF prices from the Aviation Impact Accelerator (AIA), 2025
	2050-2060	Held constant in Current Trends and DfT analysis based on aviation demand, GHG savings and SAF prices from the AIA in the Technology Development scenario
SAF Prices	2024-2060	DfT analysis of AIA prices data, November 2025
Oil Prices	2000-2024	Blomberg Oil and CIF Kerosene prices for regression analysis through DESNZ, June 2025
	2024-2050	DESNZ fossil fuel price assumption, November 2024
	2050-2060	Held constant by assumption
Exchange Rates USD/GBP	2024-2030	OBR Autumn budget, November 2025
	2030-2060	Held constant by assumption
APD	2024-2026	HMRC 2025
	2026-2060	Held constant by assumption
Load Factors	2024-2060	DfT NAPAM, 2025
Fuel Efficiency	2024-2060	DfT aviation CO_2 model, 2025
Population by District, Growth Rates	2024-2060	DfT NTEM v8.0
Other non-fuel cost fare component	2008-2024	Airlines financial statement (IAG and EasyJet), RDC Aviation Apex dataset and ONS International Passenger Survey

Table 9.4: NAPDM Input Sources table