Airports Commission

Strategic Fit: Forecasts

November 2014

An independent commission appointed by Government

The Aiports Commission has actively considered the needs of blind and partially sighted people in accessing this document. The text will be made available in full on the Commission's website. The text may be freely downloaded and translated by individuals or organisations for conversation into other accessible formats. If you have other needs in this regard please contact:

Airports Commission Consultation
Freepost RTKX-USUC-CXA
PO BOX 1492
Working
GU22 2QR

Email: airports.consultation@systra.com

Contents

Glossary

Aircraft-kilometres, Aircraft-km	The number of kilometres travelled by an aircraft
AMS	Amsterdam Schiphol Airport (IATA code)
AoN	Demand Scenario *assessment of need*
APD	Air Passenger Duty
ATM	Air Transport Movement
ATM Demand Model	Part of NAPAM which calculates the number and size (seats) of ATMs needed to serve the demand allocated to the route
Base/'Do Minimum'	Specifically the option of adding no new runway capacity as assessed in the Interim Report
CAA	Civil Aviation Authority
Capacity constrained	Modelling case where passenger and ATM demand must fit available future capacity where no significant additional runway or terminal capacity is added
Capacity unconstrained	Modelling case where passenger and ATM demand is not limited by runway or terminal capacity
Carbon capped	Modelling scenario where CO_2 emissions are limited to 2005 levels through both an ETS and higher carbon prices
Carbon-traded	Modelling scenario where CO_2 emissions are part of an Emissions Trading Scheme
CCC	UK Committee on Climate Change
CDG	Paris Charles De Gaulle Airport (IATA code)
CO_2	Carbon dioxide
DECC	Department for Energy and Climate Change
Demand Allocation Routine	Part of NAPAM which models the impact of future UK airport capacity constraints on air transport movements and passengers at the UK and four foreign hub airports
DfT	Department for Transport
DXB	Dubai Airport (IATA code)
EC	European Commission
EEA	European Economic Area
EU ETS	European Union Emissions Trading System
FRA	Frankfurt International Airport (IATA code)
GAL	Gatwick Airport Limited, promoter of Gatwick Airport Second Runway option
GDP	Gross Domestic Product (National Income)

GF	Demand Scenario *global fragmentation*
GG	Demand Scenario *global growth*
GVA	Gross Value Added
HAL	Heathrow Airport Limited, the promoter of the Heathrow Airport North West Runway option
HH	Heathrow Hub Limited, the promoter of the Heathrow Airport Extended Northern Runway option
HMRC	Her Majesty's Revenue and Customs
HS2	High Speed Two
IATA	International Air Transport Association (airline trade body)
IEA	International Energy Agency
I-I	International-to-International interliners i.e. passengers who are transferring via a UK airport with their origin and destination outside the UK
IMF	International Monetary Fund
International-interliners	Passengers starting or finishing their journey in the UK but using a foreign hub
Larame	A term in the DfT model referring to the relationships between passenger demand, aircraft size and load factors, and flight frequency that have been derived statistically from historical data
LCC	Low-cost carrier
LCK	Demand Scenario *low-cost is king*
LDC	Less Developed Country
LGW 2R	Gatwick Airport Second Runway, the option promoted by Gatwick Airport Limited
LHR NWR	Heathrow Airport North West Runway, the option promoted by Heathrow Airport Limited
LHR ENR	Heathrow Airport Extended Northern Runway, the option promoted by Heathrow Hub Limited
London airport system	For the purposes of this report, the London airport system refers to the following airports: Heathrow, Gatwick, Stansted, Luton and London City.
Monte Carlo analysis	A method of forecasting where inputs are randomly varied within a distribution to calculate the probability of a particular outcome
mppa	Million passengers per annum
Mt	Million tonnes
$MtCO_2e$	Million tonnes of carbon dioxide equivalent
NAPAM	The DfT's National Air Passenger Allocation Model
NAPDM	The DfT's National Air Passenger Demand Model
NIC	Newly Industrialised Country

OBR	Office for Budget Responsibility
O-D	Origin and Destination
OECD	Organisation for Economic Co-operation and Development (used in this report to refer to members outside the European Union)
Passenger Airport Choice Model	Part of NAPAM that models how national passenger demand splits between the UK airports
Passenger-kilometres, passenger-km	The number of kilometres travelled by an aircraft multiplied by the number of passengers on board, sometimes referred to as RPK.
PaxIS	Passenger Intelligence Services, which in this context comes from ticket data obtained from the IATA
PLANET	Rail model used by HS2 Ltd to forecast passenger flows
Point to Point	Direct connection between two destinations
PwC	PricewaterhouseCoopers
RDE	Demand Scenario *relative decline of Europe*
SE	South East
Seat-kilometres, seat-km	The number of kilometres travelled by an aircraft multiplied by the number of seats
Shadow cost	The extra cost of flying required to reduce passenger demand from above an airport's runway or terminal capacity, to a level that is back within capacity
Seeding	Seeding is the process whereby for specified years ATMs user input frequencies are used rather than being calculated within the model in response to demand and then being tested for viability.
Suppression	The process whereby passengers respond to a shadow cost by deciding not to fly rather than using a 'less preferred' airport
Terminal passenger	A person joining or leaving an aircraft at a reporting airport, as part of an ATM. More detail is included in DfT's January 2013 publication[1]
tph	Trains per hour
WE	Western Europe
WebTAG	Department for Transport Appraisal Guidance

1 DfT UK Aviation forecasts, January 2013, particularly paragraphs 2.6 to 2.8, https://www.gov.uk/government/publications/uk-aviation-forecasts-2013

1. Introduction

Report overview

1.1 As part of the Strategic Fit module the Commission has produced updated aviation demand forecasts. These forecasts allow the Commission to assess each scheme against the objective "to provide additional capacity that facilitates connectivity in line with the assessment of need". In addition these demand forecasts are an input to various other areas of the appraisal, such as the modelling of commercial and national economy impacts.

1.2 They have been produced using an updated version of the Department for Transport's (DfT) aviation forecasting model. Technical advice and support, including undertaking model runs, has been provided by DfT modellers. This report sets out forecasts of passenger numbers, air transport movements (ATMs) and aviation carbon emissions (CO_2) at UK airports for the three capacity development options together with a baseline of no new runway capacity. The forecasts are considered under five broad aviation demand scenarios, introduced in this chapter.

1.3 Over the past year the Commission has continued to build on the DfT aviation forecasting model, undertaking model developments and adopting new and alternative input assumptions, to produce these forecasts. **Chapter 2** describes the forecasting models and changes made to them since the Interim Report.

1.4 **Chapter 3** presents the changes to input assumptions that have been adopted since the last Airports Commission forecasts were published in December 2013.

1.5 **Chapter 4** sets out how the forecasts deal with CO_2 emissions from aviation and reports those emissions for the base without added runway capacity. **Chapter 5** describes the total level of national demand expected without allowing for airport capacity constraints and reports passenger demand at airports for the base without added runway capacity. **Chapter 6** sets out demand and CO_2 emission forecasts for both 'carbon capped' and 'carbon-traded' cases in the five demand scenarios for the three additional runway capacity options outlined below.

1.6 Finally, **Chapter 7** reports a number of tests to test the sensitivity of the modelling results to changes in key input assumptions.

Capacity development options

1.7 Airport usage forecasts are provided for the 'do minimum' and three additional capacity options:

Base *The 'Do Minimum' case where no new runway capacity is added.*

LGW 2R *Gatwick Airport Second Runway doubling the airport capacity from 280,000 to 560,000 ATMs per annum from 2025.*

LHR NWR *Heathrow Airport Northwest Runway increasing the airport capacity from 480,000 to 740,000 ATMs per annum from 2026.*

LHR ENR *Heathrow Airport Extended Northern Runway permitting mixed mode operations and increasing the airport capacity from 480,000 to 700,000 ATMs per annum from 2026.*

Future demand scenarios

1.8 An important aspect of the Commission's appraisals is that they are not centred on one potential view of the future. This is because the future development of the aviation sector is inherently difficult to predict.

1.9 Therefore, rather than base its analysis on one likely pattern of future demand, the Commission has constructed five future scenarios. These scenarios are reflected in the Commission's passenger demand forecasts, and are considered to inform the assessments undertaken in this consultation. By considering each scheme in relation to multiple potential futures, the Commission aims to stress-test the robustness of its analysis, and ultimately its final recommendations to Government.

1.10 The Commission's scenarios broadly follow the approach taken in the first phase of its work, in which a set of scenarios were developed to test the overall assessment of the need for new capacity set out in the Interim Report.[2] They reflect different potential outcomes in respect of the development of the global economy and the international aviation sector, including consideration of:

- ongoing liberalisation or more protectionist policies;
- shifts in the balance between full-service and low-cost carriers;
- varying rates of long-term economic growth, including at global level or in specific regions;
- how established and new entrant airlines might work together; and,
- differing effects of global or domestic climate change measures.

2 Airports Commission: interim report (December 2013), https://www.gov.uk/government/publications/airports-commission-interim-report

1.11 Five possible scenarios of future demand are considered to test how the scheme performs against different futures, these are briefly described below and discussed more fully in **Chapter 3.**

Assessment of need	Future demand is primarily determined by central projections published by sources such as the Office for Budgetary Responsibility, OECD and IMF.
Global growth	This scenario sees higher global growth in demand for air travel. It adopts higher GDP growth forecasts for all world regions, coupled with lower operating costs.
Relative decline of Europe	This scenario sees higher relative growth of passenger demand in emerging economies in the future compared to the growth in the developed world. It adopts higher GDP growth rates for newly industrialised and developing countries, and a strengthened position of Far and Middle Eastern aviation hubs and airlines.
Low-cost is king	This scenario sees the low-cost carriers strengthening their position in the short-haul market and capturing a substantial share of the long-haul market. As with the *global growth* scenario, it also sees GDP growth rates for all world regions and lower operating costs, resulting in higher passenger demand growth rates.
Global fragmentation	This scenario sees economies close themselves off by adopting more conditional and interventionist national policies. As a result, there is a decline in GDP growth rates for all world regions, coupled with higher operating costs. This results in lower passenger demand growth rates.

1.12 It must be stressed that none of these should be considered a 'central' scenario. It would be as risky, for example, to assume that past trends will simply continue into the future as it would be to base a decision on any single view of how those trends might alter over time. The purpose of the scenarios is not to identify a single correct or most plausible future. It is to provide a range of potential demand forecasts, reflecting differing potential futures, to understand better the ways in which the appraisal results for each shortlisted option might be affected by long-term structural changes.

1.13 In line with the approach taken in the Interim Report, the Commission has also prepared two sets of forecasts based on different approaches to handling carbon emissions from aviation:

- 'Carbon-traded' – These cases assume that carbon emissions from flights departing UK airports are traded at the European level until 2030 and then as part of a liberal global carbon market. As such these forecasts assume that the total emissions allowed

beyond 2030 in the global market are set with reference to stabilisation targets and that society seeks to make reductions where they are most desirable or efficient across the global economy. This market would be established under a future international agreement that aims for a global temperature increase of equal, or close to 2 degrees C and aims to ensure that a 4 degree C global temperature increase is reached only with very low probability (less than 1 per cent). Therefore, it is assumed that any aviation emissions target can be met in part through buying credits from other sectors. The carbon-traded case assumes that carbon is traded at a price equal to DECC's central long run forecast of carbon prices (September 2013 version) for appraisal.

- Carbon capped' – These cases represent the level of aviation demand consistent with the Committee on Climate Change's (CCC) current assessment of how UK climate change targets can most effectively be met. These forecasts increase the costs of carbon to ensure demand for aviation in the UK is reduced to stay within this planning assumption and as such assume no trading of aviation emissions either within the UK economy or internationally e.g. such as under an EU Emissions Trading Scheme or any international global agreement to tackle these emissions.

1.14 As with the Commission's scenarios, the objective is not to identify a single 'correct' forecast, but rather to understand the varying effects on aviation demand of constraining and pricing carbon emissions. In practice, the impacts on overall demand will depend upon the precise mix of policies used to address carbon emissions in aviation and other sectors. This could include domestic, European or global measures, and the carbon prices used for modelling purposes in the carbon capped scenario should not be taken as indicating any policy recommendation.

Terminology

1.15 Throughout this report the following terminology is used to differentiate how the different elements of the forecasts are described:

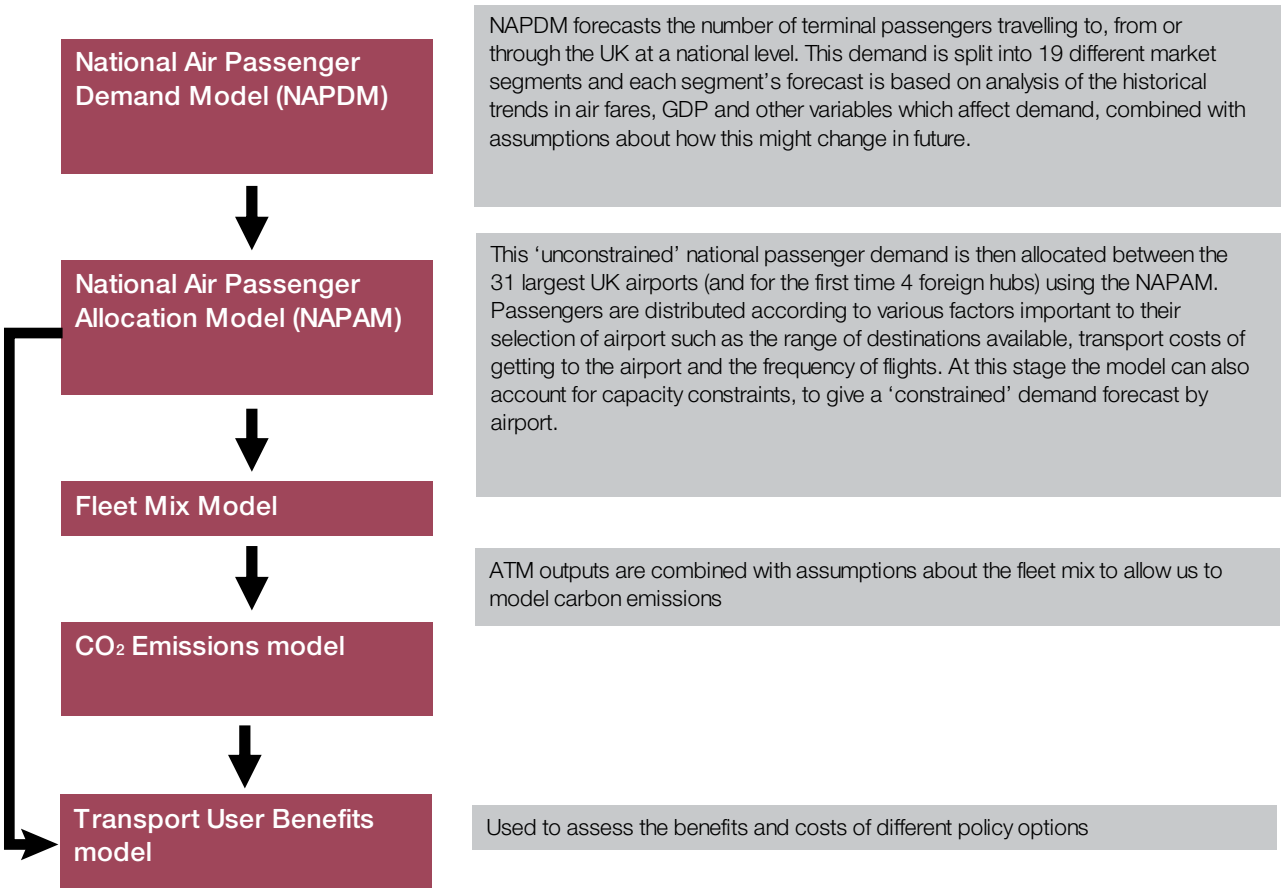
'Scenario'	A specific set of future demand assumptions and forecasts.
'Carbon case'	A variant on each of the demand scenarios where carbon is either 'traded' as part of an emissions trading scheme or 'capped' to a specific target (see **Chapter 4)**.
'Option'	A scheme for adding runway capacity e.g. 'LGW 2R', 'LHR NWR' and 'LHR ENR'.

2. Model updates

Introduction

2.1 This Chapter provides an outline of the DfT's aviation forecasting model (see **Table 2.1**). It also summarises the changes made to DfT modelling following the response to the Commission's *Aviation Demand Forecasting* discussion paper[3] and describes the more limited improvements made to the model since the publication of the Commission's Interim Report.

Table 2.1: Outline of the DfT suite of aviation models



3 Airports Commission, Aviation Demand Forecasting discussion paper, February 2013, https://www.gov.uk/government/publications/discussion-paper-on-aviation-demand-forecasting

2.2 The two major components of the DfT's aviation modelling suite that have been updated for the Commission are:

- the National Air Passenger Demand Model (NAPDM or "Demand Model") which forecasts the number of air passengers before taking account of airport capacity constraints; and,
- the National Air Passenger Allocation Model (NAPAM or "Allocation Model") which allocates these passengers to airports, taking into account capacity constraints.

2.3 These models are described in greater detail in DfT's *UK Aviation Forecasts, January 2013*.[4]

National Air Passenger Demand Model

2.4 NAPDM combines a set of time series econometric models of past UK air travel demand with projections of key driving variables and assumptions about how the relationship between UK air travel and these drivers will change in the future. The market for passenger air travel is split into separate sub-markets reflecting different trends, strength of driving forces and availability of data. The markets are split according to:

- the global region (including within the UK) the passenger is travelling to or from;
- whether the passenger is a UK or overseas resident;
- the passenger's journey purpose (leisure or business); and,
- whether the passenger is making an international-to-international connection which could be made at one of the airports within the model, including the overseas hubs.

2.5 The drivers of demand are set out in **Chapter 3.** The estimated responsiveness of demand to these drivers is largely unchanged from that used by DfT in their January 2013 publication.[5] The only change relates to the price elasticity of demand applied to international-to-international (I-I) transfer passengers, which was lowered from -0.7 to -0.5 to reflect the fact that many of the choices available to these passengers are now explicitly modelled within the National Air Passenger Allocation Model (NAPAM, see paragraph 2.6 onwards). This year the Commission has reviewed the recent literature to verify that the DfT assumptions on elasticities are still the most appropriate based on the evidence available.

4 DfT UK Aviation forecasts, January 2013, particularly chapter 2, https://www.gov.uk/government/publications/uk-aviation-forecasts-2013

5 DfT UK Aviation forecasts, January 2013, particularly Annex A, https://www.gov.uk/government/publications/uk-aviation-forecasts-2013

Literature Review of Aviation Demand Elasticities

To assess the continued suitability of DfT aviation model demand elasticities, the price and income elasticities have been compared with those found in recent literature.

Few studies since 2008 have concentrated on UK aviation in particular but the most directly comparable are Smyth & Pearce (2008)[1] and Dargay (2012)[2]. Although neither of these studies covers all the market sectors modelled, where they coincide they find price elasticities broadly comparable to those estimated by the DfT and used in the Commission's latest forecasts.

The price elasticity of intra-Europe travel is found to be in the range of -0.8 to -0.9 by Smyth & Pearce[1]; this is a little more elastic than the DfT estimate of -0.6 for UK to Western Europe travel. Dargay[2] finds that domestic air travel has a PED of -0.19 for leisure passengers, and -0.8 for business passengers; this closely resembles the DfT values of -0.3 for domestic leisure passengers and -0.7 for domestic business passengers.

The DfT's estimates of UK demand elasticities are also broadly in line with recent studies of international demand. For example, Kopsch (2012)[3] finds a PED of -0.58 in the short run and -1 in the long run. Granados et al (2012)[4] also suggest that price elasticities range between -0.57 and -0.64.

The income elasticity of UK leisure travel is found to be in the range of 1.3 to 1.5 (depending on journey length) by Smyth & Pearce.[1] This is in line with the DfT estimate of 1.4. Dargay[2] finds that YED varies between 0.6 in the short run to 2.16 in the long run.

Overall this review has concluded that the DfT work based on UK specific evidence by journey purpose and the current DfT based elasticities by market segment remain appropriate.

(1) Air Travel Demand, Mark Smyth & Brian Pearce, IATA Economics Briefing No. 9, 2008

(2) The Prospects for Longer Distance Domestic Coach, Rail, Air and Car Travel in Britain, Joyce M Dargay, University of Leeds, Institute for Transport Studies, Report to the Independent Transport Commission, 2010

(3) A demand model for domestic air travel in Sweden, Fredrik Kopsch, Journal of Air Transport Management: Volume 20, 2012.

(4) A La Carte pricing and price elasticity of demand in air travel, Nelson F. Granados, Robert J. Kauffman, Hsianchu Lai & Huang-chi Lin, Decision Support Systems: Volume 53, Issue 2, 2012

National Air Passenger Allocation Model

Scope

2.6 NAPAM forecasts passenger demand at the following UK airports:

Table 2.2: Airports included in the NAPAM

London	Midlands	Scotland
Heathrow	Birmingham	Glasgow
Gatwick	East Midlands	Edinburgh
Stansted	Coventry	Aberdeen
Luton	**North**	Prestwick
London City	Manchester	Inverness
Other East & South East	Newcastle	**Northern Ireland**
Southampton	Liverpool	Belfast International
Norwich	Leeds Bradford	Belfast City
Southend	Durham Tees Valley	**Foreign Hubs**
South West & Wales	Doncaster-Sheffield	Amsterdam Schiphol
Bristol	Humberside	Paris Charles de Gaulle
Cardiff	Blackpool	Frankfurt International
Bournemouth		Dubai
Exeter		
Newquay		

2.7 NAPAM estimates how passengers making trips to and from the UK choose between UK airports, and in the new version how international-to-international transfer passengers choose at which hub airport to interline.

2.8 It comprises several sub-models which are used iteratively and in combination:

- the *Passenger Airport Choice Model* forecasts how passenger demand is split between UK airports;
- the *ATM Demand Model* translates passenger demand forecasts for each airport into ATM forecasts; and,
- the *Demand Allocation Routine* accounts for the likely impact of future UK airport capacity constraints on ATMs (and thus passengers) at UK airports.

2.9 The heart of NAPAM is a multinomial logit model using generalised cost parameters to generate the probabilistic assignment of passengers to airports on international and domestic routes drawing on, in its simplest form, the following basic structure and formula:

$$P_{(i,j,A,p)} = \frac{e^{-\beta_1 \times Cost_{(i,j,A)}}}{\sum_{R \in all\ available\ Routes} e^{-\beta_1 \times Cost_{(i,j,R)}}}$$

where:

i represents passengers with a given UK origin/destination (district) and purpose (p)

j is the foreign destination (or another district in the domestic model),

A is the UK airport/route chosen.

Cost is generalised cost consisting mainly of the composite cost of travelling from the district(i) to all possible airports (A) by road or rail, the frequency of air services at airport (A) to destination (j) including any shadow costs at airport (A)

2.10 NAPAM allocates all the following components of demand separately using calibrated models for each:

- international scheduled UK business passengers;
- international scheduled UK leisure passengers;
- international scheduled foreign business passengers;
- international scheduled foreign leisure passengers;
- international low-cost carrier passengers (for all the above journey purposes)
- international UK charter leisure passengers;
- scheduled domestic end-to-end passengers (those whose journeys start and end in a UK mainland district); and,
- international-to-international transfer passengers.

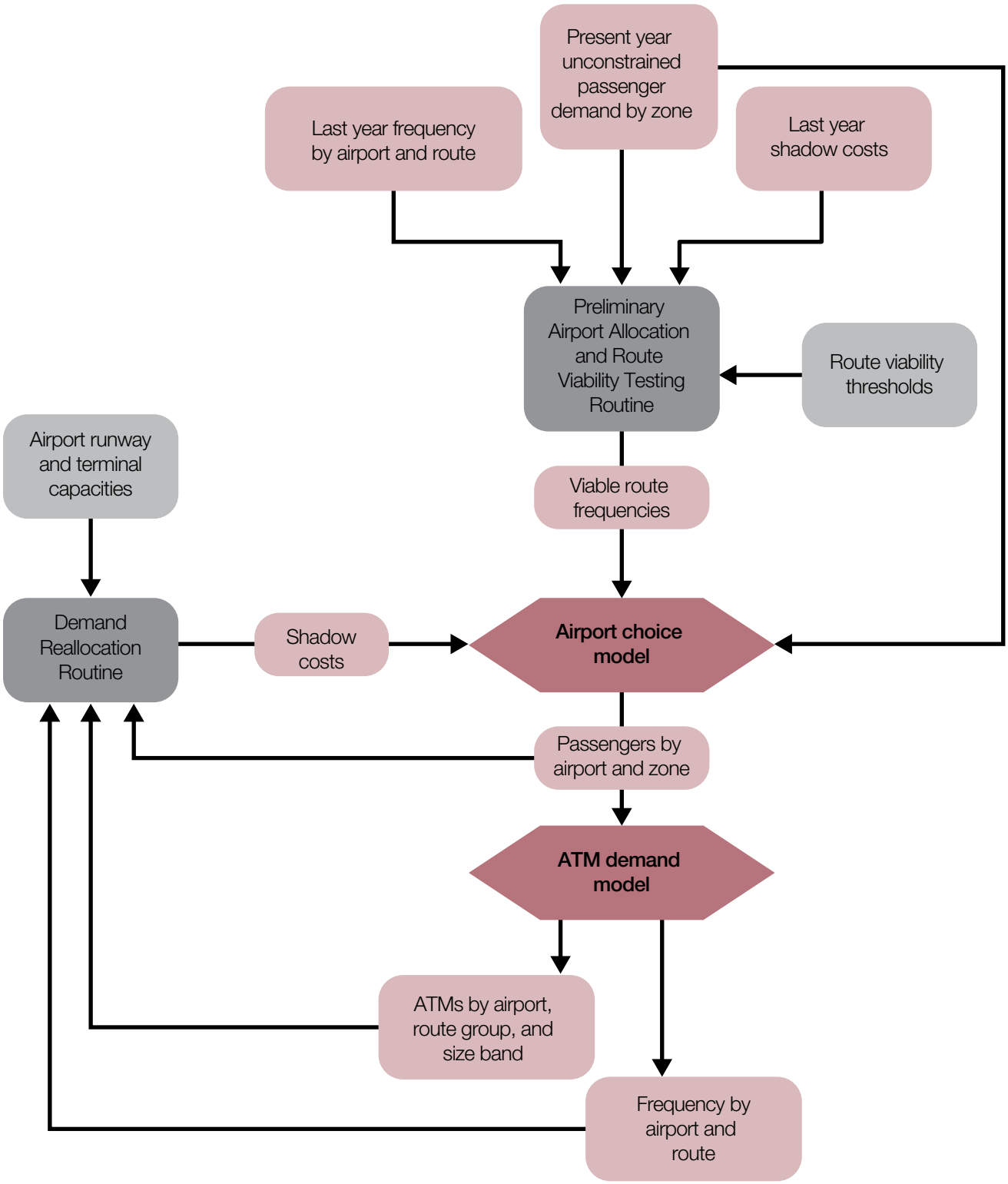
Structure and process

2.11 **Figure 2.1** illustrates this structure and process. The following section outlines:

- what the sub models do;
- how they are estimated; and
- how they are used to forecast constrained passenger numbers.

Their validation by showing how well they reproduce the base year data is introduced in paragraph 2.56.

Figure 2.1: National Air Passenger Allocation Model



2.12 The level of air passenger demand depends on the overall costs faced by passengers wanting to fly between each district and each destination zone. The 'generalised' costs include surface access journeys to the desired airport, the number and range of flights offered at an airport and flight times for each route. In the constrained forecasts, shadow costs apply at congested airports and are added to the other elements of generalised cost. Their function is to act locally as a congestion premium increasing generalised costs

to bring allocated demand into line with the capacity at an over-capacity airport. They represent the general inconvenience of using an overloaded airport: they could be a locally increased fare differential, but shadow costs could also represent higher access costs (e.g. increased parking charges, longer transfer times, or a generally more unpleasant travelling environment). They therefore also represent the value a marginal passenger would place on flying to/from that airport, if extra capacity were available and are a key monetised input to the appraisal of potential additional capacity.

2.13 In this report the forecasts for all the capacity options use shadow costs and are **constrained**. In the Interim Report a constrained base option was compared with an unconstrained forecast to assess the national need for new capacity. An unconstrained forecast is essentially a useful modelling diagnostic tool rather than a real world representation. It is a theoretical forecast that switches off shadow costs by modelling unlimited terminal and runway capacity at all modelled airports. All demand can then travel from its most preferred airport and no travel is suppressed. But as the input demand is limited to the NAPDM national forecast levels, and all the demand can be accommodated at the most demanded airports, it logically follows that in an unconstrained system some airports will see lower passenger allocations than they receive when in-demand airports are constrained. When airport constraints are turned on some airports will receive more passengers.

2.14 Given this theoretical nature of unconstrained forecasts, they are only used to provide a broad estimate of national demand for aviation in the UK rather than being a useful tool when considering demand at individual airports or options for adding capacity.

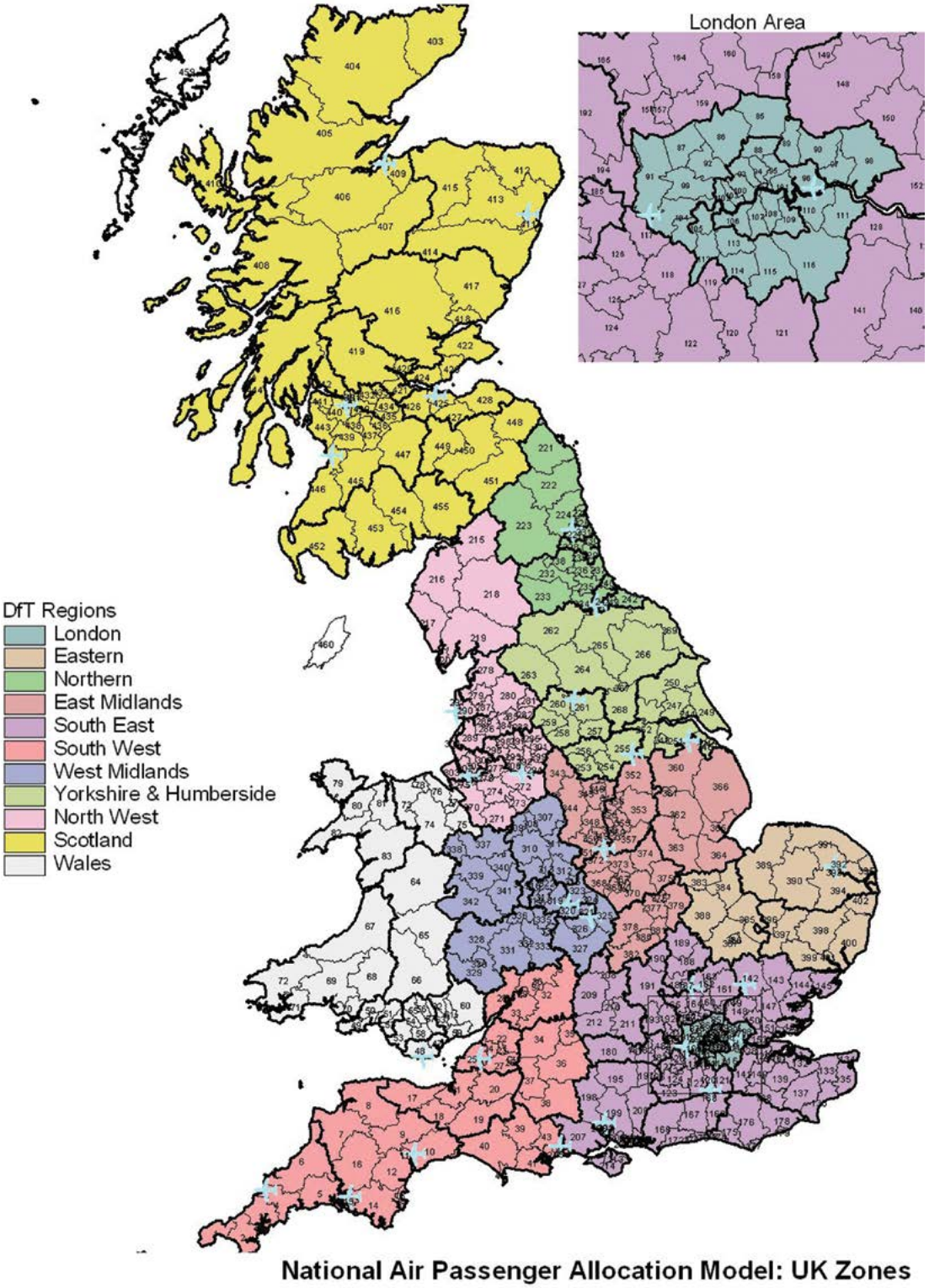
Allocating passengers to airports

2.15 A passenger flight is usually just 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. For example, a passenger leaving Gatwick might have an initial origin in Brighton and a passenger arriving at Leeds-Bradford might have a destination in York.

2.16 NAPAM has been built to explain and reproduce passengers' current choice of airport by their journey purpose (and country of residence) from the place where the journey started to their ultimate destination. This type of data forms the base pattern of passenger demand and is only available from the CAA passenger interview surveys. These surveys are annual at the London airports and Manchester (allowing a very large sample to be built up) and generally on 3-5 year cycles at all the larger regional airports. The forecasts of demand by airport are then obtained by applying projections of the variables driving airport choice described below: principally surface access, availability of services and shadow costs.

2.17 NAPAM splits the UK into 455 district based zones (see **Figure 2.2**),[6] and assumes that the share of travellers originating in, or destined for, each zone potentially might be travelling via any of the 31 modelled UK airports listed in **Table 2.2** and if a transfer passenger, one of the four overseas hubs.

Figure 2.2: NAPAM district zones



6 1991 census geography which gives finer definition in Scotland.

2.18 Information about the overseas zones and the modelling of individual destinations within these zones are available in DfT's January 2013 publication.[7]

2.19 Passenger choice of airport from a UK ground origin or destination has been found to depend on:

- time and money costs of accessing that airport by road or public transport based on the network of future road and rail services, and using the standard transport modelling approach of combining journey time, including waiting and interchanging, and money costs into a single 'generalised cost' measure;
- frequency of the service at each airport converted into money costs using standard transport modelling approaches;
- flight duration ('in-flight time');
- travellers' preferences for particular airports; and,
- travellers' value of time (which varies by journey purpose).

For example, the lower the time and money costs of accessing an airport, and the greater the range and depth of services offered, the greater will be the share of demand to/from a given zone the airport will attract.

2.20 Air fares have not been found to be a significant driving factor of airport choice. An extensive exercise undertaken by the DfT in 2010 to re-estimate the factors driving airport choice confirmed an earlier study from 2001, and failed to find a statistically significant relationship between fares for particular routes and passengers' choice of airport.[8] This may in part be attributable to the difficulty in deriving reliable mean fares with the increasingly wide spread of fares for each route available with web based ticketing and modern yield management systems. The decision to omit fares as an airport choice variable was supported by the subsequent Peer Review process.[9] But as the previous section has described, fares remain a key driver of the underlying national unconstrained demand forecasts. They are important in forecasting the overall decision whether or not to travel by air, if not the choice of airport itself.

7 DfT *UK Aviation forecasts, January 2013*, particularly chapter 2 paragraphs 2.36-2.37 and Figure 2.6, https://www.gov.uk/government/publications/uk-aviation-forecasts-2013

8 See DfT *UK Aviation forecasts, August 2011*, Annex E, https://www.gov.uk/government/publications/uk-aviation-forecasts-2011

9 *Peer Review of NAPALM*, John Bates Services, October 2010 (available at www.dft.gov.uk)

2.21 The strength of each factor in driving an airport's share of demand is determined by calibrating the model to 2008 CAA airport choice data.[10] Calibration is a statistical technique by which the weight placed on each factor is chosen so as to maximise the model's accuracy in predicting current choices. This means that the model represents passengers' actual, observed, airport choice behaviour.

2.22 The model of passengers' airport choice delivered by the estimation process outlined above is used to forecast passenger demand at each modelled UK airport. The first step is to use the unconstrained demand forecasts from the National Air Passenger Demand Model for each type of passenger journey purpose to project growth in demand to/from zones (the districts of ultimate origin or destination) in the UK. Immediately prior to allocation to airports, growth rates by journey purpose are varied at the zonal (district) level to take account of local forecasts of population, households, employment and income used in the DfT's National Trip End Model. The growth in passengers at the national level is however, controlled to be consistent with the forecast growth from the National Air Passenger Demand Model.[11] The following are then also projected to forecast how this demand splits between airports:

- travel time and costs between each zone and each airport, based on future road and rail network and conditions:[12] these have been assumed to be broadly constant at 2008 levels and assume that road improvements or other management measures offset future traffic growth and maintain broadly similar levels of service; the 2008 rail network is supplemented by High Speed Rail introduced between 2026 and 2033.
- route availability and frequency at each airport;
- travellers' value of time; and,
- for modelling domestic air travel, comparative road, rail and air travel time and other costs between all UK zones.

2.23 As illustrated in **Figure 2.1**, the availability of routes from each modelled airport is initially checked at the start of each model year. The process of checking whether sufficient demand exists to support new routes, or indeed whether existing routes are still viable, is a key part of the calculation of route frequencies.

10 As described in paragraph 2.16 passengers are interviewed by the CAA at Heathrow, Gatwick, Stansted, Luton and Manchester every year with all but the smallest regional airports in the model being rotated on an annual basis normally on a 3-5 year cycle. The 2008 choice data includes the nine airports surveyed by the CAA in 2008 with data from other airports taken from the most recent survey and updated to 2008 traffic levels from published CAA activity statistics.

11 See DfT *UK Aviation forecasts, August 2011*, Annex E, https://www.gov.uk/government/publications/uk-aviation-forecasts-2011 for more information on this process.

12 Future road and rail schemes included in these costs are given in Appendix 2.

Capacity constraint

2.24 The forecast must account for the effect of capacity constraints on demand at every airport in a system-wide manner. The shadow cost component of NAPAM therefore models the impact of capacity constraints on the numbers of air passengers, and on ATMs and their passenger loads at each UK airport. If unconstrained passenger demand at an airport exceeds capacity, the shadow cost process estimates the extra generalised cost of using the airport that would be necessary to reduce excess demand to zero. It also represents the value a marginal passenger would place on flying to/from that airport, if extra capacity were available. This routine is iterated until an equilibrium solution is found in which capacity is not exceeded at any airport.[13] It is a key input to the appraisal of potential additional capacity.

2.25 As the shadow cost is ultimately added to the individual passenger's overall cost of travel, a runway constraint will stimulate the use of larger aircraft and higher passenger loads to help airlines meet demand and because the charge levied on the use of the runway is lower on a per passenger basis for heavier loaded aircraft. Conversely a terminal shadow cost will not penalise the use of smaller aircraft. Runway capacity is generally a more finite or 'binding' limit than terminal capacity and the NAPAM settings encourage a runway shadow cost solution, particularly at the congested London airports.

2.26 Where new airport runway capacity options have been modelled, the options reported in **Chapter 6**, an infinite terminal capacity has been given. This is because this is primarily an investigation of more runway capacity and it is assumed that sufficient terminal capacity will be provided by the airport operator. A consequence of this approach is that terminal throughputs can exceed the terminal capacities assessed elsewhere in the option appraisal, for example in the costs assessment. Where the modelled terminal demand exceeds the capacity built in to the assessment this has been noted and further discussion of this issue can be found in the Operational Efficiency module.

2.27 As explained in more detail above in paragraph 2.13, all the forecasts reported here are capacity constrained and are different to the unconstrained forecast considered in the Interim Report. In the Interim Report's unconstrained case infinite terminal and runway capacity were allowed at all modelled airports.

13 An equilibrium solution which satisfies capacity limits at all airports is computationally intensive and progressively more difficult to solve as demand mounts through the forecasting period. The solution is generally deemed to be found when over-capacity airports are within +/-1.5% of their input capacities. Runway capacity is regarded as a "harder" capacity than terminal capacity in the search for an equilibrium solution.

Commission changes to the DfT model for the Interim Report

2.28 The Airports Commission published a discussion paper, *Aviation Demand Forecasting*, in February 2013,[14] which asked:

- To what extent do you consider that the DfT forecasts support or challenge the argument that additional capacity is needed?
- What impact do you consider capacity constraints will have on the frequency and number of destinations served by the UK?
- How effectively do the DfT forecasts capture the effect on UK aviation demand of trends in international aviation?
- How could the DfT model be strengthened, for example to improve its handling of the international passenger transfer market?
- What approach should the Commission take to forecasting the UK's share of the international aviation market and how forecasts may change in different scenarios?
- How well do you consider that the DfT's aviation model replicates current patterns of demand? How could it be improved?

2.29 Overall, a total of 36 submissions from airport operators, airlines, industry bodies (including the regulator), environmental and other pressure groups and private individuals were received and analysed.

2.30 Responses were cautiously supportive of using the DfT forecasting model, particularly if there was to be some further development. There was a clear steer not to rely on one particular forecast but to consider alternative approaches, especially 'scenario development'. The developments led by the Commission last year aimed at tackling the issues most respondents cited as areas of concern, and the scenario based approach has been taken further in phase two of the work programme.

2.31 The key updates undertaken in 2013 and reported fully in Chapter 3 of Appendix 3 to the Interim Report were:

1. **A revised definition of emerging economies.** The definition of markets used for international forecasting was re-evaluated with several countries, such as Brazil and Indonesia, previously classified as Less Developed Countries (LDCs), being re-classified as Newly Industrialised Countries (NICs).

14 Airports Commission, Aviation Demand Forecasting discussion paper, February 2013, https://www.gov.uk/government/publications/discussion-paper-on-aviation-demand-forecasting

2. **Decreased levels of 'demand overspill' from the South East.** Once an airport reaches capacity, prospective passengers either travel to an alternative airport or do not fly at all. Forecasting procedures were modified so that more people choose not to travel at all than to go to another available airport. This change reduced some implausibly high demand growth in the later years of the forecast period at the smaller regional airports.

3. **Probabilistic forecasts.** Monte Carlo simulation, a statistical technique involving repeated random sampling, was introduced to produce a range of all possible levels of output and the probability they will occur for any combination of inputs. This was a better approach to capturing some of the inherent uncertainty in forecasting than traditional high/low scenarios.

4. **Modelling overseas hubs.** The biggest overseas hub competitors to London were introduced into the model at the same level of detail as UK airports. The four newly modelled hubs were Paris Charles de Gaulle (CDG), Amsterdam Schiphol (AMS), Frankfurt International (FRA) and Dubai (DXB).

5. **Revisions to model inputs.** The forecasts used updated oil price assumptions, using forecasts from the International Energy Agency (IEA). The Commission also led work to improve the assumptions about growth in aircraft size, which increased as a result. It also reviewed the assumptions on aircraft load factors, concluding that they remain appropriate.

Scheme promoter forecasts

Gatwick Airport Limited (GAL) demand forecasts

2.32 GAL have used the ICF London Air Traffic model to forecast passenger demand in the South East up to 2050. They have produced passenger and ATM forecasts for a baseline, unconstrained and constrained London system under a Gatwick and Heathrow expansion. It is assumed a two runway Gatwick can serve 560,000 ATMs from 2025. The model outputs include destinations and journey purpose forecasts in addition to passengers and ATMs.

Heathrow Airport Limited (HAL) demand forecasts

2.33 HAL developed an econometric model to forecast passenger demand and have produced passenger projections up to 2050. They forecast a two runway and three runway Heathrow, assuming a capacity of 740,000 ATMs from 2025 and consider demand solely at Heathrow.

Heathrow Hub Limited (HH) demand forecasts

2.34 HH have produced passenger projections up to 2050, under a baseline two runway airport and with an expanded Heathrow capable of serving 700,000 ATMs annually from 2023. The model considers demand solely at Heathrow.

Recent changes to the National Air Passenger Demand Model (NAPDM)

2.35 Changes made to the forecasting process since the Interim Report are described below and were generally limited to updating inputs and improving model precision where possible. These processes are reported separately for demand model (NAPDM) and the passenger allocation model (NAPAM).

Monte Carlo range forecasts

2.36 The *assessment of need* scenario includes a confidence range of 60%, based on Monte Carlo analysis. Monte Carlo is a form of probability assessment, which estimates the likelihood of different outcomes occurring. More details are provided in the Interim Report; in summary this is achieved by:

- identifying the key variables that determine demand;
- checking past data on these variables for stationarity and transforming them when needed;
- assigning probability distributions to the forecast values of these variables;
- assigning correlations between variables; and,
- running repeated simulations of NAPDM.

2.37 The distribution of the forecast values of each variable continue to be assigned by, where possible, assessing which statistical distribution best described the variation of that variable in historic data.

2.38 Again, judgments are made where no robust evidence was available – for example around the uncertainty attached to market maturity parameters. For those variables where historic data was available, a correlation matrix is used.

2.39 Some changes to specific distributions of some variables, or their treatment, have been updated:

1. Foreign GDP is assumed to follow a logistic distribution, rather than the normal distribution assumed in the Interim Report – this better reflects the historic data.
2. To better reflect DECC appraisal carbon prices, a lognormal distribution is now used, rather than a normal distribution. But as there is no usable observed data on carbon prices, the distribution parameters continue to rely on assumptions.[15]

These changes had relatively little impact on the range forecasts reported in **Appendix 3**.

2.40 The scope of the probability assessment has been extended to include the year in which the process of maturity starts and ends. As before, the scope includes the final income elasticity that is reached via the process of market maturity.

2.41 The result of all these updates is a wider 60% confidence range, with a stronger tendency towards the higher end of the range.

Load factors

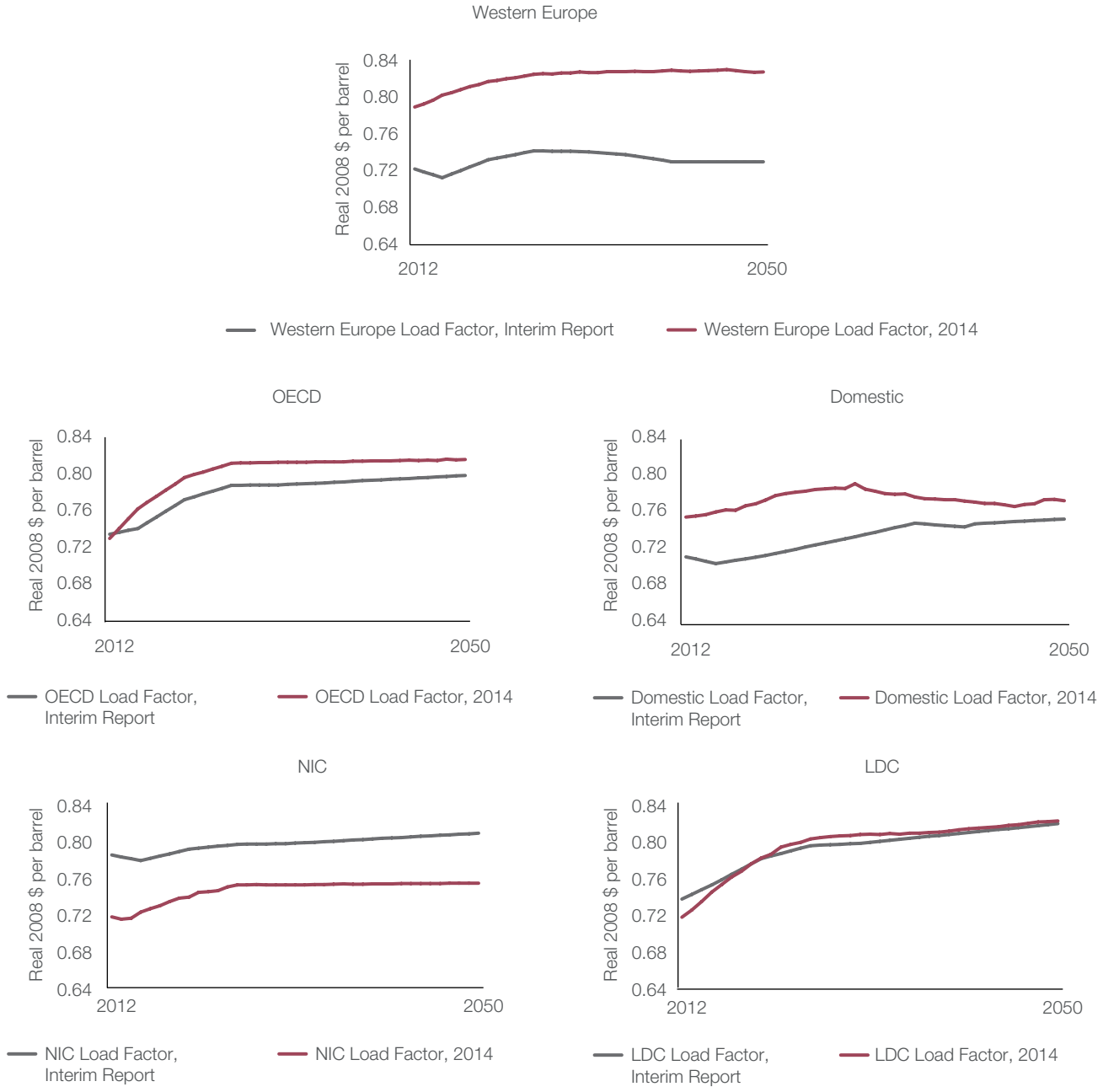
2.42 Load factors used in NAPDM primarily to calculate fare cost components on a per passenger basis are now determined by NAPAM model outputs from the current (2014) version of the model. This change is essentially model maintenance and updating. The new version of NAPDM includes all the changes to the aircraft size and load factor modelling in NAPAM requested by the Commission and discussed in paragraphs 2.49-2.50.

2.43 **Figure 2.3** shows that the updated load factors are noticeably higher in the Western Europe, domestic and OECD market segments, and lower in the NIC segment. The change is less pronounced in the LDC segment. These higher load factors will slightly increase national demand as they reduce the average fare paid per passenger per market segment.

2.44 The method used for applying this input is now more compatible with other NAPAM outputs. The new approach involves taking distance weighted averages.

15 Carbon prices now adopt the lognormal distribution rather than the normal distribution, which was previously assumed.

Figure 2.3: New forecast load factors used NAPDM



Market maturity

2.45 Since the Interim Report, the approach to market maturity has been updated so that price elasticities of demand no longer decline over time. This improves consistency with the mechanism in the Allocation Model (NAPAM), described below in this chapter that determines how passengers respond when their airport of choice is full. The change has a minimal effect on the forecasts.

Input updates

2.46 The model inputs have been updated where new data was available. Updated variables include short run UK and foreign GDP, oil prices, long run carbon prices, load factors, fuel efficiency and air passenger duty. The input assumptions are described in detail in **Chapter 3**.

Recent updates to the DfT Passenger Allocation Model (NAPAM)

International-international interliner model

2.47 In 2013 the Commission undertook a study to recalibrate the logit models used to allocate international-to-international transfer passengers between hub airports available in the model.[16] This used a combination of PaxIS ticket data for Paris CDG, Amsterdam, Frankfurt and Dubai and CAA passenger interview survey data for Heathrow and Gatwick for demand and fares with timetable data for frequency, and in-flight times to recalibrate the logit models.[17] At the time of the publication of the Interim Report the results of the study were still subject to peer review. Following that review the new logit parameters prepared by PwC for the Commission have now been included in NAPAM and a comprehensive re-validation exercise made to provide evidence of their suitability.

2.48 A comparison of the old and new parameters is shown below in **Table 2.3.** The new model places more weight on in-flight times of the connecting services and now includes fares as explanatory variable, although it is a weak parameter and its effect is limited. As reported later in **Table 2.8**, the new parameters have contributed to the continued good match between modelled and observed passengers at the major hub airports in both 2011 and 2013.

Table 2.3: New international-to-international transfer passenger logit model parameters

Driver	Coefficient used in Interim Report	New PwC coefficients
Flight Time (expressed in £)	-0.0402	-0.0112
Fare	0	-0.000644
Frequency cost (expressed in £)	-0.0927	-0.066
Shadow cost	-0.0927	-0.066

16 Airports Commission Interim Report, December 2013, paragraph 3.45 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/271231/airports-commission-interim-report.pdf

17 PwC, Airports Commission: Support to develop DfT model to better incorporate international competition between major hubs, October 2013.

Aircraft size and passenger loads

2.49 Since the Interim Report the graphs which relate potential demand on a route to aircraft size over time have been further reviewed and replaced where appropriate.[18]

2.50 Of greater impact was the implementation of a recommendation of the 2011 Peer Review of NAPAM by John Bates which suggested load factors need not be tied to each graph.[19] The input load factor is now no longer part of the aircraft size graph but is allocated on a route basis separately for scheduled, charter and LCC airline types. This change adds greater precision to both the aircraft size and passenger load modelling. Like the logit model change described above, this change also necessitated the re-calibration and re-validation of the model 2011 base year prediction of ATMs and passenger loads. This was carried out to the same standard of quality as previously achieved in 2013.

Route group zone proportions

2.51 The distribution of traffic within each of the 27 route group zones (see DfT 2013 forecasts[20]) is now a separate input for each of the three airline types in the model: scheduled, charter and LCC. So the three different airline types can have different proportions of passengers to different destinations in a route group. This makes the model more precise and improves its performance in predicting the number of destinations served at each airport.

Demand suppression

2.52 Suppression describes the process by which passengers are deterred from flying by higher shadow costs. There had been some criticism of the balance between passengers choosing different airports and choosing not to fly in the responses to the Commission's consultation on the forecasts.[21] Since the Interim Report further improvements to the suppression algorithm were made:

- changing its functional form, in line with the 2011 Peer Review recommendations;[22]
- applying the logit model weights to the components of generalised cost in the calculation of composite costs; and,
- using the NAPDM fare elasticities.

18 See PwC report *Review of DfT model aircraft size and route threshold assumption* (sic)-1 April 2014, published under *Economic Analysis: consultants reports*, on the Commissions website. http://www.gov.uk/government/publications/airports-commission-interim-report

19 John Bates Services, Peer Review of NAPALM https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/4506/review-napalm.pdf

20 DfT *UK Aviation forecasts, January 2013*, particularly chapter 2 paragraphs 2.36-2.37 and Figure 2.6, https://www.gov.uk/government/publications/uk-aviation-forecasts-2013

21 Airports Commission, Aviation Demand Forecasting discussion paper, February 2013, https://www.gov.uk/government/publications/discussion-paper-on-aviation-demand-forecasting

22 John Bates Services, Peer Review of NAPALM https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/4506/review-napalm.pdf

2.53 The new approach introduced greater consistency with NAPDM and within NAPAM itself, used suppression elasticities that were more evidence based and more precisely disaggregated to match the modelled passenger purpose. Test model runs demonstrated that the overall impact on demand and airport allocation were minimal.

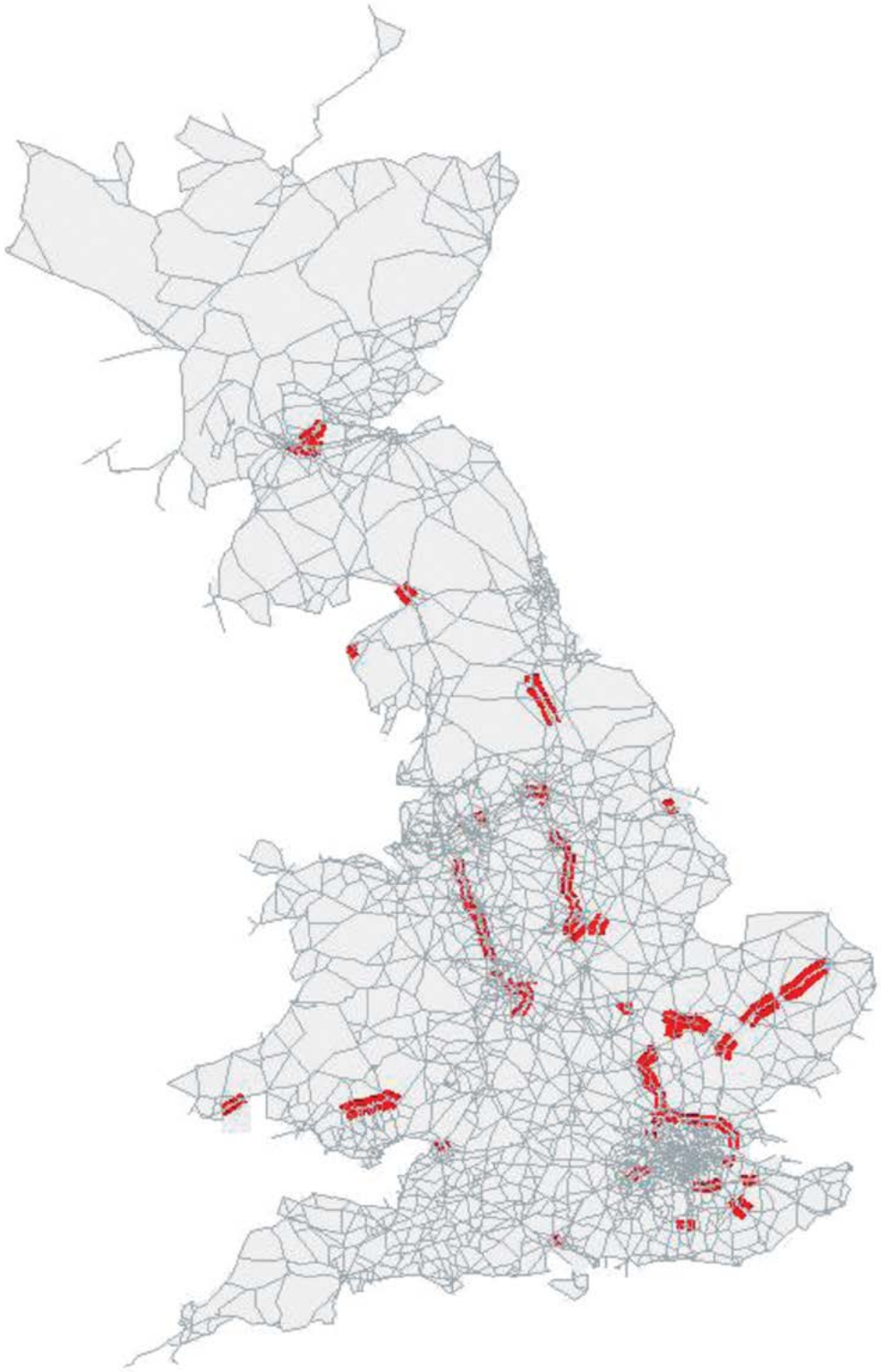
Surface access inputs model

2.54 The time and money costs of surface access from origin district to airport play a key role in determining passenger airport choice, making the surface access module within the DfT aviation model suite particularly important. Although the focus of the changes to this module relates to updates of future year rail and road schemes set out in **Chapter 3** and **Appendix 2**, the structure of the surface access model has changed. It is now more fully integrated into DfT's aviation modelling suite and called the National Airport Accessibility Model (NAAM2). The most significant developments were modernising the software platform but these had little impact on the costs generated. There was also improved disaggregation in some regions, particularly in Scotland, which allows for a better representation of how passengers access both the road and rail networks and improves the allocation of passengers to the Scottish airports.

2.55 Figure 2.4 illustrates the NAAM2 highway network for 2020 with highway improvements marked in red.[23] The figure gives an indication of the detail available in the airport access costs input into the passenger allocation model, NAPAM.

23 Full lists of future road and rail improvements included in NAAM2 for the base and options is given in **Appendix 2.**

Figure 2.4: The NAAM2 airport surface access road network, 2020



Model validation

2.56 Several of the model updates described above had an effect on the base year passenger allocation and so necessitated a revalidation exercise. Model validation is a very important part of the transport modelling where modelled outputs are compared in detail with independent observations. This is to ensure that the model is fit for forecasting and can accurately reproduce current patterns of airport use, traffic on particular routes, aircraft movements and aircraft passenger loads.

2.57 The principal model base year for validating detailed route level outputs against observed statistical returns (actuals) is 2011. **Table 2.6** (with graphic) compares modelled passengers at the most significant airports, including overseas hubs, with observed data for the model base year of 2011. It can be seen that a good correspondence between modelled and observed data has been achieved.

2.58 As the overseas hubs are fully incorporated into the model and the logit model and the load factor modelling has been improved, it is necessary to ensure that ATMs at these airports are forecast as accurately as at UK airports. This is necessary for accurate modelling of frequencies. **Table 2.7** compares modelled ATMs with those reported at the principal airports in the model.

Table 2.4: Actual compared with modelled passengers (millions) in 2011 at larger UK airports and the foreign hubs

Airport	Actual	Fitted	Difference	Difference (%)
Heathrow	69.4	70.1	0.7	1%
Gatwick	33.6	33.9	0.3	1%
Stansted	18.0	17.7	-0.3	-2%
Luton	9.5	10.2	0.7	7%
London City	3.0	3.1	0.1	3%
London subtotal	**133.6**	**135.0**	**1.5**	**1%**
Manchester	18.8	20.1	1.3	7%
Birmingham	8.6	8.2	-0.4	-5%
Glasgow	6.9	6.7	-0.2	-2%
Edinburgh	9.4	8.5	-0.9	-9%
Bristol	5.8	5.5	-0.2	-4%
Newcastle	4.3	4.4	0.0	1%
Belfast International	4.1	4.1	-0.0	-1%
Liverpool	5.2	5.2	-0.0	-0%
East Midlands	4.2	3.8	-0.4	-10%
Other airports in model	16.7	16.3	-0.4	-2%
UK total	**217.6**	**217.8**	**0.2**	**0%**
Paris	57.7	57.6	-0.0	-0%
Amsterdam	41.7	41.5	-0.2	-1%
Frankfurt	53.6	53.1	-0.4	-1%
Dubai	45.6	45.4	-0.2	-0%
Total in model	**416.1**	**415.4**	**-0.7**	**-0%**
Other non-modelled airports	2.3			
National total	**219.9**			

* Data source: CAA (2011) and EuroStat (2011)

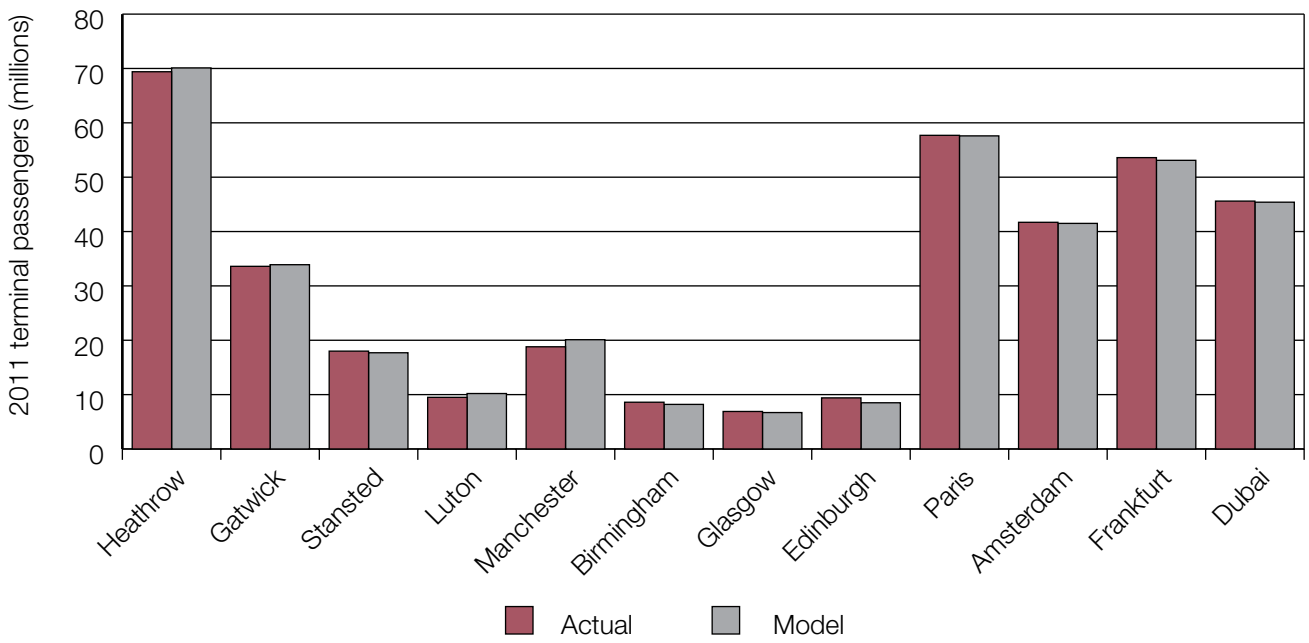
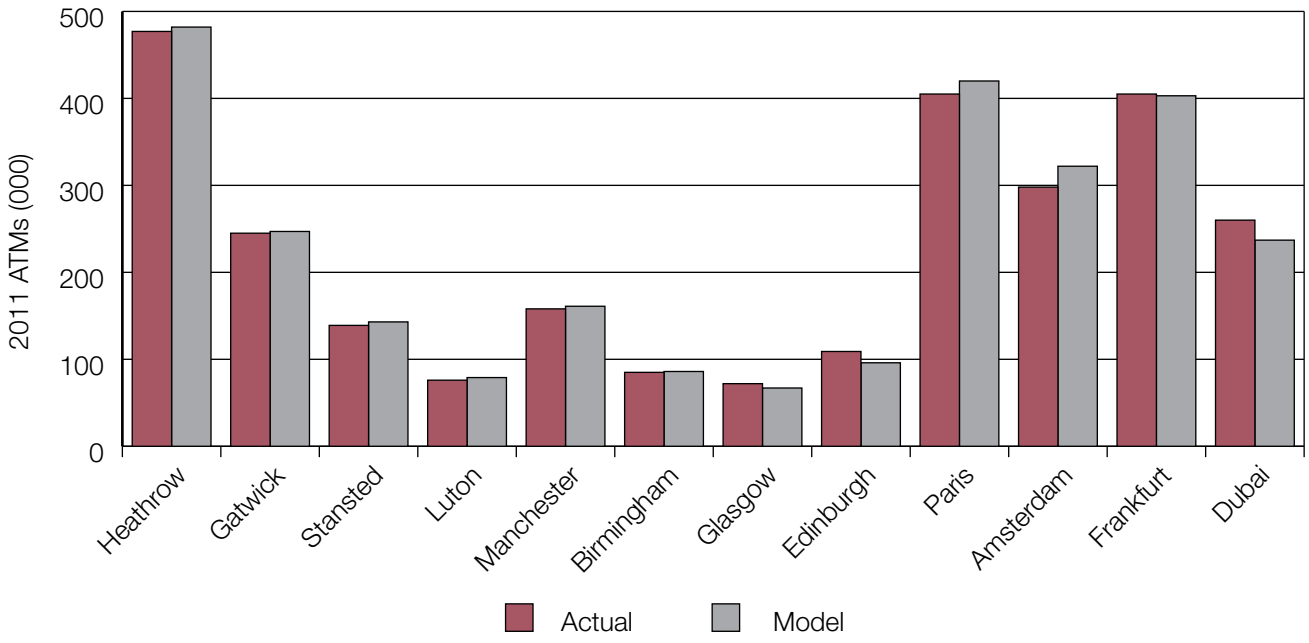


Table 2.5: Actual compared with modelled ATMs (thousands) in 2011 at larger UK airports and the foreign hubs

Airport	Actual	Fitted	Difference	Difference (%)
Heathrow	477	482	5.2	1%
Gatwick	245	247	2.5	1%
Stansted	139	143	3.8	3%
Luton	76	79	2.8	4%
London City	67	57	-10.5	-16%
London subtotal	**1,004**	**1,008**	**3.9**	**0%**
Manchester	158	161	2.6	2%
Birmingham	85	86	0.8	1%
Glasgow	72	67	-4.9	-7%
Edinburgh	109	96	-13.2	-12%
Bristol	53	54	1.0	2%
Newcastle	45	45	0.2	1%
Belfast International	38	43	4.9	13%
Liverpool	46	45	-1.4	-3%
East Midlands	58	50	-8.7	-15%
Other airports in model	341	331	-10.5	-3%
UK total	**2,010**	**1,985**	**-25.4**	**-1%**
Paris	405	420	15.1	4%
Amsterdam	298	322	23.9	8%
Frankfurt	405	403	-2.3	-1%
Dubai	260	237	-22.9	-9%
Total in model	**3,378**	**3,367**	**-11.6**	**-0%**
Other non-modelled airports	132			
National total	**2,143**			



2.59 More details of the modelled passengers and ATMs in 2011 are shown in **Appendix 1.**

2.60 The model forecasts every year in the period 2011-2050. Although the model is not calibrated to produce the 2013 outturn in the detail of the validation year of 2011, checking uncalibrated 2013 forecasts against actuals provides a rigorous independent check of modelling performance and suitability for forecasting.[24] **Table 2.6** (with graphic) compares modelled passengers at the most significant UK airports with observed data for 2013. Although not to the standard of the 2011 validation year shown in the previous two tables**,** it can be seen that a good correspondence between modelled and observed data has been achieved. The most noticeable discrepancy is at Liverpool where there passenger numbers have dropped by close to a quarter 2011-2013, an effect not captured in the model. Liverpool accounts for 72% of the national total over-forecast.

2.61 **Table 2.7** compares modelled ATMs with those reported at the principal airports in the model. Again the model has not been calibrated to produce 2013 ATMs, so this constitutes a tough validation test. Although not to the standard of the 2011 validation year shown in **Table 2.4** and **Table 2.5** above**,** it can be seen that with some exceptions a good correspondence between modelled and observed data has been achieved.

24 The throughputs for foreign hubs in 2013 are not shown as there is less good quality observed data available on passenger O-Ds and ATMs compared to 2011 where many independent checks were run on the overseas data.

Table 2.6: Actual compared with modelled passengers (millions) in 2013 at larger UK airports and the foreign hubs

Airport	Actual	Fitted	Difference
Heathrow	72.3	71.9	-0.5
Gatwick	35.2	37.0	1.8
Stansted	17.7	17.9	0.2
Luton	9.7	10.6	0.9
London City	3.3	4.0	0.7
London subtotal	**138.3**	**141.5**	**3.2**
Manchester	20.5	20.5	0.0
Birmingham	9.0	7.9	-1.1
Glasgow	7.2	6.2	-1.0
Edinburgh	9.7	9.0	-0.7
Bristol	6.1	5.8	-0.3
Newcastle	4.4	4.2	-0.2
Belfast International	4.0	4.3	0.2
Liverpool	3.9	5.7	1.8
East Midlands	4.3	3.9	-0.4
Other airports in model	16.9	18.0	1.1
UK total	**224.4**	**226.8**	**2.5**
Other non-modelled airports	1.7		
National total	**226.0**		

* Data source: CAA (2013)

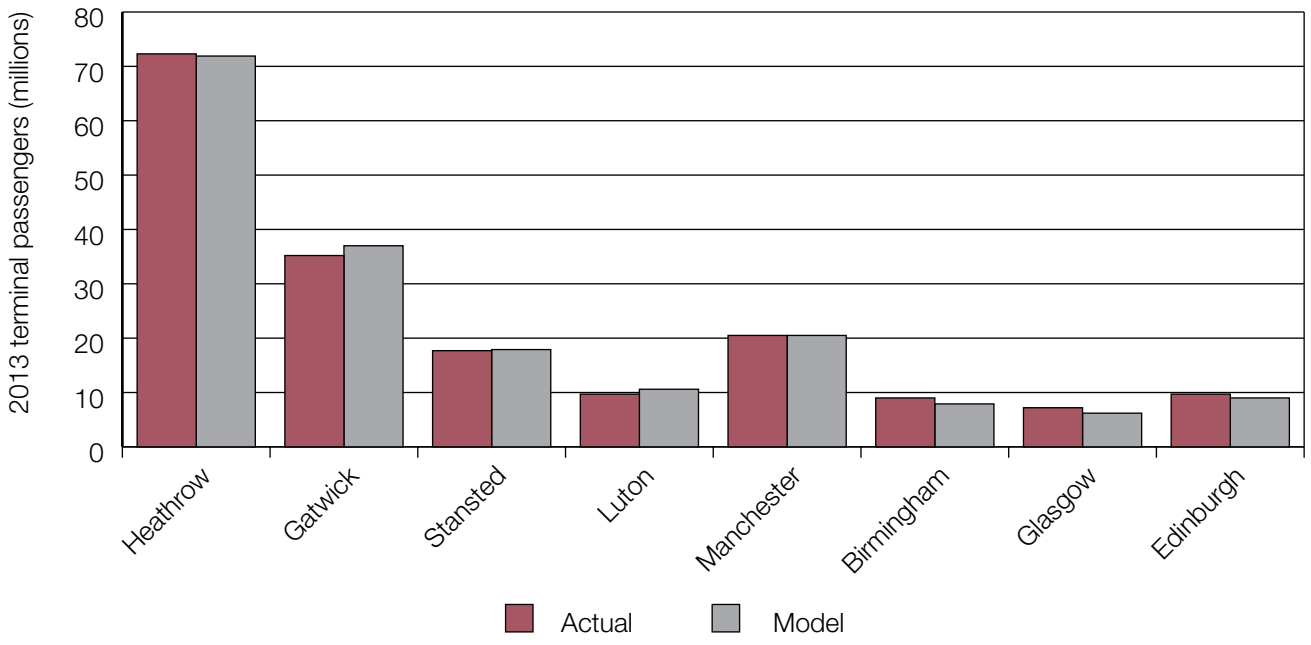
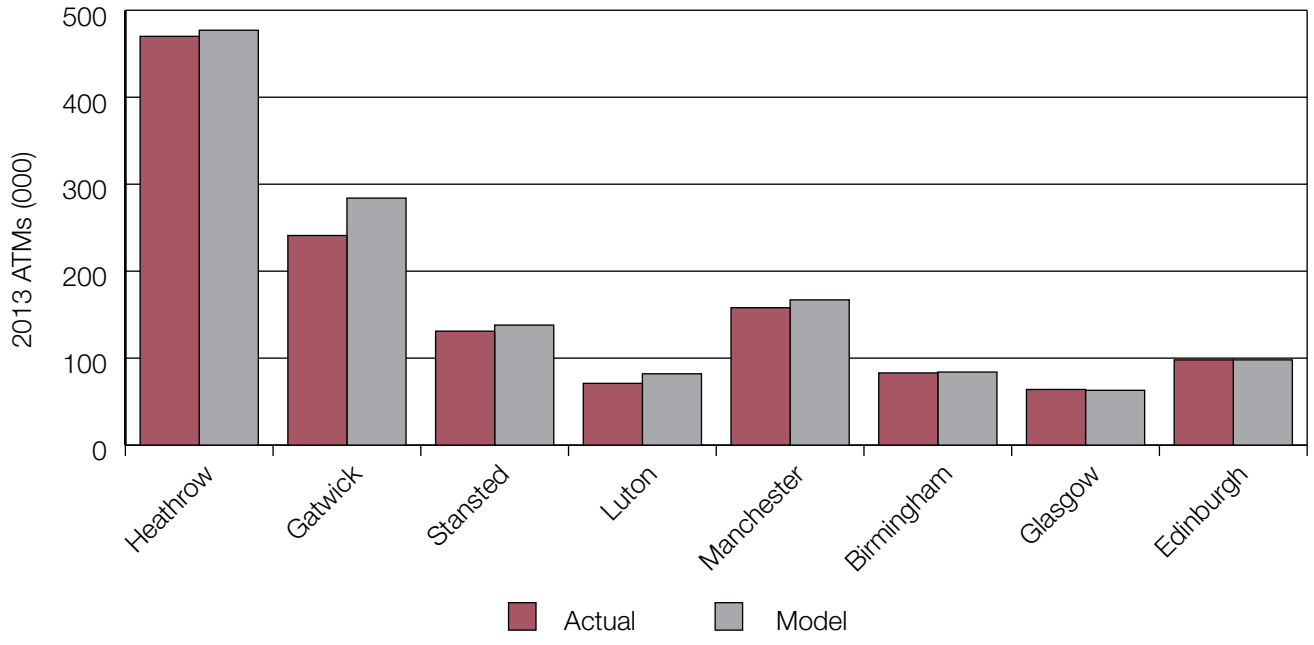


Table 2.7: Actual compared with modelled ATMs (thousands) in 2013 at larger UK airports and the foreign hubs

Airport	Actual	Fitted	Difference
Heathrow	470	477	7.7
Gatwick	241	284	42.5
Stansted	131	138	7.4
Luton	71	82	11.8
London City	65	74	8.4
London subtotal	**978**	**1,055**	**77.8**
Manchester	158	167	8.3
Birmingham	83	84	0.3
Glasgow	64	63	-0.6
Edinburgh	98	98	-0.0
Bristol	53	56	3.3
Newcastle	43	46	3.4
Belfast International	37	46	9.4
Liverpool	29	46	16.9
East Midlands	56	52	-4.1
Other airports in model	232	361	129.3
UK total	**1,830**	**2,074**	**244.0**
Other non-modelled airports	56		
National total	**1,887**		

* Data source: CAA (2013)



2.62 In 2013 ATMs are over-forecast at Gatwick and this also leads to a 1.8m passenger over-forecast evident in **Table 2.6.** The effect of this over-forecast is to bring forward the year Gatwick's congestion shadow costs bite as capacity is reached rather than any material difference in Gatwick forecasts once capacity is reached. Passengers are over-forecast at Luton in 2013 by 9% and there is a 17% over-forecast of ATMs which results in modelled aircraft loads of 128 compared to an actual of 137. Further growth 2011-2013 has been modelled at Luton whereas the actual traffic has been largely static. Luton interacts closely with Stansted (almost double Luton's size) and here the model performance in 2013 is more satisfactory. The over-forecast at Liverpool following the decline is reflected in the ATM forecasts where the modelling did not pick up a 30% decline in ATMs 2011-2013.

2.63 A recent innovation of the Commission's modelling has been the allocation of international-to-international transfer passengers between the seven hubs where the model permits such transfers to take place: Heathrow, Gatwick, Manchester, Paris CDG, Amsterdam Schiphol, Frankfurt International and Dubai. Given the latest work for the Commission by PwC to produce a new logit model for these transfer passengers (see paragraphs 2.45-2.46) a detailed calibration exercise has been repeated to adjust the allocation of such movements. This has been followed by a hub transfer validation exercise to check that route level transfers taking place at the modelled hubs reflect reality**. Table 2.8** demonstrates a good match between modelled and observed data in 2011. The goodness of fit statistic (r^2) reports the fit of the modelled inter-continental matrices compared to observed movements based on IATA ticket data.

2.64 Between 2011 and 2013 there has been significant change in the level of interlining at Heathrow and particularly Dubai. Although the detailed route level calibration is made for 2011, the overall fit for the new patterns in 2013 (where an estimate of the actual number of transfers and the OD matrix is possible) has been checked. **Table 2.8** shows that to a large extent the latest version of the model has captured changes at Heathrow and Dubai.

Table 2.8: Goodness of fit of inter-continental traffic at hub airports

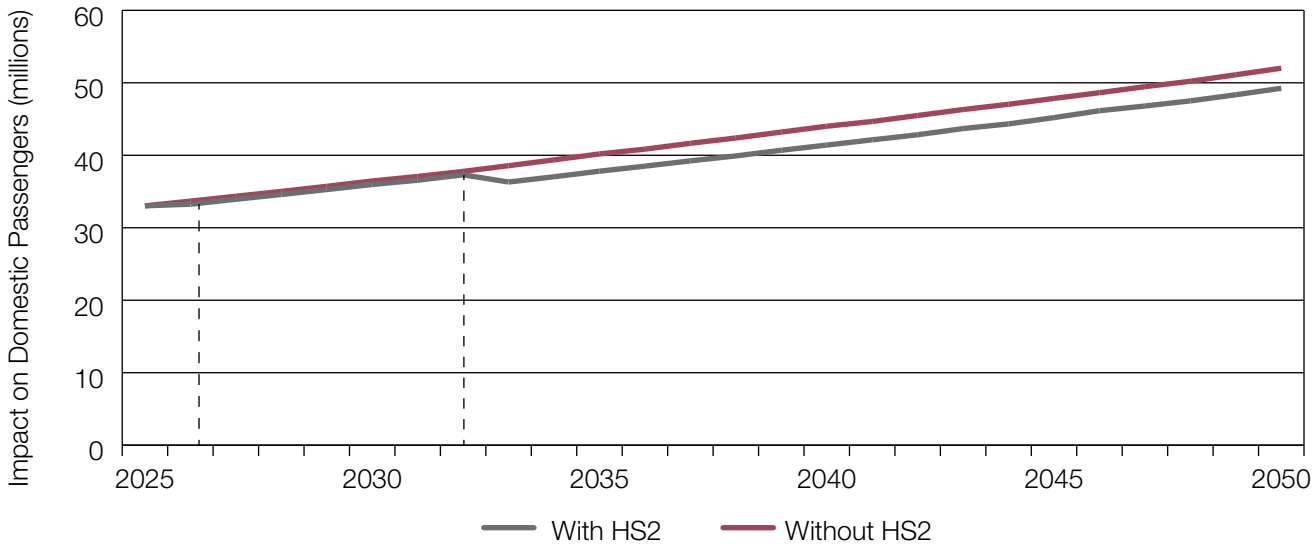
mppa 2011	Modelled	Actual	Matrix Fit (r2)
Heathrow	18.5	18.6	0.990
Amsterdam	13.1	13.1	0.996
Paris CDG	16.5	16.3	0.992
Frankfurt	26.3	26.7	0.993
Dubai	17.8	17.4	0.979
mppa 2013	**Modelled**	**Actual**	**Matrix Fit (r2)**
Heathrow	22.4	21.3	0.984
Amsterdam	13.3		
Paris CDG	16.5		
Frankfurt	26.3		
Dubai	23.1	22.8	0.981

Impact of including HS2 in the demand model

2.65 The treatment of HS2 passenger demand has not changed from the Interim Report.[25] As the baseline case includes HS2, a model run was undertaken adding the transfers back in to test the effect. **Figure 2.5** shows that the number of domestic air passengers falls slightly between 2026 and 2033 and more significantly beyond this date, when the second phase of HS2 to Manchester and Leeds is implemented.

2.66 HS2 is also forecast to have an impact by improving accessibility to UK airports for passengers taking international flights. It was considered that this aspect was already adequately incorporated into existing DfT modelling, so the HS2 surface access methodology has been retained from the previous forecast.[26]

Figure 2.5: Impact of HS2 on domestic passenger forecasts



25 Interim Report paragraphs 3.62-3.65

26 DfT UK Aviation forecasts, January 2013, paragraphs 3.43-3.46, https://www.gov.uk/government/publications/uk-aviation-forecasts-2013

3. Input assumptions

3.1 Historically, the two main input drivers of aviation demand have been economic activity and air fares. As such, projections of these drivers are required to generate passenger demand forecasts.

3.2 Forecasts of future economic activity are based on projections of UK and foreign GDP, UK consumer expenditure and trade. Forecasts of air fares are based on projections of the fare drivers which include oil prices, fuel efficiency, rates of Air Passenger Duty (APD), carbon prices and other non-fuel costs.

3.3 It is anticipated that the aviation market will "mature", becoming progressively less responsive to changes in its key drivers. Therefore the passenger demand forecasts also include some judgement-based assumptions to reflect different levels of market maturity.

3.4 There is inherent uncertainty in projecting any of these variables into the future. To reflect this, the Airports Commission has produced forecasts of demand under five global economic scenarios:

- assessment of need
- global growth
- relative decline of Europe
- low-cost is king
- global fragmentation

3.5 The *assessment of need* scenario repeats the input assumptions from the Interim Report forecasts, updated to take account of new data. The four global scenarios build on those introduced in the Interim Report, particularly on the economic input variations to the *assessment of need* scenario. Some of the input assumptions are transformed based on judgment. Many of the NAPAM inputs introduce airline behaviour in response to changes in capacity into the modelling.

3.6 This chapter describes the input assumptions that have been adopted under all five economic scenarios, noting how they differ from those presented in the Airports Commission's Interim Report. The *assessment of need* inputs described below are all adopted in all other scenarios, unless specifically qualified in the description of a scenario's inputs.

Assessment of need

3.7 This scenario uses consistent input assumptions to the forecasts published in the Interim Report. Where possible, the inputs are sourced from the Office for Budgetary Responsibility, OECD and IMF. However some inputs remain judgment-based, such as those reflecting market maturity.

3.8 This scenario includes a high and low range, which is based on a probability assessment. The range represents a 60% confidence interval, and is informed by historic variation in the main input drivers of demand. This section describes the inputs used in the probability assessment, along with the option-specific assumptions that have been developed since the Interim Report.

Summary of updated economic input assumptions

3.9 **Table 3.1** sets out the updated economic input assumptions the Commission is adopting for the *assessment of need* scenario. The biggest changes in demand are due to a more optimistic outlook for short term UK GDP, higher forecast load factors and higher forecasts of oil prices. The resulting forecast of national demand is higher than the Interim Report level for most of the period, before reverting back to about the same level by 2050.

Table 3.1: Summary of updated economic input assumptions

Model Input	Period	Airports Commission December 2013 source	Airports Commission Autumn 2014 source
UK GDP and consumer expenditure growth rates	2014 to 2018	OBR, March 2013	OBR, March 2014
	2019 onwards	OBR, July 2013	OBR, July 2013
Foreign GDP growth rates	2011 to 2019	IMF, April 2013	IMF, April 2014
	2020 onwards	OECD, June 2013	OECD, June 2013
Carbon prices (long term)	2031 onwards	DECC, October 2011	DECC, September 2013
Oil prices	2012 to 2035	IEA, November 2012	IEA, November 2013
Exchange rates	2011 to 2040	OBR, July 2013	OBR, July 2013
Air Passenger Duty	2011 onwards	HMRC, April 2013	HMRC, December 2013
Load factors	2011 onwards	DfT model, 2010	DfT model, May 2014*
Fuel efficiency	2011 onwards	DfT model, September 2013	DfT model, May 2014*

* Sourced from the carbon-traded Assessment of Need demand scenario run.

GDP, consumer expenditure and trade

3.10 The *assessment of need* scenario adopts the most recent short term UK GDP and consumer expenditure projections from the Office of Budgetary Responsibility (OBR). Since the Interim Report, the OBR has revised its short term GDP and consumer expenditure forecasts to reflect the improved UK economic outlook, increasing them by around 1% for the years 2013 and 2014.

3.11 The long term UK GDP forecasts are unchanged, and continue to be based on the projections published by the OBR in July 2013.

3.12 The *assessment of need* scenario adopts the most recent short term foreign GDP growth rates from the IMF.[27] Since the Interim Report, the IMF has revised their short term GDP growth forecasts for the two dominant regional blocks, Western Europe and OECD to be slightly lower. Long term foreign GDP growth rates are unchanged, and continue to be sourced from the OECD *Economic Outlook No 93*.[28]

3.13 Based on an assessment of the historic relationship between trade and GDP growth rates, and in line with the Interim Report forecasts, it is assumed that trade with Western Europe and other OECD members grows at the same rate as the local GDP of those regions. Trade with NICs and LDCs grows at the same rate as UK GDP. This reflects internal DfT research which identified these historic relationships between visible trade and GDP by region.

Oil prices

3.14 The *assessment of need* scenario adopts oil price projections from the IEA, published in 2013. Since the Interim Report inputs were derived, the IEA has revised its projection of oil prices upwards. The price per barrel in the year 2035 has increased to $121 compared to $114 in the Interim Report.[29]

3.15 The projections continue to be taken from the 'New Policies Scenario', which takes account of broad policy commitments and plans that have been announced. This includes national pledges to reduce greenhouse-gas emissions and the G20 commitment to phase out fossil-fuel subsidies, even if the specific measures to implement these commitments have yet to be identified or announced. The IEA forecast is extrapolated by applying the average growth rate between 2030 and 2035 to the rest of the forecast period.

Carbon prices

3.16 The *assessment of need* scenario includes forecasts under two carbon policy cases; carbon-traded and carbon capped. The carbon-traded case assumes that carbon is traded at a price equal to DECC's central long run forecast of carbon prices for appraisal (September 2013 version).[30] A sensitivity has also been completed adopting DECC's high long run forecast of carbon prices. The carbon capped case assumes that carbon is capped to the 2005 level. It is implemented by raising the price of carbon until UK departing aircraft CO_2 emissions fall to 37.5Mt in 2050. Assumptions regarding the carbon cases are described in detail in **Chapter 4**.

27 http://www.imf.org/external/ns/cs.aspx?id=29

28 http://stats.oecd.org/index.aspx?DataSetCode=EO93_INTERNET

29 In real 2008 prices

30 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/360323/20141001_Supporting_Tables_for_DECC-HMT_Supplementary_Appraisal_Guidance.xlsx These are in practice the DECC 2012 published values.

Market maturity

3.17 As in the Interim Report, the *assessment of need* scenario continues to adopt a series of assumptions about the extent to which the response of air travel demand to additional income could decline in the future. In the absence of quantified evidence, these forecasts are drawn on qualitative evidence provided by the University of Westminster to generate judgment-based adjustments to reflect market maturity. The approach is described in detail by the DfT in the January 2013 forecasts.[31]

Air Passenger Duty

3.18 The treatment of Air Passenger Duty (APD) has been changed since the Interim Report, following the announcement in the 2014 Budget that the number of Air Passenger Duty bands will be reduced from four to two in April 2015. The highest long-haul bands C and D, will be merged into the lowest long-haul charge, Band B. So overall long-haul APD is reduced from the Interim Report. APD rates are sourced from HMRC.[32]

3.19 The inputs to all scenarios have been updated to reflect the change in policy, but as modelled demand is calculated by calendar year, they have been assumed to come into force from the start of 2016.

Local demand growth at the foreign hubs

3.20 The inclusion of overseas hubs as modelled airports in NAPAM requires a forecast how local demand at these airports will change in the future.

3.21 The *assessment of need* scenario continues to adopt the Interim Report assumption that demand at overseas European hubs, excluding international transfer passengers, grows at the same rate as total UK unconstrained demand.

3.22 In the Interim Report, local passenger demand at Dubai airport was assumed to grow at the same rate as demand to and from Newly Industrialised Countries (NICs) from UK airports – a faster rate than the European hubs. However between 2003 and 2012, passenger growth at Dubai has significantly exceeded the European hubs, at 12% per annum on average. To reflect this, the *assessment of need* scenario adopts a local demand growth rate of 12% in the years 2012 and 2013, which is linearly phased into the NIC growth rate over five years.

31 DfT UK Aviation forecasts, January 2013 particularly Chapter 3 and Annex A, https://www.gov.uk/government/publications/uk-aviation-forecasts-2013

32 https://www.gov.uk/government/publications/rates-and-allowances-excise-duty-air-passenger-duty

Other demand inputs

3.23 The scenarios adopt short term **exchange rates** from the OBR's economic and fiscal outlook.[33] Beyond this date, they continue to be held constant at the 2013 level.

3.24 **Fuel efficiency** and **load factor** changes over time continue to be determined by the outputs of NAPAM. Both of these inputs have been updated to adopt outputs from the most recent version of NAPAM.

3.25 **Biofuels** are assumed to account for 0.5 per cent of fuel on flights using UK airports by 2030, rising to 2.5 per cent by 2050.

3.26 The **price elasticity of demand** for international-to-international interliners was reviewed as part of the improvements to demand suppression being made to NAPAM (see **Chapter 2),** and has been changed to -0.5, from -0.2. The new value is the weighted average price elasticity of all foreign passengers in NAPDM.

Monte Carlo low-high range

3.27 As described in paragraph 2.34 in the previous chapter, the *assessment of need* scenario continues to include a confidence range of 60%, based on Monte Carlo analysis. Beyond the minor methodological changes described in **Chapter 2**, no changes in the underlying sources have been made since the Interim Report.

Global growth

3.28 This scenario sees higher passenger demand from all world regions, coupled with lower operating costs and the alternative cases of a global carbon cap and a global emissions trading scheme.

3.29 GDP growth is increased relative to the *assessment of need* scenario by 2% points per annum for newly industrialised (NIC) and developing countries (LDC), and 0.5% for Europe, the OECD and the UK up to 2050. This is coupled with an increase in trade in line with GDP for all world zones.

3.30 The role of hubs is enhanced, with a rise in international-to-international transfer passenger demand of 1% per annum cumulatively. Meanwhile, airlines enjoy cheaper operating costs with the price of oil set at the '450 scenario', the lowest of the scenarios published by IEA. Both carbon-traded and carbon capped policy cases are modelled.

3.31 With the Gatwick Airport Second Runway (LGW 2R), this scenario involves an airline alliance, modelled as SkyTeam, moving both its short-haul and long-haul services from Heathrow to Gatwick when the second runway opens. This is represented by an increase in flight frequencies equivalent to that alliance's operations at Heathrow being applied at

33 http://budgetresponsibility.org.uk/category/topics/economic-forecasts/

Gatwick in 2025. The Heathrow frequencies are 'seeded' at Gatwick. Seeding is the process whereby for specified years ATMs user input frequencies are used rather than being calculated within the model in response to demand and then being tested for viability. Domestic services at Gatwick are also bolstered to provide SkyTeam with feeder services by seeding to the maximum value between the domestic ATMs calculated by the model for 2025 and frequencies in the validation year of 2011. In both cases the frequency seeds at Gatwick were applied for 2025-2028.

3.32 The frequencies at Heathrow are not altered, representing an assumption that other carriers fill the SkyTeam slots. Otherwise no extra airport specific assumptions are assumed for the Heathrow Airport North West Runway (LHR NWR) and Heathrow Airport Extended Northern Runway (LHR ENR) capacity options.

Relative decline of Europe

3.33 This scenario sees higher growth of passenger demand in emerging economies, a strengthened position of Far and Middle Eastern aviation hubs and airlines, and the alternate cases of a global carbon cap and a global emissions trading scheme.

3.34 GDP growth is increased relative to the *assessment of need* scenario by 2% points per annum in NIC and LDC. This is coupled with an equivalent increase in trade between the UK and these regions. It is assumed that Heathrow, Frankfurt and Paris CDG become progressively less attractive to interliners than the Middle-Eastern hubs and revert their focus to the European market. In this process of consolidation, it is assumed that Amsterdam Schiphol successfully gains a share of transfer traffic from the other European hubs. In this, as in all scenarios, Dubai can in effect be viewed as a proxy for all developing Middle-Eastern hubs. The change was modelled by increasing 'hub penalties' at the European airports excluding Amsterdam and halving the calibrated penalty at Dubai.

3.35 In the Heathrow Airport North West Runway and Heathrow Airport Extended Northern Runway options, this scenario involves one of the large Middle-Eastern or Asian carriers purchasing a controlling equity stake in British Airways (BA) parent company IAG. This results in Heathrow feeder services to the Dubai hub being increased, while direct services to destinations beyond Dubai (the Indian sub-continent, the Far East and Australasia) decline, with BA long-haul services focusing on the Americas and Africa. This change was effected by 'de-seeding' the BA share of frequencies to destinations east of Dubai and moving those frequencies as seeds to the Americas and Africa zones (2026-2028). Domestic feeder services are strengthened by seeding them (2026-2028) to restore them to their 2011 level if they have subsequently been modelled as declining from that level with rising shadow costs. Overall the route network offered by Heathrow contracts, resulting in a greater reliance on the origin and destination market. Consequently, low-cost carriers are 'unbanned' from Heathrow from 2026 onwards and some LCC services prove viable when the runway capacity is increased.

3.36 In the Gatwick Airport Second Runway option, this scenario involves a Middle-Eastern airline purchasing a controlling equity stake in LCCs at Gatwick to provide feeder traffic for the parent airline's long-haul operations. To allow this effect to be represented in the model, all LCC passengers at Gatwick are re-classified as scheduled in 2025, enabling them to make all possible transfers and act as a feeder traffic to long-haul (and short-haul) operations. This is supported in the modelling with an increase in services between Gatwick and Dubai. The proportion of Heathrow frequencies to the model's Middle East zone which were Emirates flights to Dubai in the base year were calculated (15%). This proportion was then applied to Heathrow's 2025 modelled Middle East services and the calculated service frequencies representing Emirates were used at Gatwick for 2025-2028. The Gatwick seeded frequencies were not removed from Heathrow.

Low-cost is king

3.37 This scenario sees the LCC model expanding into new markets, which could include long-haul. It also sees higher passenger demand from all world regions, lower operating costs, and the alternative cases of a global carbon cap and a global emissions trading scheme.

3.38 The baseline assumptions, including those about economic growth, across all of the options are the same as for the *global growth*. In the Heathrow Airport North West Runway and Heathrow Airport Extended Northern Runway options, low-cost airlines are allowed to operate at Heathrow when the new runway capacity is provided and there is a strengthening of domestic services back to 2011 levels to allow low-cost airlines to provide domestic-international transfer traffic. Domestic feeder services are strengthened by seeding them (2026-2028) to restore them to their 2011 level if they have subsequently been modelled as declining from that level with rising shadow costs.

3.39 In the Gatwick Airport Second Runway option, the new capacity is assumed to result in a significant improvement in the viability of long-haul services at Gatwick. It gains a third of the long-haul services operating at Heathrow at the time the new runway opens (Heathrow services are unaltered). This is effected through seeding Gatwick with 33% of Heathrow's modelled 2025 long-haul baseline frequencies for the seeding period 2025-2028. The seeded frequencies are not removed at Heathrow. There is an associated improvement in Gatwick's attractiveness to transfer passengers and its 'hub penalty' relative to the other modelled hubs is reduced between 2025 and 2040. LCC passengers at Gatwick are re-classified as scheduled in 2025, enabling them also to act as a feeder traffic for transfers. Domestic services are also significantly improved (by seeding 2025-2028 to be the equivalent to 33% of those at Heathrow in the 'Do Minimum' baseline) to better feed the expanded long-haul operations. Interchange penalties for passengers transferring at Gatwick are halved from the calibrated baseline levels.

Global fragmentation

3.40 This scenario sees a reversal of globalisation trends as economies close themselves off by adopting more interventionist national policy models. As a result, there is a decline in passenger demand from all world regions, coupled with higher operating costs for airlines and the UK introducing a stand-alone carbon price, or stand-alone carbon cap as no global carbon agreement is reached.

3.41 Across all of the options, it is assumed that the UK experiences GDP growth consistent with the bottom end of the OBR forecast range, which is on average 1.6% GDP growth throughout the period. GDP growth for all other countries is lower by 1% point per annum and there is a fall in trade in line with GDP for all world zones. International-to-international transfer traffic falls back to 2011 levels by 2040 and there is a decline in the attractiveness of all hub airports to UK originating transfer passengers. Meanwhile, airlines face higher operating costs with the price of oil set at the 'new policies scenario' the highest of the scenarios published by IEA. Both the carbon-traded and carbon capped cases are modelled such that only UK passengers pay a carbon price in each.

3.42 In the Gatwick Second Runway option, the new capacity is assumed to be accompanied by Gatwick discontinuing thinner routes with insufficient load factors and yields. This is modelled by increasing the volume of demand needed to make a route viable. No further changes are made under the Heathrow Airport North West Runway or Heathrow Airport Extended Northern Runway options.

Baseline airport capacities

3.43 **Table 3.2** gives the assumed capacities for the baseline capacity used to constrain demand to airports. These capacities are in line with those used in the Interim Report which in turn were in line with the last DfT forecasts.[34] It is assumed that:

- no new runways are built in the UK;
- extra capacity included in planning applications or published masterplans is constructed;
- terminal capacity is increased incrementally to service additional runway capacity where there is no planning constraint; and,
- depending on location, runways are subject to up to 13 per cent capacity gain through operational and technological improvements.

34 DfT UK Aviation forecasts, January 2013, pp 56- 57, https://www.gov.uk/government/publications/uk-aviation-forecasts-2013

Table 3.2: ATM and passenger (terminal) capacities for the baseline

	ATMs (000s)				Terminal passengers (mppa)			
London airports	**2011**	**2030**	**2040**	**2050**	**2011**	**2030**	**2040**	**2050**
Heathrow	480	480	480	480	90	90	90	90
Gatwick	273	280	280	280	40	45	45	45
Stansted	245	259	259	259	35	35	35	35
Luton	130	160	160	160	12	18	18	18
London City	120	120	120	120	8	8	8	8
London, Total	1,247	1,299	1,299	1,299	185	196	196	196
Rest of UK								
Aberdeen	100	150	150	150	6	6	6	6
Belfast International	210	260	260	260	10	23	23	23
Belfast City	45	110	110	110	4	8	8	8
Birmingham	189	206	206	206	18	37	37	37
Bournemouth	150	150	150	150	3	5	5	5
Bristol	150	226	226	226	10	12	12	12
Cardiff	105	150	150	150	3	8	8	8
East Midlands	264	264	264	264	6	14	14	14
Edinburgh	150	225	225	225	13	20	20	20
Exeter	150	150	150	150	2	4	4	4
Glasgow	226	226	226	226	10	20	20	20
Humberside	150	150	150	150	1	3	3	3
Inverness	150	150	150	150	1	3	3	3
Leeds/Bradford	150	150	150	150	3	8	8	8
Liverpool	213	213	213	213	7	15	15	15
Manchester	324	400	500	500	25	38	55	55
Newcastle	213	226	226	226	9	15	15	15
Newquay	75	75	75	75	1	3	3	3
Norwich	175	175	175	175	2	3	3	3
Southend	0	53	53	53	0	5	5	5
Southampton	150	150	150	150	3	7	7	7
Durham Tees Valley	150	150	150	150	1	2	2	2
Blackpool	150	150	150	150	1	3	5	5
Coventry	150	150	150	150	1	2	2	2
Doncaster Sheffield	57	80	80	80	2	7	7	7
Prestwick	150	225	225	225	3	12	12	12
Rest of UK, Total	3,996	4,614	4,714	4,714	143	280	299	299
National, Total	**5,243**	**5,913**	**6,013**	**6,013**	**327**	**476**	**495**	**495**

3.44 The ATM capacities are unchanged from the Interim Report. The only change in the passenger capacities is that the terminal capacity at Southend has been increased from 2 mppa to 5 mppa in response to the latest estimate and new evidence from the airport owners, updating a previously lower estimate from the airport.[35]

35 A new 1 million capacity terminal was opened at Southend in 2012 and the runway has since been extended. The previous capacity estimate allowed for the latest terminal extension which was expected to double capacity in 2014. Planning permission for these facilities (and the railway station, control tower and hotel) includes conditions which limit and mitigate the environmental impact, with an overall limit of 53,300 aircraft movements a year. The current owners estimate that facilities now in place could accommodate over 5 million passengers a year provided that there is a reasonable spread of services throughout the day, week and year, within this current planning permission limit. Indeed the current owners has expressed the view that the input 5 million terminal capacity could be exceeded without breaking the ATM planning limit, but this expectation has not been included in the forecasts.

3.45 The capacities of the foreign hubs included in the model are also unchanged from the Interim Report.

Baseline surface access

3.46 The allocation of passengers with a journey end in mainland UK to airports uses travel time and costs between each zone and each airport, based on models of future road and rail network and conditions. The surface access information is sourced from the DfT's National Airport Accessibility Model (NAAM2) introduced in **Chapter 2**.

3.47 NAAM2 is used to generate future inter-peak road and rail surface access costs from all the UK districts to all modelled airports. This process should not be confused with the assessment of the surface access impacts of the airport options themselves. These impacts are addressed elsewhere in the appraisal, primarily in the Surface Access module.

3.48 Future base airport access costs take account of major planned future surface transport infrastructure:

- all committed major motorway and A-road schemes in the Highways Agency Roads Programme (assumed to be in place by 2020);
- Crossrail, Thameslink, Heathrow Western Rail Access and all larger programmed public transport improvements (assumed to be in place by 2020);
- High Speed 2 (HS2) from 2026 and with extension north of Birmingham from 2033 onwards taken from the Government's decision on the HS2 route published in January 2012.[36]

3.49 Future network assumptions are taken only for baseline modelling purposes. Rail service patterns and highway designs associated with these schemes are indicative. The opening dates of schemes are uncertain and are simplified for modelling purposes. All surface access schemes introduced after the model base year (2008) and prior to HS2 are assumed to be in place by 2020, which may in some cases be unrealistic. But this does not affect the aviation modelling results.

3.50 Baseline future year rail schemes have been sourced primarily from the DfT's Network Modelling Framework (NMF), and the PLANET Long Distance Model (PLD) used by High Speed Two (HS2) Ltd to model the demand impacts of the HS2 project. They are based primarily on committed schemes. The rail scheme assumptions are similar to those described in HS2 Ltd's publication, *The Economic Case For HS2 PFM v4.3,*[37] although some airport specific schemes, notably Western Rail Access to Heathrow, have been updated.

36 *High Speed Rail: Investing in Britain's Future – Decisions and Next Steps*, HS2 Ltd, January 2012

37 Available at http://assets.hs2.org.uk/sites/default/files/inserts/SA%2020_PFM%20assumptions%20report_V3_0.pdf. See, in particular chapters 5 and 6.

3.51 Lists of all the major rail and highway schemes included in the NAAM2 network used to derive future airport surface access costs are given in **Appendix 2**.

Airport development options

3.52 Airport usage forecasts are provided for the three additional capacity options:

1. **LGW 2R** Gatwick Airport Second Runway of over 3,000m to the south of the existing airport and capable of independent operation, doubling the potential airport capacity from 280,000 to 560,000 ATMs per annum from 2025.
2. **LHR NWR** Heathrow Airport North West Runway capable of independent operation adds a potential 260,000 ATMs increasing the airport capacity from 480,000 to 740,000 ATMs per annum from 2026.
3. **LHR ENR** Heathrow Airport Extended Northern Runway of 3,000m, in line with the existing northern runway and permitting mixed mode operations. This adds a potential 220,000 ATMs, increasing the airport capacity from 480,000 to 700,000 ATMs per annum from 2026.

3.53 In each option where new runway capacity is provided (i.e. those reported in **Chapter 6**) terminal capacity is assumed to be unconstrained as runway capacity is typically the binding constraint. Terminals are therefore assumed to expand to meet the number of passengers demanding use of the runway. This means that in some scenarios the stated passenger throughput is higher than the stated passenger capacity assessed in the Operational Efficiency module. Where there are large discrepancies there could be implications for the scheme design and cost of terminal facilities. However, it is noted in the Operational Efficiency module that the airport operator would be expected to increase terminal capacity to meet demand.

3.54 In the baseline the capacities are those shown in **Table 3.2** and terminal capacities are applied at Gatwick and Heathrow.

3.55 A number of surface access schemes are assumed to be introduced alongside airport capacity changes, and so vary depending on the option – these are described in detail in the Surface Access module. The rail schemes assumed are listed in **Table A2.3** of **Appendix 2.** At the strategic level, it is assumed that highway works associated with the options are essentially local, serving to maintain baseline levels of accessibility to the airports. Therefore no new option road schemes over and above those included in the baseline as set out in **Table A2.2** of **Appendix 2**

4. CO_2 Modelling

CO_2 emission targets

4.1 Two types of carbon scenario (carbon cases) have been modelled. The carbon-traded cases assume that aviation participates in an emissions trading system, and so 'net' CO_2 costs are included in fares. An increase in the 'gross' CO_2 emissions from flights covered by the system would therefore not increase the net global CO_2 emissions as compensatory offsets from elsewhere would have been purchased under the scheme. So under trading it is assumed that there would be no cap on the gross level of UK departing aviation emissions.

4.2 Carbon prices are based on the recommended traded values provided by DECC for use in policy appraisals, and it is assumed that the CO_2 emissions from flights to and from the UK would be covered by the EU ETS until at least 2030 and traded as part of a global carbon market beyond then.[38] Variations on these carbon price assumptions have been included in the sensitivity tests reported in **Chapter 7**.

4.3 The Climate Change Act 2008 set a target for total UK greenhouse gas emissions to be reduced by 80 per cent by 2050, relative to a 1990 baseline. Analysis by the Committee on Climate Change (CCC) of how this can be achieved shows that CO_2 emissions from UK aviation in 2050 should be at or below 2005 levels. This is the carbon capped case adopted by the Commission. When modelling the carbon capped cases, UK departing flights' emissions are thus limited to the 2005 level of 37.5MtCO_2 in 2050.[39]

4.4 The targeted emissions level is met through supplementing the DECC price of traded carbon already included in the traded carbon case in air fares in the passenger demand model, NAPDM.[40] This does not represent a new forecast of carbon prices, but is simply the value required, in the assumed absence of any other mechanism, to achieve the target of no more than 37.5MtCO_2 from aircraft departing UK airports in 2050. The carbon price adjustment only aims at hitting the emissions target in 2050, as achieving the target earlier would require further transitions of the fleet and operational practices beyond those

38 This is in line with the Aviation EU ETS scope for 2013 to 2020 under the existing UK Regulations. However, under an EU Regulation which was adopted in April 2014, it was agreed that the Aviation EU ETS will only cover emissions from flights between two European Economic Area (EEA) aerodromes between 1 January 2013 and 31 December 2016; and it expected that the existing UK Regulations will be amended to implement the new EU Regulation in UK law by the end of 2014. In addition, a review will be undertaken by the European Commission in 2016 to consider whether the scope of the Aviation EU ETS should be amended from 2017 onwards based on progress towards a global market based measure (GMBM) at the International Civil Aviation Organisation (ICAO) Assembly in 2016. More details can be found at https://www.gov.uk/government/consultations/aviation-eu-emissions-trading-system-eu-ets

39 Committee on Climate Change, Meeting the UK aviation target – options for reducing emissions to 2050, 2009, http://www.theccc.org.uk/reports/aviation-report

40 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/360323/20141001_Supporting_Tables_for_DECC-HMT_Supplementary_Appraisal_Guidance.xlsx These are in practice the DECC 2012 published values.

included in the baseline. It therefore follows that in all cases emissions can be expected to exceed 37.5MtCO_2 at some point prior to 2050.[41]

4.5 Carbon capping only through carbon pricing is a simplifying assumption and in many respects unrealistic in future policy terms. In reality, policy might focus on other areas of the economy where carbon abatement costs would be lower than these modelled levels for aviation. It is also likely that with such high carbon prices the drive for further technological improvement in aircraft fuel efficiency would be greater than those already built into the modelling inputs.

4.6 Analysis by the CCC and the DfT has demonstrated that this target could be achieved by mechanisms other than the carbon price.[42] In addition to the effect of controlling UK airport capacity, this analysis assessed the effectiveness and costs and benefits of levers such as:

- mandatory CO_2 standards for aircraft;
- further investment in fuel efficiency and the modernisation of the fleet beyond that in the base assumptions;
- changing operational practices (e.g. further air traffic management measures, or flying at different altitudes and velocities);
- encouraging a greater uptake of biofuels; and,
- limiting demand through effecting behavioural change in the public.

4.7 As with the Commission's scenarios, the objective is not to identify a single 'correct' forecast, but rather to understand the varying effects on aviation demand of constraining and pricing carbon emissions. In effect the two worlds set out above represent a range of possible ways in which aviation in the UK may contribute to achieving stabilisation of the global climate.

4.8 At one end of the range the capped approach sees that happen within the UK economy. This takes a static view of what the relative effort between sectors should be, assuming no flexibility or interactivity to promote economic efficiency or reflect society's changing views of the value of aviation relative to other sectors. It is set with reference to the 37.5MTCO_2e planning assumption the CCC recommends as a proxy until such time as a long term global climate agreement is reached. This planning assumption has been developed with a view of what the relative effort of sectors should be, based on what is known now – and thus reflects the CCC's concern that should aviation grow to 37.5MtCO_2e, the implied

41 See DfT UK Aviation forecasts, January 2013, Chapter 3, paragraphs 3.54-3.68, https://www.gov.uk/government/publications/uk-aviation-forecasts-2013.

42 Committee on Climate Change, Meeting the UK aviation target – options for reducing emissions to 2050, 2009, http://www.theccc.org.uk/reports/aviation-report http://www.theccc.org.uk/reports/aviation-report and EMRC & AEA, A marginal abatement cost curve model for the UK aviation sector, August 2011 http://assets.dft.gov.uk/publications/response-ccc-report/mac-report.pdf

near 85% reduction in the CO_2e emissions of other sectors may be at the limit of what is feasible. As the CCC notes it is a limit that should be kept under review, to allow for policy changes and new information about technology and abatement in different sectors.

4.9 The other end of the range assumes action to tackle emissions from this international industry seeks the most globally economic efficient approach without reference to national boundaries or other concerns that characterise current international negotiations. The future will almost certainly lie between these two points, for example the agreement to inclusion of aviation emissions in the EU emissions trading system, but also the adverse international reactions to its full implementation.

4.10 Detailed descriptions of how passenger demand and ATM forecasts are converted into CO_2 emissions forecasts are given in the last published DfT forecasts.[43] These forecasts also outline how the UK passenger aircraft fleet evolves over the forecast period and give baseline assumptions for the fuel efficiency of new aircraft, operational practices, biofuel uptake and behavioural change. These base assumptions, which reflected the work of the CCC in 2009, have been retained for the Commission's CO_2 forecasting.

Carbon-traded and carbon capped

4.11 The process for determining carbon-traded and carbon capped demand forecasts are unchanged from that described in the Interim Report.[44] In the carbon-traded case, carbon prices are based on the recommended traded values provided by DECC for use in policy appraisals. As described above, is assumed that the CO_2 emissions from flights to and from the UK would be covered by the EU ETS until at least 2030 and covered by a global carbon market beyond then.

4.12 In the carbon capped case, the target emissions level (37.5Mt CO_2 in 2050 from departing flights) is assumed to be met solely by increasing fares and reducing demand until the carbon cap is met. This is implemented by increasing the carbon price over and above that assumed in the carbon-traded case. It is assumed, consistent with a global carbon trading scheme, that all airports including overseas hubs face, the same carbon price.[45]

4.13 **Figure 4.1** shows that in the *assessment of need* scenario for the baseline of no additional capacity the price of CO_2e[46] would have to rise from the DECC central value of £36/tonne to £62/tonne in 2030 and from £196/tonne to £334/tonne in 2050 in order to limit UK departing emissions to 37.5Mt of CO_2e in 2050.

43 See DfT UK Aviation forecasts, January 2013, Chapter 3.

44 See, in particular, section 5 of Appendix 3.

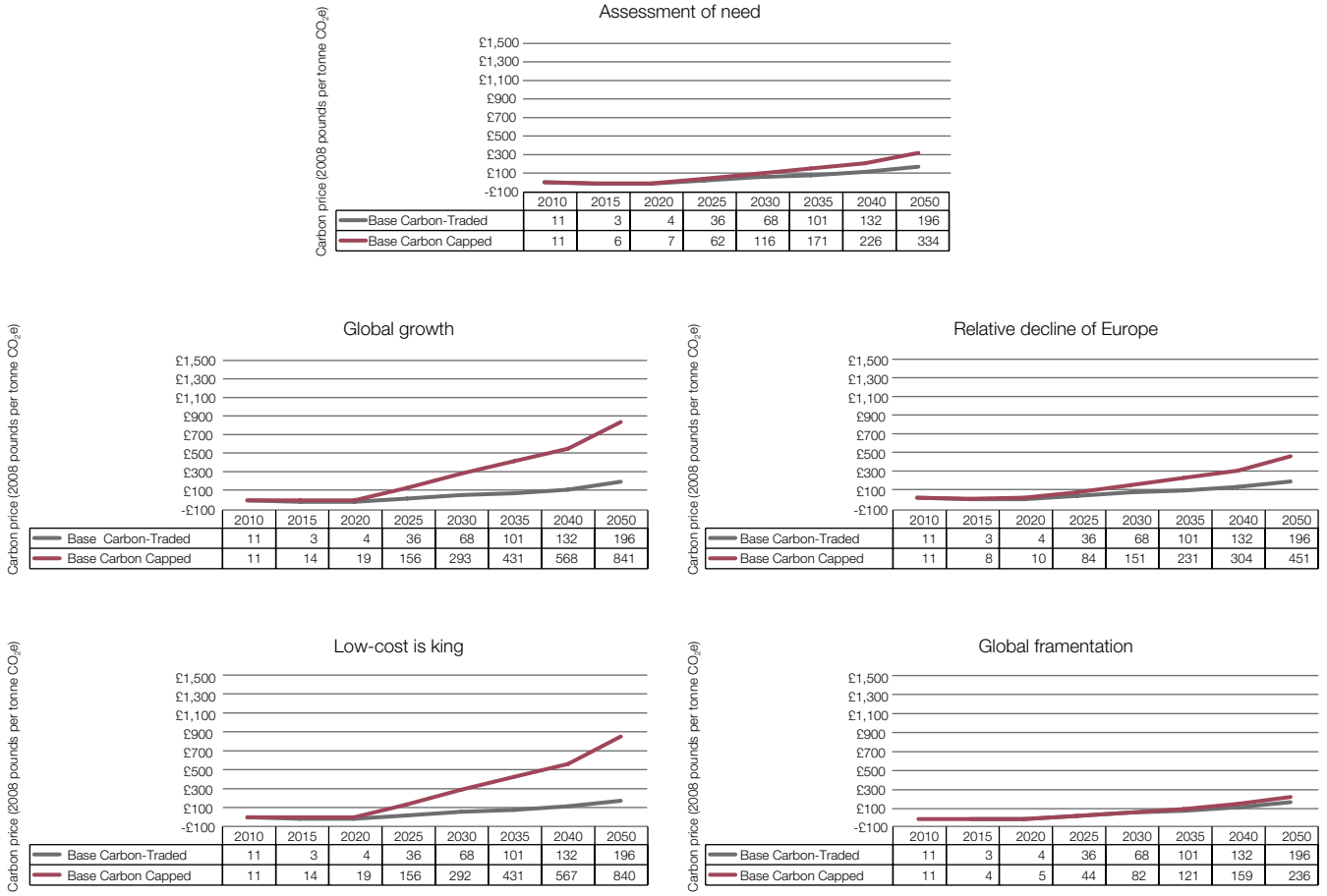
45 Except for demand scenario *global fragmentation*.

46 Multiply these figures by 44/12 to convert to carbon price units.

4.14 **Figure 4.1** also shows that in the *global fragmentation* scenario only a relatively small increase from £196/tonne to £236/tonne by 2050 is required to meet the cap target in 2050. While in *global growth* and *low-cost is king* increases from £196/tonne to just over £840/tonne by 2050 are required to meet the capping target.

4.15 The profile of carbon prices in the scenarios is similar up to 2020, because the absolute carbon price is low, and the same proportionate change is applied to the carbon price in all years.

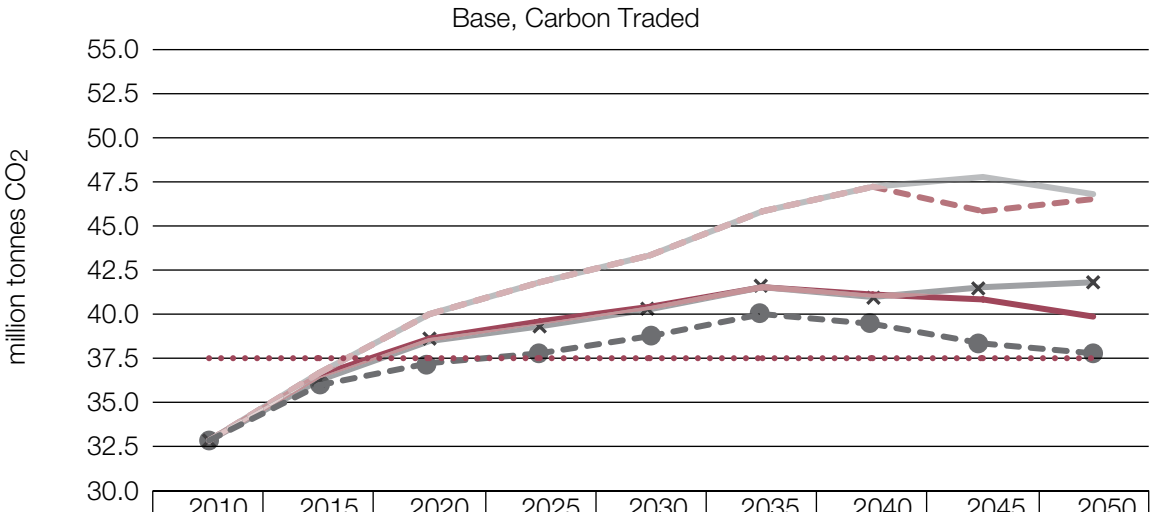
Figure 4.1: Base option CO_2e price required to cap to 37.5Mt in 2050



CO_2 emission forecasts

4.16 **Figure 4.2** shows the CO_2 emissions forecasts before the carbon capping through pricing is applied. Even on the basis of the new forecasts, and with runway capacity remaining constrained, some additional measures would still be required to keep 2050 emissions to 2005 levels in all demand scenarios – although the increase required in *global fragmentation* (as shown in **Figure 4.1**) is minimal.

Figure 4.2: Departing UK CO_2 forecasts without a carbon cap



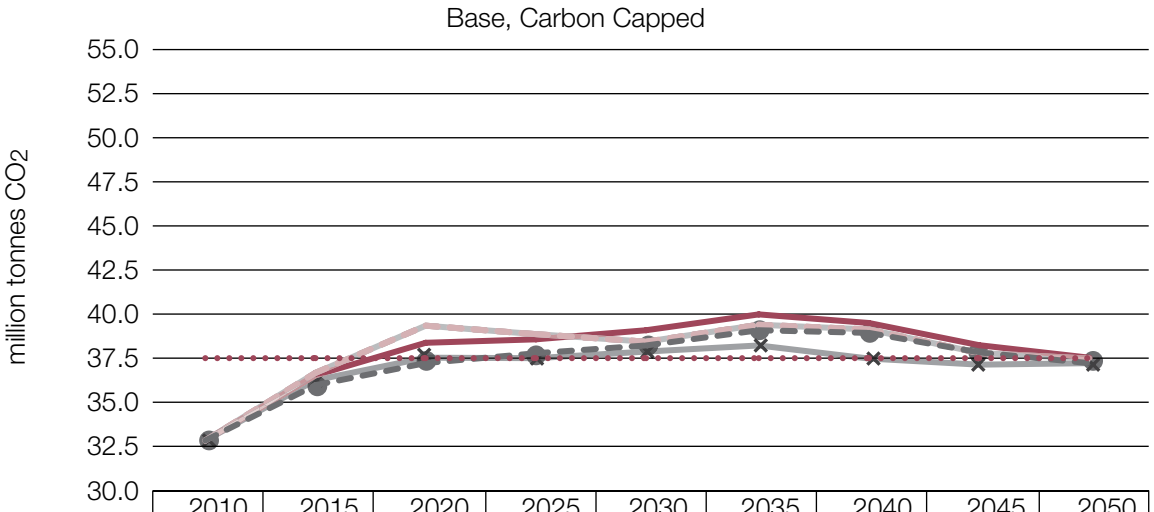
	2010	2015	2020	2025	2030	2035	2040	2045	2050
Assessment of need	32.8	36.5	38.6	39.5	40.4	41.5	41.1	40.8	39.9
Global growth	32.8	36.7	40.0	41.8	43.3	45.8	47.2	45.8	46.6
Relative decline of Europe	32.8	36.3	38.5	39.3	40.3	41.6	41.0	41.5	41.8
Low-cost in king	32.8	36.7	40.0	41.8	43.3	45.8	47.2	47.7	46.8
Global fragmentation	32.8	36.0	37.3	37.8	38.8	40.0	39.4	38.4	37.8
Target	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5

4.17 **Figure 4.3** shows the effect of increasing carbon prices to achieve the carbon cap and demonstrates that the forecasts end within 0.1Mt of the 2050 target in all demand scenarios. In each demand scenario the 37.5MtCO_2 target level is exceeded before the target is achieved in 2050. This is primarily because only towards the end of the model period does the rate of fuel efficiency improvement per passenger kilometre from fleet modernisation and turnover significantly start to exceed the rate of passenger demand growth.

4.18 The total emissions in the years up to 2050 would be lowest in the *relative decline of Europe* demand scenario. This is largely because some of the emissions would be exported to Middle East hubs.[47] *Low-cost is king* is the next lowest because this scenario tends to promote lower emitting short-haul air travel.

47 Airports Commision Interim Report Appendix 3, December 2013, pp. 72-74 discusses the export or 'leakage' of carbon from the UK inventory. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/266670/airports-commission-interim-report-appendix-3.pdf

Figure 4.3: Departing UK CO_2 forecasts with carbon capping



	2010	2015	2020	2025	2030	2035	2040	2045	2050
Assessment of need	32.8	36.5	38.5	38.8	39.2	40.1	39.5	38.4	37.5
Global growth	32.8	36.7	39.6	39.0	38.5	39.4	38.9	37.9	37.6
Relative decline of Europe	32.8	36.3	38.0	37.7	38.0	38.6	37.9	37.2	37.4
Low-cost in king	32.8	36.7	39.6	39.0	38.5	39.3	38.9	37.8	37.5
Global fragmentation	32.8	36.0	37.3	37.8	38.5	39.7	39.2	38.1	37.5
Target	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5

4.19 The new forecasts show that with carbon price used to cap emissions to the 2005 level of 37.5MtCO_2, the 2005 level of passenger numbers in an unconstrained capacity case could rise by 62%-78% depending on the demand scenario. Over the same period ATMs with unconstrained capacity could grow by 11%-29% depending on scenario.[48] As discussed in paragraph 2.13, unconstrained capacity everywhere in the UK is a somewhat artificial modelling construct. In the constrained capacity development options reported in **Chapter 6**, passenger numbers in 2050 could increase by 50%-71% above their 2005 level and ATMs by between 11% and 28% with a carbon cap in place.

48 Scenario *global fragmentation*, which discourages more long-haul flying would see the greatest growth in passenger numbers as long-haul flights are replaced by more short-haul flights. Conversely scenario *global growth* would see the lowest increase in passenger numbers, because in this scenario passengers are flying further.

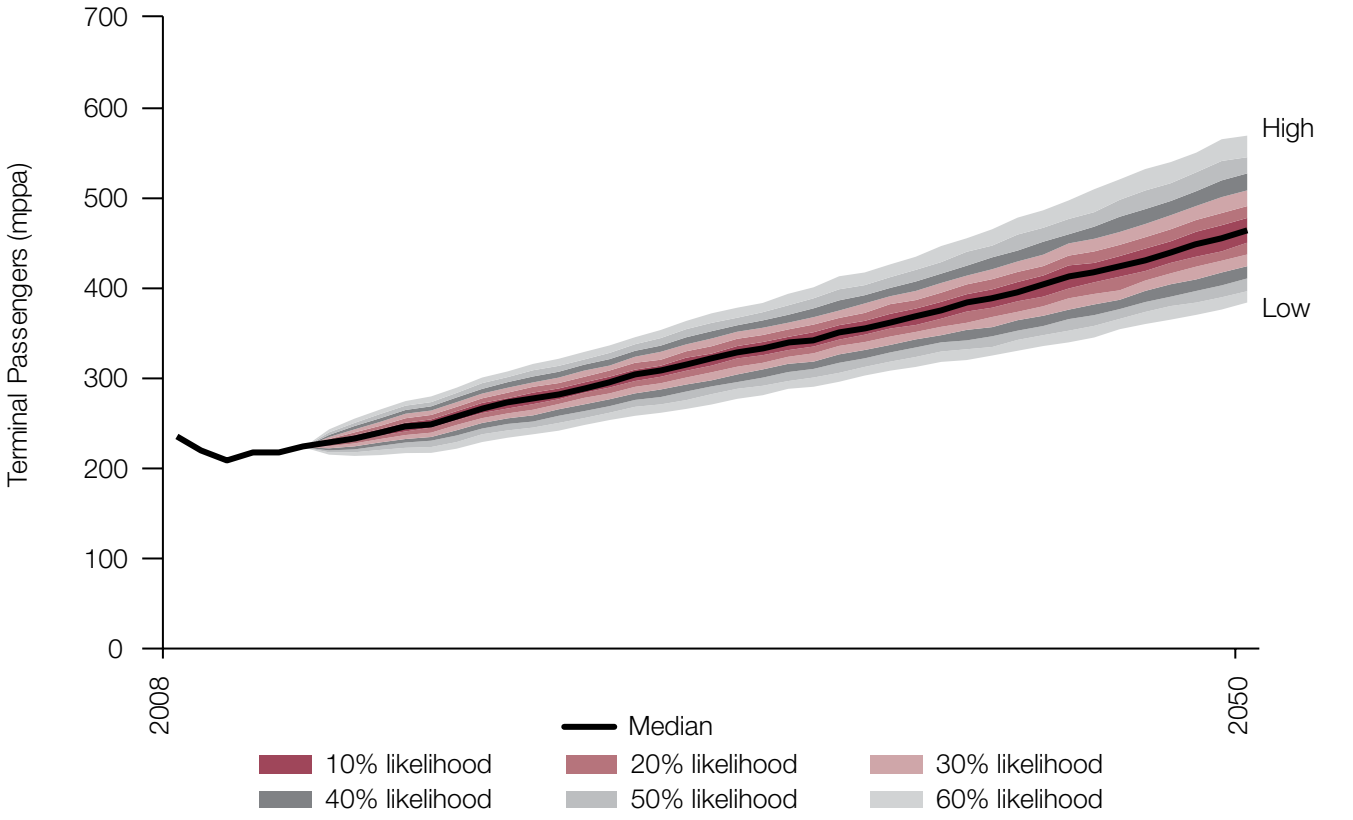
5. The national baseline

5.1 This section sets out the Commission's forecasts of underlying passenger demand in the absence of capacity constraints. Then capacity constraints are introduced to update the forecasts presented in the Interim Report for the case where no new runway capacity is provided (the 'Do Minimum'). In both cases, the forecasts are presented for all scenarios.

National demand

5.2 **Figure 5.1** shows the *assessment of need* forecasts with the full 60% confidence range and intermediate confidence interval forecasts output by the Monte Carlo analysis. The Monte Carlo approach to uncertainty is described in **Chapter 2**. These national forecasts are the equivalent to the capacity unconstrained case in the Interim Report. For the carbon-traded case, unconstrained terminal passenger demand in 2050 lies in the range 385 million to 575 million, with a central forecast of 470 million. The range represents a 60% confidence level. For the carbon capped case, the forecast of unconstrained terminal passenger demand is 370 million, i.e. below the 'low' carbon-traded forecast by 2050.

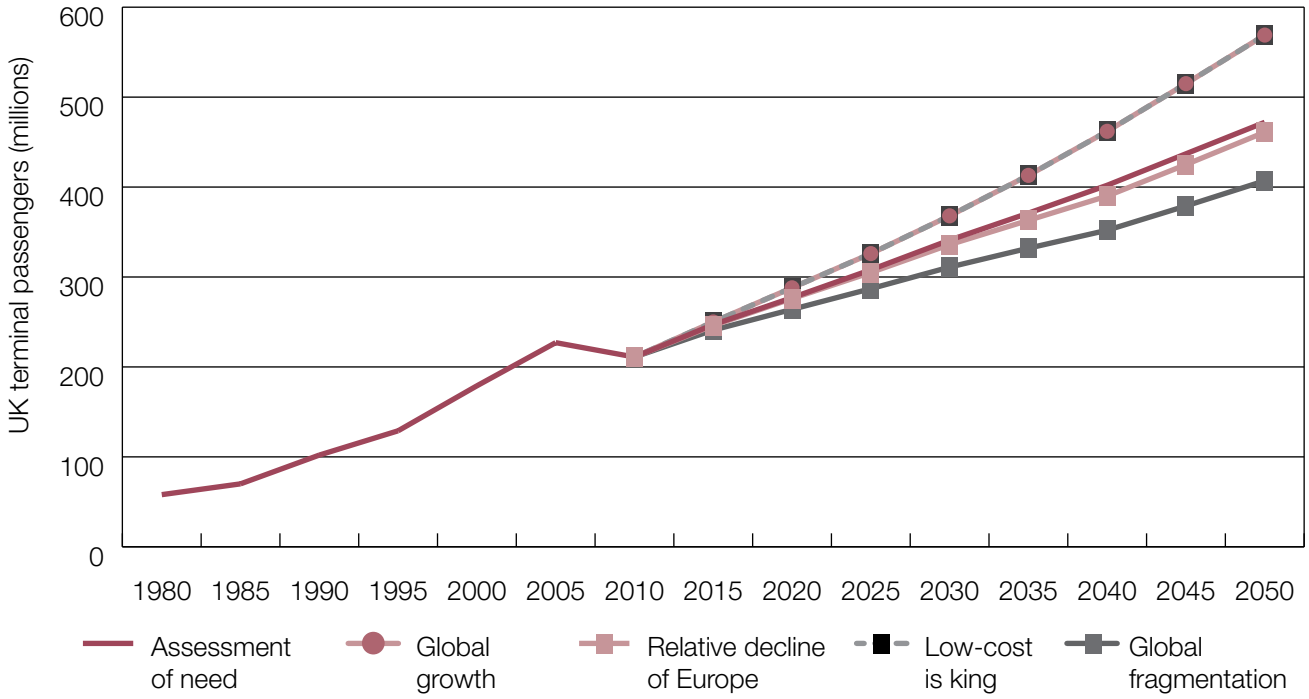
Figure 5.1: Unconstrained capacity and low-high *assessment of need* demand range fan chart



5.3 It is not possible to present a range around the carbon capped forecasts because the methodology employed is to find a level of the carbon price which drives down flights to a level which limits CO_2 emissions to 37.5Mt. This methodology precludes all but the narrowest of ranges and is unsuited to assessment through the Monte Carlo technique**.**

5.4 **Figure 5.2** shows the forecasts for all five scenarios under the carbon-traded case. Unconstrained terminal passenger demand in 2050 lies in the range 430 million in the *global fragmentation* scenario, to 570 million in the *global growth* and *low-cost is king* scenarios. These forecasts are identical for the baseline option with no new capacity and the lines charted on Figure 5.2 are therefore overlaid. In the carbon capped case, demand lies in the narrower range of 342 million to 407. When capacity is constrained the scenarios which favour long-haul travel lose more passengers than those which favour short-haul.

Figure 5.2: Unconstrained capacity demand range under all five demand scenarios in the carbon-traded case



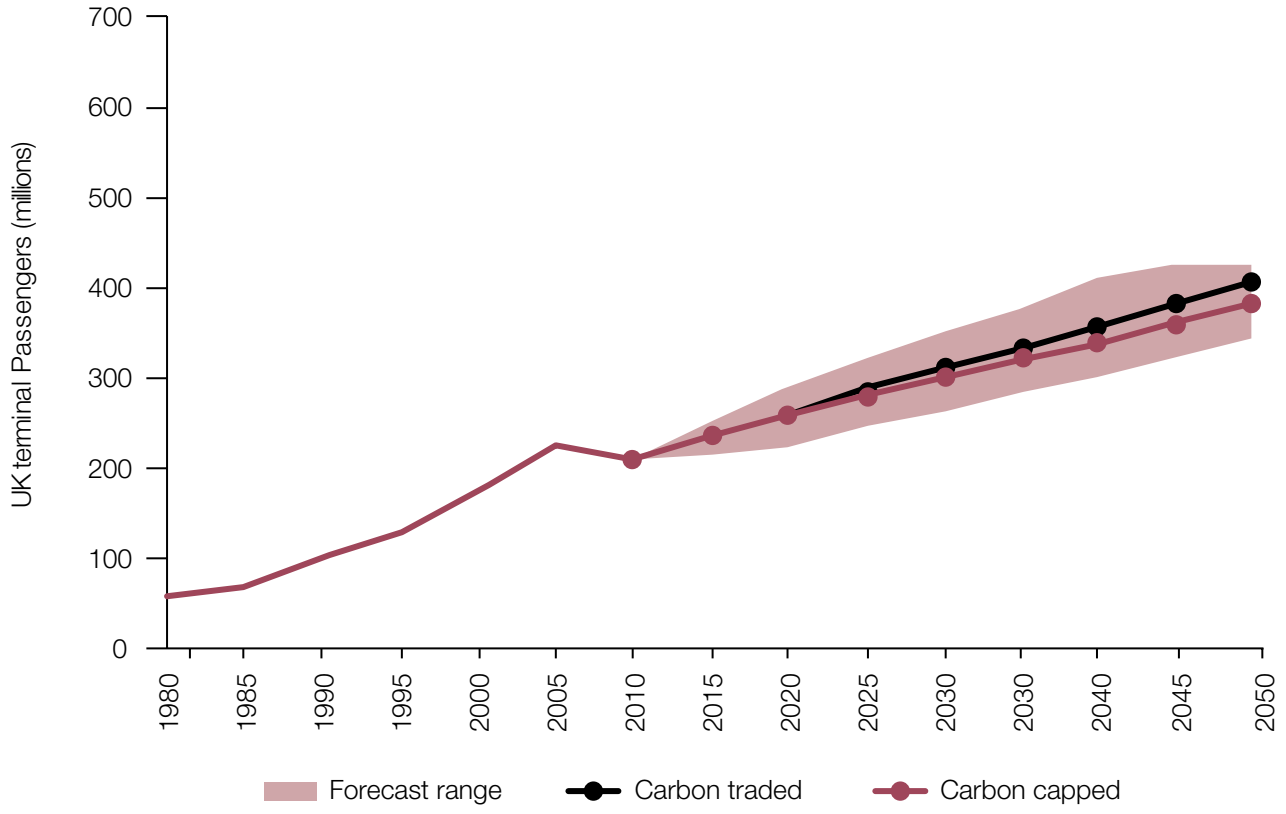
5.5 At the airport level unconstrained capacity everywhere in the UK is a somewhat artificial modelling construct used principally for diagnostics rather than a real world representation. With unlimited terminal and runway capacity at all modelled airports no shadow costs are applied anywhere and no demand is suppressed. Given the theoretical nature of such unconstrained forecasts, they are only used to provide a broad estimate of national demand for aviation in the UK rather than a realistic forecast of demand at individual airports. For assessing specific airport development options, even those providing significant capacity, forecasts where all airports are constrained to capacity provide a

more realistic representation of the future under the different demand scenarios (see also paragraph 2.13).

Base constrained national demand

5.6 As **Figure 5.3** shows, the *assessment of need* UK terminal passenger demand range narrows to 350 million to 425 million by 2050 with a central value of 410 million when capacity constraints are applied and no new runway capacity is added. This compares with a range of 350 million to 450 million with a central value of 400 million in the Interim Report. The high range forecasts are close to those of the central *assessment of need* forecast but this is because they are for a forecast year of 2042 rather than 2050. The allocation model NAPAM cannot find a solution which fits all the passenger demand into the available capacity in this combination of high demand and no new runway capacity. So the NAPAM passenger to airport constrained allocation process terminates in 2042.[49]

Figure 5.3: Constrained capacity and low-high demand range *assessment of need* demand range



49 The Interim Report showed a high range forecast of 450 mppa for the high demand case. This is because runs continued further to 2045 for these forecasts.

Baseline airport passenger demand forecasts with capacity timelines

5.7 **Table 5.1** and **Table 5.2** show airport forecasts for all five scenarios (carbon-traded and carbon capped) for the base ('maximum use of existing runways') case where no capacity is added. These forecasts are equivalent to the base forecasts in the Interim Report except:

- there have since been a number of relatively minor updates to the model described in **Chapter 2**;
- input parameters and some base capacities have been brought up to date as described in **Chapter 3**; and,
- there have been some updates to the scenarios introduced in **Chapter 1** and described further in **Chapter 3**.

5.8 **Table 5.1** and **Table 5.2** below show terminal passengers per annum for 2030, 2040 and 2050. The tables separately report the five London airports, the nine largest regional airports and the four modelled overseas hubs. The remaining 17 UK airports (although separately modelled) are grouped. The timelines show when runway capacity at the five London airports is exhausted in red, with amber indicating less than 10% capacity remaining.

5.9 The shadow cost state marked in red on the timeline could be triggered by a runway or terminal constraint. In the case of Heathrow and Gatwick this will be a runway constraint (as they have unlimited terminal capacity in the modelling). But Stansted, Luton and London City can and do incur either a runway or terminal capacity shadow cost depending on scenario and option. When airports incur terminal shadow costs they can be shown as going straight from green to red in the timeline figures.

Table 5.1: Base terminal passenger forecasts (mppa), carbon-traded[50]

Carbon-traded		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Base	**2011**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**
Heathrow	70	85	90	95	87	96	91	84	89	100	87	96	91	84	87	94
Gatwick	34	42	46	47	44	47	45	44	47	46	44	47	45	42	45	46
Stansted	18	35	35	35	35	35	35	34	35	35	35	35	35	30	35	35
Luton	10	14	18	18	18	18	18	14	18	18	18	18	18	14	18	18
London City	3	8	7	7	7	7	8	8	8	8	7	7	8	8	8	7
London	135	184	196	203	191	204	197	183	197	206	191	204	197	178	193	200
London annual growth rate			0.6%	0.4%		0.6%	-0.3%		0.7%	0.5%		0.6%	-0.3%		0.8%	0.4%
Manchester	20	33	42	53	36	48	56	33	40	51	36	48	55	32	40	51
Birmingham	8	12	17	24	14	24	34	12	18	24	14	24	34	11	16	23
Glasgow	7	8	9	11	9	11	14	9	10	11	9	11	14	8	9	10
Edinburgh	9	14	16	20	15	18	20	14	16	19	15	18	20	14	16	19
Bristol	6	7	10	12	8	12	12	8	10	12	8	12	12	7	9	12
Newcastle	4	6	7	8	6	8	12	6	8	9	6	8	12	5	6	8
Belfast International	4	6	8	8	7	7	9	6	8	8	7	7	9	6	7	9
Liverpool	5	8	9	8	8	10	15	8	10	10	8	10	15	8	9	9
East Midlands	4	7	10	14	8	13	14	7	10	14	8	13	14	7	10	12
Other modelled UK	16	27	36	49	30	47	74	28	36	52	30	47	75	26	33	45
Non-London annual growth rate			2.4%	2.4%		3.4%	2.8%		2.4%	2.5%		3.4%	2.8%		2.2%	2.4%
UK Total	**218**	**314**	**360**	**411**	**332**	**401**	**457**	**313**	**362**	**418**	**332**	**401**	**458**	**302**	**347**	**397**
UK annual growth rate			1.4%	1.3%		1.9%	1.3%		1.5%	1.5%		1.9%	1.3%		1.4%	1.3%
Paris CDG	58	83	99	119	93	119	125	83	97	117	93	119	124	79	93	109
Amsterdam	41	59	70	90	67	102	125	71	96	120	67	102	124	55	65	76
Frankfurt	53	81	103	114	98	113	117	70	79	97	98	113	117	67	79	100
Dubai	45	100	124	160	118	168	266	114	151	200	118	168	267	92	112	141
Foreign Hubs Total	**198**	**323**	**395**	**483**	**375**	**502**	**632**	**337**	**423**	**534**	**375**	**502**	**633**	**292**	**348**	**426**
Foreign hub annual growth rate			2.0%	2.0%		2.9%	2.3%		2.3%	2.4%		2.9%	2.3%		1.8%	2.0%

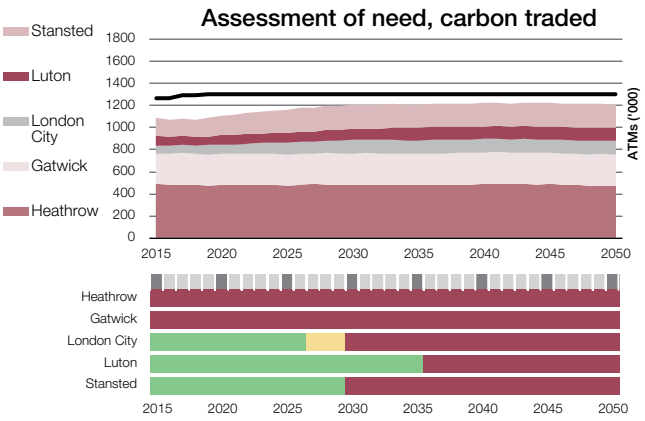
5.10 In the baseline where no extra capacity is added *global growth* and *low-cost is king* scenarios are at the high end in terms of national passenger demand and *global fragmentation* at the low end. The London system is severely constrained in the 'do minimum', with Gatwick and Heathrow full under every scenario. The airports continue to grow passenger numbers slightly despite their runway constraints, through larger planes and higher load factors.

50 Note that all 2011 passenger data shown in the tables is from the base year validated model outputs.

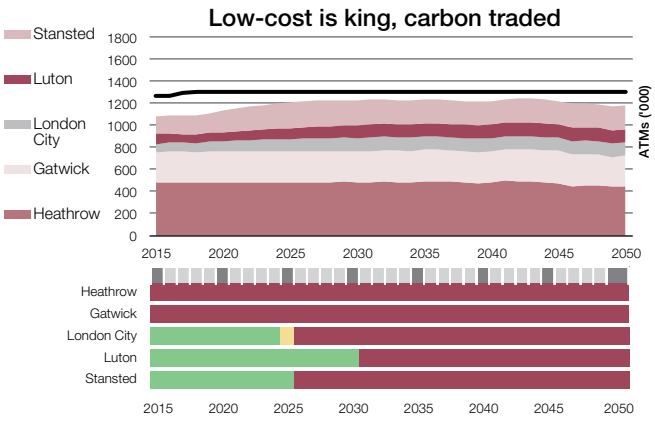
Figure 5.4: Base, timelines of runway (ATM) capacity used, carbon-traded

Base Timeline to full capacity

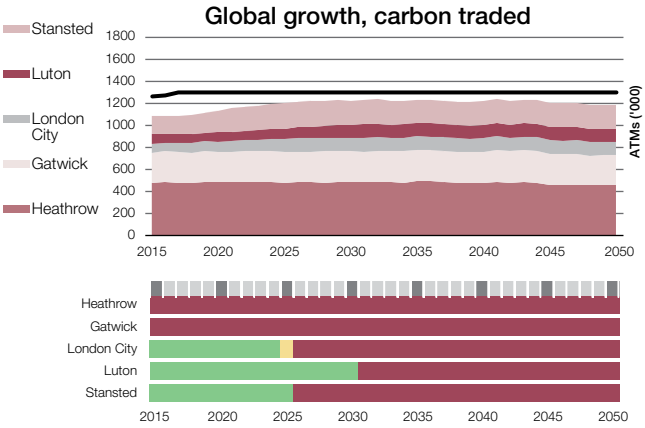
Assessment of need



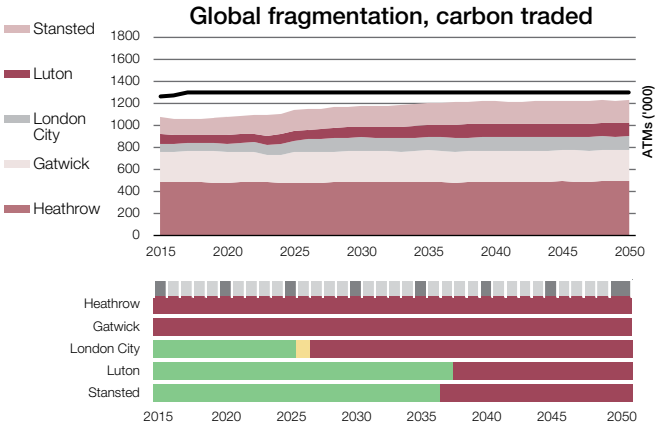
Low-cost is king



Global growth



Global fragmentation



Relative decline of Europe

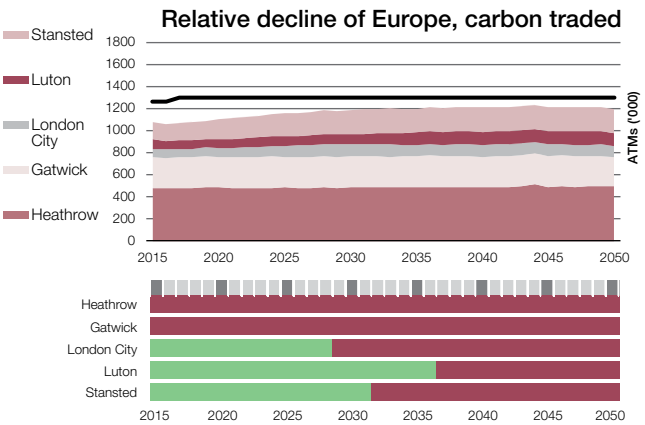


Table 5.2: Base terminal passenger forecasts (mppa), carbon capped and capacity usage timeline

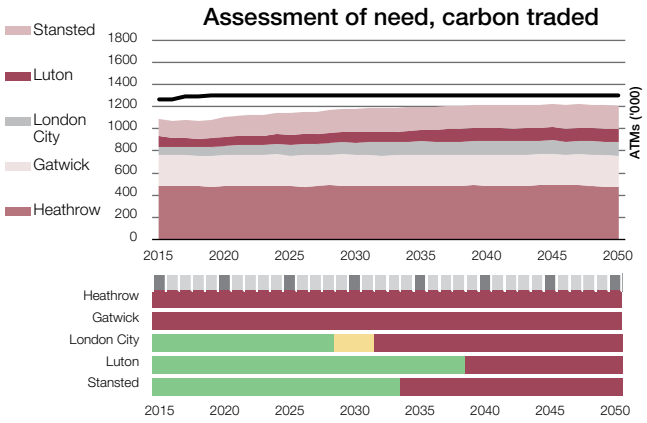
Carbon capped		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Base	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	70	85	89	94	86	90	97	84	87	97	86	91	96	83	87	94
Gatwick	34	41	44	47	41	44	45	42	45	47	41	44	44	42	45	46
Stansted	18	34	35	35	30	35	35	29	35	35	30	35	35	30	35	35
Luton	10	14	18	18	12	14	18	13	16	18	12	15	18	14	18	18
London City	3	7	7	7	6	7	8	7	7	7	6	7	8	7	7	7
London	135	180	193	201	175	191	202	174	190	205	175	191	201	176	193	201
London annual growth rate			0.7%	0.4%		0.9%	0.6%		0.9%	0.8%		0.9%	0.5%		0.9%	0.4%
Manchester	20	32	39	46	30	36	44	31	36	45	30	36	44	32	39	49
Birmingham	8	11	14	22	10	10	14	10	12	15	10	10	14	11	15	22
Glasgow	7	8	9	10	8	8	10	8	8	10	8	8	10	8	9	10
Edinburgh	9	14	16	18	13	14	17	13	15	17	13	14	17	14	16	18
Bristol	6	7	9	11	6	7	9	7	9	11	6	7	9	7	9	12
Newcastle	4	6	6	7	5	6	6	6	7	8	5	6	6	5	6	7
Belfast International	4	6	7	8	6	7	7	6	7	7	6	7	7	6	7	8
Liverpool	5	7	8	8	7	7	6	7	9	8	7	8	7	8	9	8
East Midlands	4	7	9	11	6	8	9	7	8	9	6	8	9	7	9	12
Other modelled UK	16	25	32	43	22	26	35	24	29	39	22	26	36	26	33	45
Non-London annual growth rate			1.9%	2.2%		1.5%	2.0%		1.6%	2.0%		1.4%	2.1%		2.1%	2.4%
UK Total	**218**	**303**	**341**	**386**	**287**	**321**	**361**	**293**	**329**	**374**	**287**	**321**	**361**	**299**	**344**	**393**
UK annual growth rate			1.2%	1.2%		1.1%	1.2%		1.2%	1.3%		1.1%	1.2%		1.4%	1.3%
Paris CDG	58	81	94	110	79	94	115	76	86	103	79	94	115	79	93	109
Amsterdam	41	57	65	77	56	65	81	61	76	94	56	65	81	55	65	76
Frankfurt	53	76	95	114	78	101	116	60	64	78	78	102	116	66	78	99
Dubai	45	97	118	148	102	132	175	101	129	171	102	132	175	92	111	141
Foreign Hubs Total	**198**	**310**	**371**	**451**	**315**	**392**	**487**	**298**	**356**	**445**	**315**	**392**	**487**	**292**	**347**	**424**
Foreign hub annual growth rate			1.8%	2.0%		2.2%	2.2%		1.8%	2.3%		2.2%	2.2%		1.7%	2.0%

5.11 With a carbon cap in place national demand is reduced across all scenarios, particularly *global growth* and *low-cost is king*, with reductions of 96 milllion and 97 million passengers respectively. The London system remains constrained.

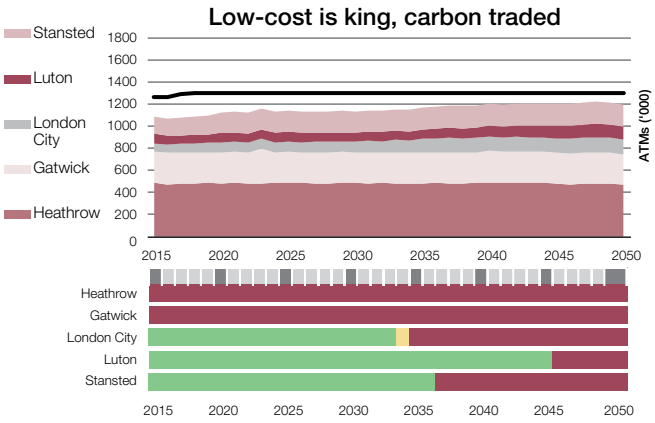
Figure 5.5: Base, timelines of runway (ATM) capacity used, carbon capped

Base Timeline to full capacity

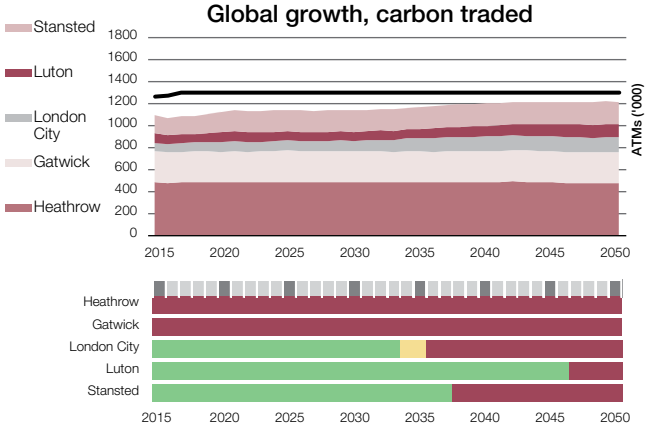
Assessment of need



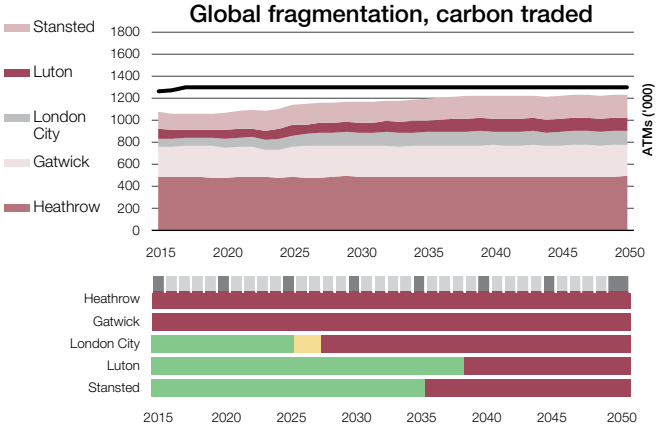
Low-cost is king



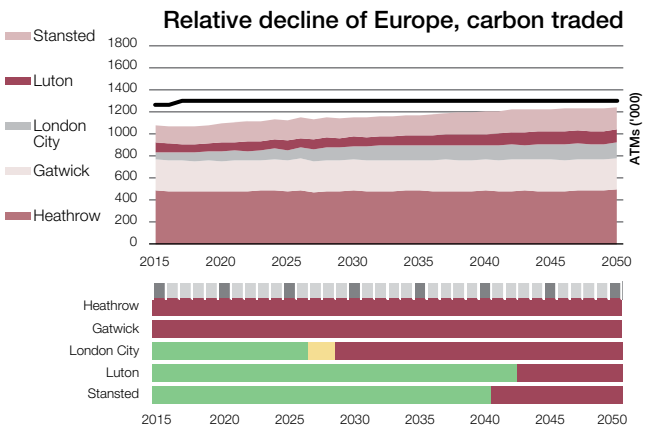
Global growth



Global fragmentation



Relative decline of Europe



5.12 The low-high range of airport throughput forecasts for the *assessment of need* scenario is shown in **Appendix 3**. It should be noted that as described in paragraph 5.6, for the high range the NAPAM model runs cannot continue beyond 2042, so no 2050 forecasts are shown. As described earlier, range forecasts are only available for the carbon-traded demand scenario.

5.13 The passenger forecasts and the capacity timelines shown above suggest a steady and then sharply deteriorating passenger experience as the UK appears to be reaching the limits of the air travel that can be made with the existing airport infrastructure.

5.14 Passengers at Heathrow already suffer from a high level of delay and unreliability, as a result of capacity constraints limiting the airport's day-to-day efficiency and its ability to respond to one-off events. These issues not only affect passengers, but also limit the airport's ability to offer predictable patterns of respite from noise for local communities.

5.15 As other airports reach capacity, similar impacts can be foreseen at the other London airports and congestion could spill out to affect other airports in southern England and Birmingham.

5.16 In terms of connectivity in the 'do minimum', all London airports will suffer from a lack of opportunity to establish new routes to emerging economies. And the number of domestic routes to these airports is forecast to decline, restricting access from other UK regions to London airport's network of international services.

5.17 The Commission's economic analysis in phase one concluded there is also likely to be a high cost to the wider economy or having a capacity constrained system, between £30 billion and £45 billion.[51]

5.18 The current approach of forcing ever greater volumes of traffic through the existing infrastructure, if continued, would therefore have increasingly detrimental effects on the national economy, businesses, and air passengers.

51 Wider economic costs, present values 2021-2080 in 2013 prices.

Long-haul share

Table 5.3: Base terminal passenger forecasts (mppa), long-haul/short-haul split, carbon-traded[52]

Base	2011														
	Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon-traded	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic
Heathrow	37.8	30.2	2.1	37.8	30.2	2.1	37.8	30.2	2.1	37.8	30.2	2.1	37.8	30.2	2.1
Gatwick	6.5	25.3	2.1	6.5	25.3	2.1	6.5	25.3	2.1	6.5	25.3	2.1	6.5	25.3	2.1
Other London	0.2	27.4	3.3	0.2	27.4	3.3	0.2	27.4	3.3	0.2	27.4	3.3	0.2	27.4	3.3
London Total	**44.5**	**83.0**	**7.5**	**44.5**	**83.0**	**7.5**	**44.5**	**83.0**	**7.5**	**44.5**	**83.0**	**7.5**	**44.5**	**83.0**	**7.5**
Regional Total	**9.8**	**52.9**	**20.1**	**9.8**	**52.9**	**20.1**	**9.8**	**52.9**	**20.1**	**9.8**	**52.9**	**20.1**	**9.8**	**52.9**	**20.1**
National Total	**54.3**	**135.9**	**27.6**	**54.3**	**135.9**	**27.6**	**54.3**	**135.9**	**27.6**	**54.3**	**135.9**	**27.6**	**54.3**	**135.9**	**27.6**
							2030								
Heathrow	49.3	34.8	1.4	51.9	34.6	1.0	47.1	34.8	1.6	51.9	34.6	1.0	46.5	36.0	1.5
Gatwick	8.2	32.1	2.1	10.7	31.2	1.8	10.6	31.1	2.0	10.7	31.2	1.8	7.5	32.4	2.0
Other London	2.1	47.8	6.8	2.0	49.9	7.8	1.6	47.7	6.6	2.0	49.9	7.8	1.2	44.5	6.2
London Total	**59.6**	**114.7**	**10.2**	**64.6**	**115.6**	**10.6**	**59.3**	**113.6**	**10.3**	**64.6**	**115.6**	**10.6**	**55.2**	**113.0**	**9.7**
Regional Total	**15.3**	**84.6**	**29.1**	**17.7**	**92.2**	**31.1**	**16.3**	**84.7**	**29.1**	**17.7**	**92.2**	**31.1**	**13.9**	**82.7**	**27.5**
National Total	**74.9**	**199.3**	**39.3**	**82.4**	**207.9**	**41.8**	**75.5**	**198.3**	**39.3**	**82.4**	**207.9**	**41.8**	**69.1**	**195.6**	**37.2**
							2040								
Heathrow	54.6	34.8	1.0	63.5	31.4	1.1	52.0	35.8	1.0	63.5	31.4	1.1	50.0	36.4	0.9
Gatwick	9.4	34.8	2.0	11.4	33.8	1.9	12.9	32.2	1.8	11.4	33.8	1.9	8.6	34.0	2.1
Other London	1.2	50.2	8.3	0.6	50.6	9.1	0.9	51.9	8.5	0.6	50.6	9.1	1.1	52.2	7.5
London Total	**65.2**	**119.9**	**11.2**	**75.5**	**115.9**	**12.2**	**65.7**	**119.9**	**11.3**	**75.5**	**115.9**	**12.2**	**59.7**	**122.6**	**10.5**
Regional Total	**20.2**	**108.8**	**34.5**	**26.2**	**133.2**	**38.3**	**22.8**	**107.9**	**34.5**	**26.2**	**133.2**	**38.3**	**17.8**	**105.1**	**31.8**
National Total	**85.3**	**228.7**	**45.7**	**101.8**	**249.0**	**50.4**	**88.5**	**227.9**	**45.8**	**101.8**	**249.0**	**50.4**	**77.5**	**227.6**	**42.3**
							2050								
Heathrow	62.7	31.1	1.1	60.4	29.2	1.4	65.2	33.6	1.1	61.9	27.8	1.3	56.1	36.4	1.1
Gatwick	10.9	34.5	2.0	12.3	30.1	2.7	13.7	29.9	2.1	12.3	30.0	2.7	9.8	34.1	2.3
Other London	0.0	51.2	9.9	0.0	50.5	10.6	0.0	50.9	9.9	0.0	50.5	10.6	0.0	51.9	8.4
London Total	**73.6**	**116.8**	**13.0**	**72.6**	**109.8**	**14.7**	**78.9**	**114.4**	**13.1**	**74.2**	**108.4**	**14.6**	**65.9**	**122.4**	**11.8**
Regional Total	**27.5**	**138.3**	**41.3**	**49.7**	**163.9**	**46.0**	**31.3**	**139.3**	**41.3**	**48.2**	**166.5**	**46.2**	**24.1**	**135.1**	**37.4**
National Total	**101.2**	**255.0**	**54.3**	**122.4**	**273.7**	**60.6**	**110.2**	**253.7**	**54.4**	**122.3**	**274.9**	**60.8**	**90.0**	**257.4**	**49.2**

5.19 With no significant scope for further market growth in the London airport system, the forecasts suggest that Gatwick's passenger split would remain broadly one quarter long-haul and three quarters short-haul and domestic, although a marginal increase in the long-haul proportion would be seen over time as demand spills over from a constrained Heathrow. At present around 20% of Gatwick passengers are taking long-haul flights, so ther will be an increase in this proportion as increasing pressure on the single runway displaces more marginal leisure traffic on smaller aircraft. The peak long-haul share is 30% by 2050 in the *relative decline of Europe scenario.*

52 Note that all 2011 passenger data shown in the tables is from the base year validated model outputs.

5.20 At present around 55% of Heathrow's passengers take long-haul flights. With no further expansion this proportion is expected to grow and by 2050 would constitute approximately two thirds of all Heathrow traffic. Long-haul requires a short-haul and domestic feed, but such routes operated by smaller aircraft find it ever harder to secure or maintain their slots because of the increasing premium on runway slots. So despite an increasing share of long-haul, it will increasingly be point-to-point long-haul traffic and Heathrow's role as a hub for transfer traffic will be steadily eroded in the 'do minimum'.

Table 5.4: Base terminal passenger forecasts (mppa), long-haul/short-haul split, carbon capped

Base															2011
	Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon capped	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic
Heathrow	37.8	30.2	2.1	37.8	30.2	2.1	37.8	30.2	2.1	37.8	30.2	2.1	37.8	30.2	2.1
Gatwick	6.5	25.3	2.1	6.5	25.3	2.1	6.5	25.3	2.1	6.5	25.3	2.1	6.5	25.3	2.1
Other London	0.2	27.4	3.3	0.2	27.4	3.3	0.2	27.4	3.3	0.2	27.4	3.3	0.2	27.4	3.3
London Total	**44.5**	**83.0**	**7.5**	**44.5**	**83.0**	**7.5**	**44.5**	**83.0**	**7.5**	**44.5**	**83.0**	**7.5**	**44.5**	**83.0**	**7.5**
Regional Total	**9.8**	**52.9**	**20.1**	**9.8**	**52.9**	**20.1**	**9.8**	**52.9**	**20.1**	**9.8**	**52.9**	**20.1**	**9.8**	**52.9**	**20.1**
National Total	**54.3**	**135.9**	**27.6**	**54.3**	**135.9**	**27.6**	**54.3**	**135.9**	**27.6**	**54.3**	**135.9**	**27.6**	**54.3**	**135.9**	**27.6**
							2030								
Heathrow	48.6	34.8	1.5	50.1	34.4	1.2	45.7	35.4	2.4	50.1	34.4	1.2	46.1	35.6	1.6
Gatwick	7.9	31.2	2.0	8.0	30.3	2.1	9.7	30.4	2.2	8.0	30.3	2.1	7.4	32.2	2.0
Other London	2.0	45.9	6.4	1.9	40.3	6.1	1.2	41.9	5.2	1.9	40.3	6.1	1.2	44.2	6.1
London Total	**58.5**	**111.9**	**10.0**	**60.1**	**105.0**	**9.5**	**56.6**	**107.7**	**9.8**	**60.1**	**105.1**	**9.5**	**54.7**	**112.1**	**9.6**
Regional Total	**14.5**	**80.1**	**28.1**	**14.1**	**71.4**	**27.0**	**14.9**	**76.8**	**27.3**	**14.1**	**71.4**	**27.0**	**13.8**	**82.1**	**27.2**
National Total	**73.0**	**192.0**	**38.1**	**74.2**	**176.4**	**36.4**	**71.5**	**184.5**	**37.0**	**74.2**	**176.5**	**36.4**	**68.5**	**194.2**	**36.8**
							2040								
Heathrow	53.0	34.7	0.9	56.5	32.7	0.9	49.3	35.4	2.3	56.7	33.2	0.9	49.9	36.6	0.9
Gatwick	9.0	33.0	2.2	9.7	31.7	2.3	11.9	30.9	2.2	9.6	32.1	2.3	8.6	34.0	2.1
Other London	1.8	50.8	7.7	2.4	47.4	7.4	1.6	50.0	6.3	2.3	46.7	7.4	1.1	52.1	7.3
London Total	**63.8**	**118.5**	**10.8**	**68.6**	**111.8**	**10.5**	**62.8**	**116.2**	**10.8**	**68.7**	**112.1**	**10.5**	**59.6**	**122.7**	**10.4**
Regional Total	**18.5**	**97.1**	**32.7**	**17.9**	**81.0**	**31.0**	**19.5**	**88.5**	**31.2**	**17.8**	**80.6**	**31.0**	**17.5**	**103.1**	**31.3**
National Total	**82.2**	**215.6**	**43.6**	**86.5**	**192.8**	**41.5**	**82.2**	**204.7**	**42.0**	**86.5**	**192.7**	**41.6**	**77.1**	**225.7**	**41.7**
							2050								
Heathrow	61.0	31.4	1.1	66.8	28.8	1.0	60.5	33.9	2.2	66.6	28.5	1.0	56.2	36.6	1.0
Gatwick	10.5	33.9	2.2	11.3	31.5	2.3	14.5	30.9	2.0	11.2	31.1	2.1	9.8	34.1	2.3
Other London	0.0	51.5	9.2	2.1	49.6	8.9	0.4	52.3	8.0	2.0	49.6	9.1	0.0	52.4	8.3
London Total	**71.5**	**116.9**	**12.5**	**80.1**	**109.9**	**12.2**	**75.4**	**117.1**	**12.2**	**79.8**	**109.2**	**12.2**	**66.0**	**123.1**	**11.6**
Regional Total	**24.6**	**121.4**	**38.8**	**24.7**	**97.3**	**37.0**	**26.0**	**106.2**	**36.8**	**24.7**	**97.6**	**37.0**	**23.5**	**131.9**	**36.7**
National Total	**96.1**	**238.3**	**51.3**	**104.8**	**207.1**	**49.2**	**101.4**	**223.3**	**49.0**	**104.5**	**206.8**	**49.2**	**89.5**	**255.0**	**48.4**

5.21 When carbon is capped Gatwick's single runway remains constrained in all years and all demand scenarios. There is marginally less long-haul traffic at the airport in most future scenarios because adding sufficient carbon costs to passenger fares to meet the 37.5MtCO_2 target penalises longer flights. Nevertheless Gatwick still increases its long-haul share from the current 20% to between 21%-31% depending on the scenario.

5.22 Heathrow's two runways also remain constrained throughout the period. In such congested conditions, long-haul has a competitive advantage because it uses larger aircraft which lower the pass-through costs to passengers of using ever more expensive slots. So the carbon cap does not significantly dilute the long-haul share at Heathrow and it rises from the current 55% to between 60% – 70% with the airport successfully exploiting its dominant long-haul position in those demand scenarios such as *global growth and low-cost is king* which include strong economic growth in developing countries.

Journey purpose

5.23 **Table 5.5** (carbon-traded) and **Table 5.6** (carbon capped) below show how the journey purposes of baseline passengers at Heathrow and Gatwick, across London and nationally would vary between future demand scenario in 2030 and 2050 without any airport capacity expansion.[53]

5.24 Business travellers are forecast to make up between 15% and 17% of Gatwick's passengers in 2030 compared to 15% today. By 2050 with business passengers more willing to pay the higher costs of using the crowded airport the range widens to 7.2 million (*relative decline of Europe*) to 9.7 million (*low-cost is king*) and business passengers represent between 16% and 22% of Gatwick passengers.

5.25 The business component at the unexpanded Heathrow varies between 31% and 34% of all passengers in 2030 compared to the current proportion of 31%. By 2050 as fares and congestion continue to rise, depending on scenario, the business proportion continues to rise varying between 31% and 42% as more leisure passengers are forced to use less convenient airports, and transfer passengers, who are predominantly leisure, hub elsewhere.

5.26 Nationally today around 24% of all air passengers travel for business purposes. This varies between 25% for London as a whole and 21% for the other regional UK airports in total. By 2030 the national business proportion ranges between 22% and 24%. There is significant variation between scenarios for London as whole ranging in 2050 between 24% in global fragmentation to 34% in the most economically optimistic scenarios of *global growth* and *low-cost is king*. Outside London the other airports range in the much narrower band of 18% to 20% business passengers.

53 In interpreting the purpose split tables, it is assumed that the international-to-international transfer passengers (who are treated in the modelling as a separate purpose category) split 27% business and 73% leisure. This is the currently observed journey purpose split. It should also be noted that leisure passengers include the 'visiting friends and relatives' (VFR) journey purpose, though this is not identified separately.

Table 5.5: Base, journey purpose split, 2011, 2030 & 2050, million terminal passengers, carbon traded

Base	2011							
	UK Business	UK Leisure	Foreign Business	Foreign Leisure	Dom. Business	Dom. Leisure	I to I	Total
Carbon-traded	**Assessment of need**							
Heathrow	9.1	20.3	7.5	12.6	1.2	0.9	18.5	70.1
Gatwick	2.3	20.0	1.6	6.8	1.0	1.0	1.2	33.9
Other London	2.9	14.9	2.3	7.0	1.9	1.5	0.5	31.0
London Total	**14.3**	**55.2**	**11.4**	**26.5**	**4.1**	**3.4**	**20.2**	**135.0**
Regional Total	**4.6**	**46.1**	**3.0**	**8.9**	**10.2**	**9.9**	**0.2**	**82.8**
National Total	**18.8**	**101.3**	**14.4**	**35.3**	**14.3**	**13.3**	**20.4**	**217.8**
Base	**2030**							
	UK Business	UK Leisure	Foreign Business	Foreign Leisure	Dom. Business	Dom. Leisure	I to I	Total
Carbon-traded	**Assessment of need**							
Heathrow	12.7	25.8	9.7	16.3	0.8	0.6	19.6	85.5
Gatwick	3.4	25.9	2.4	7.7	0.9	1.2	0.9	42.3
Other London	4.5	30.0	3.6	11.1	4.0	2.8	0.7	56.6
London Total	**20.6**	**81.7**	**15.7**	**35.0**	**5.6**	**4.6**	**21.2**	**184.4**
Regional Total	**6.8**	**73.6**	**5.0**	**14.2**	**14.7**	**14.5**	**0.4**	**129.1**
National Total	**27.4**	**155.3**	**20.7**	**49.2**	**20.3**	**19.1**	**21.5**	**313.5**
	Global growth							
Heathrow	14.1	25.6	10.6	16.9	0.5	0.4	19.4	87.5
Gatwick	3.5	26.6	2.5	8.5	0.8	1.0	0.7	43.7
Other London	4.8	30.9	3.8	11.6	4.6	3.2	0.8	59.7
London Total	**22.4**	**83.1**	**16.9**	**36.9**	**6.0**	**4.7**	**20.8**	**190.9**
Regional Total	**7.6**	**80.6**	**5.5**	**15.9**	**15.8**	**15.4**	**0.3**	**141.1**
National Total	**30.1**	**163.8**	**22.4**	**52.8**	**21.7**	**20.0**	**21.1**	**332.0**
	Relative decline of Europe							
Heathrow	13.3	25.0	10.3	16.5	0.9	0.7	16.9	83.6
Gatwick	3.7	26.1	2.6	8.4	0.9	1.2	0.8	43.7
Other London	4.4	29.8	3.5	11.0	3.8	2.7	0.6	55.8
London Total	**21.4**	**80.9**	**16.4**	**35.8**	**5.6**	**4.6**	**18.3**	**183.1**
Regional Total	**7.0**	**74.1**	**5.1**	**14.6**	**14.6**	**14.4**	**0.3**	**130.0**
National Total	**28.3**	**154.9**	**21.5**	**50.4**	**20.3**	**19.1**	**18.6**	**313.2**
	Low-cost is king							
Heathrow	14.1	25.6	10.6	16.9	0.5	0.4	19.4	87.5
Gatwick	3.5	26.6	2.5	8.5	0.8	1.0	0.7	43.7
Other London	4.8	30.9	3.8	11.6	4.6	3.2	0.8	59.7
London Total	**22.4**	**83.1**	**16.9**	**36.9**	**6.0**	**4.7**	**20.8**	**190.9**
Regional Total	**7.6**	**80.6**	**5.5**	**15.9**	**15.8**	**15.4**	**0.3**	**141.1**
National Total	**30.1**	**163.8**	**22.4**	**52.8**	**21.7**	**20.0**	**21.1**	**332.0**
	Global fragmentation							
Heathrow	11.7	26.5	9.2	16.2	0.8	0.7	19.0	84.0
Gatwick	3.1	25.9	2.3	7.9	0.8	1.2	0.7	41.9
Other London	3.7	28.5	2.9	10.1	3.6	2.6	0.4	51.9
London Total	**18.6**	**80.9**	**14.4**	**34.2**	**5.2**	**4.5**	**20.1**	**177.8**
Regional Total	**6.1**	**71.9**	**4.5**	**13.7**	**13.7**	**13.7**	**0.3**	**124.0**
National Total	**24.7**	**152.8**	**18.9**	**47.9**	**19.0**	**18.2**	**20.4**	**301.9**

Base	2050							
	UK Business	UK Leisure	Foreign Business	Foreign Leisure	Dom. Business	Dom. Leisure	I to I	Total
Carbon-traded	**Assessment of need**							
Heathrow	17.9	36.4	12.9	19.6	0.6	0.5	6.9	94.9
Gatwick	4.5	29.5	3.0	8.4	1.0	1.0	0.1	47.5
Other London	6.0	29.1	4.7	11.4	5.4	4.5	0.0	61.0
London Total	**28.4**	**95.0**	**20.6**	**39.4**	**7.1**	**6.0**	**7.0**	**203.4**
Regional Total	**12.0**	**120.9**	**8.7**	**24.1**	**20.5**	**20.8**	**0.1**	**207.1**
National Total	**40.4**	**215.9**	**29.3**	**63.4**	**27.5**	**26.8**	**7.1**	**410.5**
	Global growth							
Heathrow	21.8	30.4	16.0	20.7	0.7	0.7	0.7	91.0
Gatwick	5.0	25.0	3.4	8.8	1.3	1.4	0.0	45.0
Other London	6.5	26.8	5.3	11.9	6.2	4.4	0.0	61.1
London Total	**33.3**	**82.2**	**24.7**	**41.5**	**8.2**	**6.5**	**0.7**	**197.1**
Regional Total	**15.1**	**154.1**	**10.8**	**33.6**	**23.4**	**22.6**	**0.1**	**259.6**
National Total	**48.4**	**236.2**	**35.4**	**75.1**	**31.6**	**29.0**	**0.8**	**456.7**
	Relative decline of Europe							
Heathrow	20.8	36.1	15.8	22.5	0.6	0.5	3.6	100.0
Gatwick	5.0	26.6	3.4	8.6	1.0	1.0	0.0	45.7
Other London	5.9	29.0	4.6	11.4	5.5	4.4	-0.0	60.9
London Total	**31.7**	**91.7**	**23.8**	**42.5**	**7.2**	**6.0**	**3.6**	**206.5**
Regional Total	**12.4**	**123.5**	**9.1**	**25.5**	**20.5**	**20.8**	**0.0**	**211.9**
National Total	**44.1**	**215.2**	**32.9**	**68.1**	**27.7**	**26.7**	**3.7**	**418.4**
	Low-cost is king							
Heathrow	21.8	30.8	15.8	20.6	0.7	0.6	0.7	91.1
Gatwick	5.0	24.6	3.6	9.0	1.3	1.4	0.0	45.0
Other London	6.7	26.7	5.3	11.8	6.2	4.4	0.0	61.1
London Total	**33.5**	**82.2**	**24.8**	**41.4**	**8.2**	**6.4**	**0.7**	**197.2**
Regional Total	**14.9**	**155.0**	**10.7**	**33.9**	**23.5**	**22.7**	**0.1**	**260.8**
National Total	**48.5**	**237.2**	**35.5**	**75.3**	**31.6**	**29.1**	**0.8**	**458.0**
	Global fragmentation							
Heathrow	15.2	39.2	11.5	19.6	0.6	0.5	7.1	93.5
Gatwick	3.6	29.4	2.5	8.2	1.0	1.3	0.2	46.2
Other London	4.7	31.4	3.7	12.2	4.6	3.8	0.0	60.3
London Total	**23.5**	**100.0**	**17.6**	**40.0**	**6.2**	**5.6**	**7.2**	**200.1**
Regional Total	**9.7**	**119.5**	**7.2**	**22.5**	**18.5**	**18.9**	**0.3**	**196.6**
National Total	**33.1**	**219.5**	**24.8**	**62.5**	**24.7**	**24.5**	**7.5**	**396.6**

5.27 When carbon is capped both Heathrow and Gatwick remain full across demand scenarios. In 2030 business passenger proportions remain relatively steady at 31% to 36% at Heathrow and 15% to 19% at Gatwick. By 2050 these proportions rise to 31% to 43% and 16% to 24% at Heathrow and Gatwick respectively. Although carbon capping slightly lowers the demand at individual airports, imposition of higher carbon charges discourages more leisure passengers from travelling and therefore also raises the proportion of business passengers, by varied amounts depending on the demand scenario.

Table 5.6: Base, journey purpose split, 2011, 2030 & 2050, million terminal passengers, carbon capped								
Base	**2011**							
	UK Business	**UK Leisure**	**Foreign Business**	**Foreign Leisure**	**Dom. Business**	**Dom. Leisure**	**I to I**	**Total**
Carbon capped	**Assessment of need**							
Heathrow	9.1	20.3	7.5	12.6	1.2	0.9	18.5	70.1
Gatwick	2.3	20.0	1.6	6.8	1.0	1.0	1.2	33.9
Other London	2.9	14.9	2.3	7.0	1.9	1.5	0.5	31.0
London Total	**14.3**	**55.2**	**11.4**	**26.5**	**4.1**	**3.4**	**20.2**	**135.0**
Regional Total	**4.6**	**46.1**	**3.0**	**8.9**	**10.2**	**9.9**	**0.2**	**82.8**
National Total	**18.8**	**101.3**	**14.4**	**35.3**	**14.3**	**13.3**	**20.4**	**217.8**
Base	**2030**							
	UK Business	**UK Leisure**	**Foreign Business**	**Foreign Leisure**	**Dom. Business**	**Dom. Leisure**	**I to I**	**Total**
Carbon capped	**Assessment of need**							
Heathrow	12.8	25.0	9.7	15.9	0.9	0.6	20.0	84.9
Gatwick	3.5	24.6	2.5	7.5	0.9	1.2	0.9	41.1
Other London	4.4	29.0	3.4	10.4	3.8	2.6	0.6	54.3
London Total	**20.7**	**78.7**	**15.7**	**33.8**	**5.5**	**4.4**	**21.5**	**180.3**
Regional Total	**6.7**	**69.4**	**4.9**	**13.4**	**14.2**	**13.9**	**0.3**	**122.8**
National Total	**27.4**	**148.1**	**20.6**	**47.1**	**19.7**	**18.3**	**21.8**	**303.1**
	Global growth							
Heathrow	14.3	22.8	10.7	15.6	0.7	0.5	21.1	85.8
Gatwick	3.8	23.7	2.7	7.2	1.0	1.1	1.0	40.5
Other London	4.4	25.0	3.4	8.9	3.8	2.3	0.6	48.3
London Total	**22.5**	**71.5**	**16.8**	**31.7**	**5.5**	**4.0**	**22.7**	**174.6**
Regional Total	**6.8**	**61.3**	**5.0**	**12.0**	**13.9**	**13.1**	**0.4**	**112.4**
National Total	**29.2**	**132.8**	**21.7**	**43.8**	**19.4**	**17.1**	**23.0**	**287.0**
	Relative decline of Europe							
Heathrow	13.7	24.4	10.6	16.2	1.4	1.0	16.2	83.5
Gatwick	3.7	25.0	2.7	8.2	1.0	1.2	0.7	42.4
Other London	4.0	26.2	3.2	9.3	3.1	2.1	0.4	48.2
London Total	**21.4**	**75.6**	**16.4**	**33.6**	**5.4**	**4.3**	**17.4**	**174.1**
Regional Total	**6.7**	**66.7**	**4.9**	**13.2**	**13.8**	**13.5**	**0.2**	**119.0**
National Total	**28.1**	**142.3**	**21.3**	**46.8**	**19.3**	**17.8**	**17.6**	**293.1**
	Low-cost is king							
Heathrow	14.3	22.8	10.7	15.6	0.7	0.5	21.1	85.8
Gatwick	3.8	23.7	2.7	7.2	1.0	1.1	1.0	40.5
Other London	4.4	25.0	3.4	8.9	3.8	2.3	0.6	48.4
London Total	**22.5**	**71.5**	**16.8**	**31.7**	**5.5**	**4.0**	**22.7**	**174.7**
Regional Total	**6.8**	**61.4**	**5.0**	**12.0**	**13.9**	**13.1**	**0.4**	**112.4**
National Total	**29.2**	**132.9**	**21.7**	**43.8**	**19.4**	**17.1**	**23.0**	**287.1**
	Global fragmentation							
Heathrow	11.8	26.2	9.2	16.0	0.8	0.7	18.6	83.3
Gatwick	3.1	25.8	2.2	7.8	0.8	1.1	0.7	41.6
Other London	3.7	28.3	2.9	10.1	3.5	2.5	0.4	51.5
London Total	**18.6**	**80.3**	**14.4**	**33.9**	**5.2**	**4.4**	**19.7**	**176.4**
Regional Total	**6.1**	**71.4**	**4.5**	**13.6**	**13.6**	**13.6**	**0.3**	**123.1**
National Total	**24.7**	**151.7**	**18.9**	**47.5**	**18.8**	**18.0**	**19.9**	**299.5**

Base	2050							
	UK Business	UK Leisure	Foreign Business	Foreign Leisure	Dom. Business	Dom. Leisure	I to I	Total
Carbon capped	**Assessment of need**							
Heathrow	18.1	34.5	13.0	18.9	0.6	0.5	8.1	93.5
Gatwick	4.7	28.3	3.1	8.1	1.1	1.2	0.1	46.6
Other London	6.1	29.7	4.6	11.1	5.2	4.0	0.0	60.7
London Total	**28.8**	**92.6**	**20.7**	**38.1**	**6.8**	**5.7**	**8.2**	**200.9**
Regional Total	**11.2**	**105.9**	**8.3**	**20.5**	**19.5**	**19.3**	**0.1**	**184.8**
National Total	**40.0**	**198.5**	**29.0**	**58.5**	**26.3**	**25.0**	**8.3**	**385.7**
	Global growth							
Heathrow	22.5	28.9	16.0	19.3	0.5	0.6	9.1	96.6
Gatwick	5.7	25.4	3.8	7.6	1.0	1.2	0.2	45.0
Other London	7.0	28.8	5.3	10.4	5.6	3.3	0.0	60.5
London Total	**35.2**	**83.1**	**25.1**	**37.3**	**7.2**	**5.1**	**9.3**	**202.2**
Regional Total	**11.6**	**85.0**	**8.4**	**16.9**	**19.1**	**17.9**	**0.1**	**158.9**
National Total	**46.8**	**168.1**	**33.5**	**54.2**	**26.2**	**22.9**	**9.3**	**361.2**
	Relative decline of Europe							
Heathrow	21.0	32.2	15.8	20.3	1.3	0.9	5.2	96.6
Gatwick	5.4	27.0	3.7	9.0	0.9	1.1	0.2	47.5
Other London	6.0	30.9	4.6	11.2	4.6	3.5	0.0	60.7
London Total	**32.4**	**90.1**	**24.2**	**40.5**	**6.8**	**5.4**	**5.4**	**204.8**
Regional Total	**10.8**	**94.6**	**7.9**	**18.8**	**18.5**	**18.3**	**0.2**	**169.0**
National Total	**43.2**	**184.6**	**32.1**	**59.3**	**25.3**	**23.7**	**5.6**	**373.8**
	Low-cost is king							
Heathrow	22.4	28.8	15.9	19.2	0.5	0.6	8.7	96.1
Gatwick	5.7	25.1	3.8	7.6	1.0	1.1	0.2	44.4
Other London	6.9	29.0	5.2	10.5	5.7	3.4	0.0	60.7
London Total	**35.0**	**82.8**	**25.0**	**37.2**	**7.2**	**5.1**	**9.0**	**201.2**
Regional Total	**11.8**	**85.1**	**8.5**	**17.0**	**19.1**	**17.9**	**0.1**	**159.3**
National Total	**46.7**	**167.9**	**33.5**	**54.2**	**26.2**	**23.0**	**9.0**	**360.6**
	Global fragmentation							
Heathrow	15.2	38.9	11.5	19.5	0.6	0.5	7.7	93.8
Gatwick	3.6	29.3	2.5	8.2	1.0	1.3	0.2	46.2
Other London	4.7	32.1	3.6	12.0	4.5	3.7	0.0	60.7
London Total	**23.5**	**100.3**	**17.6**	**39.7**	**6.2**	**5.5**	**7.9**	**200.7**
Regional Total	**9.6**	**116.4**	**7.2**	**22.1**	**18.2**	**18.6**	**0.2**	**192.2**
National Total	**33.1**	**216.8**	**24.8**	**61.8**	**24.3**	**24.0**	**8.2**	**392.9**

5.28 By 2030 the national business proportion ranges between 22% and 26% and by 2050 the variation becomes even more pronounced when carbon is capped, ranging between 21% under *global fragmentation* and 30% in the higher GDP scenarios, *global growth* and *low-cost is king*. There is the same significant variation as with carbon-traded between scenarios for London as a whole with a range in 2050 from 24% to 34%. But outside London the other airports range more widely: from 18% in global fragmentation to 25% business passengers in the *global growth*, and *low-cost is king* scenarios.

Baseline transfers

5.29 Three types of transfer at hub airports are reported in the tables below:

1. 'International-to-international': these passengers are passing through the country of the hub airport and do not stay there more than 24 hours; at present at all the hubs airports this is much the largest group of transfer passengers. These are shown in **Table 5.7.**

   In 2011 there were some 18 million international-to-international transfer passengers at Heathrow. These should not be confused with journeys. They represent 9 million connecting passengers arriving or departing at the hub on the international first leg of their trip and the same 9 million passengers counted again arriving or departing at the hub on the international second leg of their trip. It follows that one return journey by an international-to-international transfer passenger contributes four 'terminal passenger' movements to total throughput. Heathrow international-to-international transfer passenger numbers have grown significantly between 2011 and 2013 to 21 million. **Table 2.8** on the international-to-international transfer passenger model validation demonstrates that this increase has been captured in the modelling.

   Gatwick had 1 million international-to-international transfer passengers in 2011. This represents 0.5 million connecting passengers arriving or departing on the international first leg of their trip and the same 0.5 million passengers counted again arriving or departing on the international second leg of their trip. One reason that Gatwick has a smaller volume of international-to-international transfer passengers is because a significant proportion of passengers are on low-cost or charter carriers and these airlines do not support through-ticketing, so transfer movements tend to take the form of 'self connecting'.

2. **'Domestic-interliners'**: in the model these are only forecast at UK hub airports, they are passengers bound for or originating in the UK (both UK and foreign residents) who fly to or from Heathrow, Gatwick or another UK hub on a feeder service from another UK airport. These are the UK hub totals reported in the top half of **Table 5.8**.

   This table shows that in 2011 there were 5.1 million domestic interliners at Heathrow. This means that there were 2.55 million connecting passengers counted arriving or departing on domestic flights at Heathrow and the same 2.55 million passengers counted again connecting to international flights.[54] These passengers would also have been counted separately in the national totals at their domestic airport of origin (Manchester, Glasgow, Aberdeen etc.), so one domestic interlining return journey contributes 6 terminal passenger movements to the national total.

54 There were also around 2.1m domestic passengers at Heathrow who were starting or terminating their journey at Heathrow. The CAA statistical returns for Heathrow show some 4.7m domestic passengers at Heathrow in 2011. In practice this is the 2.1m terminating passengers combined with the 2.55m connecting passengers on the domestic leg of their journeys.

Table 5.8 shows that at Gatwick in 2011 there were 1.2 million domestic-interliners. That represents 0.6 million connecting passengers counted arriving or departing on domestic flights and the same 0.6 million passengers counted again connecting to international flights.

3. **'International-interliners'**: are similar to domestic interliners in that they are bound for or originating in the UK but they are to or from one of the overseas hubs on a feeder service from another UK airport i.e. they use Amsterdam Schiphol or Paris CDG as an alternative hub to using Heathrow or Gatwick. 'International interliners' are the overseas hub totals reported in the lower half of **Table 5.8** which shows that, for example, in 2011 there were 0.8 million passengers arriving and departing from the UK as transfer passengers at Paris CDG. Note these figures are not the total transfer activity at the overseas hubs, but just the total arrivals and departures from connecting passengers starting or ending their journeys in the UK.

5.30 Domestic interlining and international-to-international transfer passenger traffic is particularly sensitive to shadow costs at congested UK airports. When a runway shadow cost is applied at an over-capacity airport, transfer passengers face paying it twice: both on the feeder and connecting service. Therefore transfer passengers generally reduce at a faster rate than point-to-point traffic at a congested airport. Even if in some cases the costs of double-runway use might not always be fully passed through to transfer passengers, the higher shadow cost also reflects the greater sensitivity to service uncertainty and inconvenience that transfer passengers face at a congested airport.

5.31 Domestic and international interliners to or from the UK are usually even more vulnerable to shadow costs at over-capacity airports as feeder services are often smaller aircraft more susceptible to runway shadow costs. Domestic-interliners will also reduce faster as in some cases direct services bypassing the hub become viable at the origin airport and in other cases, trips by surface transport to the hub may replace the feeder service. These effects of lost transfer traffic are most evident in the base case of no additional runway capacity where shadow costs are highest.

5.32 Note that all 2011 passenger data shown in the tables is from the base year validated model outputs.

Table 5.7: Baseline international – international transfers at hub airports, million terminal passengers

		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon-traded	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	18	20	13	7	19	12	1	17	9	4	19	12	1	19	13	7
Gatwick	1	1	0	0	1	0	0	1	1	0	1	0	0	1	0	0
Paris CDG	16	19	21	24	23	28	14	17	15	15	23	28	14	16	16	16
Amsterdam	13	15	16	26	19	41	50	26	40	51	19	41	49	12	12	12
Frankfurt	26	39	52	53	53	55	45	27	26	31	53	55	45	26	29	40
Dubai	18	31	33	41	39	55	105	37	45	51	39	55	107	23	22	25
Heathrow %	20%	16%	10%	5%	13%	6%	0%	13%	7%	2%	13%	6%	0%	19%	14%	7%
Gatwick %	1%	1%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	1%	1%	0%
% of Heathrow pax	26%	23%	14%	7%	23%	14%	1%	20%	10%	4%	23%	14%	1%	22%	14%	7%
% of Gatwick pax	3%	2%	1%	0%	2%	1%	0%	2%	1%	0%	2%	1%	0%	2%	1%	0%

		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon capped	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	18	20	14	8	21	16	9	16	10	5	21	16	9	19	13	8
Gatwick	1	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0
Paris CDG	16	19	20	22	19	21	25	14	11	11	19	21	25	16	16	16
Amsterdam	13	15	15	17	15	16	21	19	25	32	15	16	21	12	12	12
Frankfurt	26	36	47	57	39	54	58	19	16	18	39	54	58	26	28	39
Dubai	18	29	31	35	31	35	41	28	29	33	31	35	41	23	22	24
Heathrow %	20%	17%	11%	6%	17%	11%	6%	17%	10%	5%	17%	11%	6%	19%	14%	8%
Gatwick %	1%	1%	1%	0%	1%	1%	0%	1%	1%	0%	1%	0%	0%	1%	1%	0%
% of Heathrow pax	26%	24%	16%	9%	25%	18%	10%	19%	11%	6%	25%	18%	9%	22%	15%	8%
% of Gatwick pax	3%	2%	2%	0%	2%	2%	0%	2%	1%	1%	2%	2%	0%	2%	1%	0%

5.33 In the case of no expansion, with a relatively low base of long-haul routes, increasing pressure on the single runway and rising shadow costs throughout the period, Gatwick does not grow international-to-international transfer passengers in any of the demand scenarios or either of the carbon cases and continues with a broadly similar mix of point-to-point traffic as today, except for some replacement of the more marginal short-haul routes with some long-haul.

5.34 Heathrow is full throughout and experiences the pressure of excess demand on its current two runways accompanied by steadily rising shadow costs. Although Heathrow has a solid base of long-haul routes and a diversity of short-haul feeder routes, without expansion it loses most of its international-to-international connecting traffic. These passengers generally have a wide range of options available for their journey and are highly price sensitive. Therefore, a combination of increasing costs and a reduction in

transfer opportunities due to the declining route network, makes Heathrow a less attractive option for these passengers. At most it only retains around half of the current levels and, as described below, there are significant losses to the number of destinations served. Much of this lost connecting traffic goes to Dubai and the competing European hubs despite some of the latter also experiencing congested conditions. Increasingly Heathrow represents a point-to-point airport with international-to-international transfer passengers falling from the current 25% to around 10% of its total traffic.

Table 5.8: Baseline transfers at hub airports by passengers bound for or originating in the UK, domestic and international interliners, million terminal passengers

		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon-traded	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	5.1	0.8	0.4	0.3	0.4	0.4	0.1	0.8	0.2	0.2	0.4	0.4	0.1	0.8	0.4	0.4
Gatwick	1.2	1.1	0.3	0.1	0.9	0.2	0.0	0.8	0.0	0.0	0.9	0.2	0.0	0.9	0.3	0.2
Manchester	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
London	6.3	1.9	0.7	0.5	1.3	0.6	0.1	1.6	0.2	0.2	1.3	0.6	0.1	1.6	0.7	0.6
Paris	0.8	0.3	0.3	0.4	0.4	0.4	0.5	0.2	0.1	0.1	0.4	0.4	0.5	0.0	0.0	0.1
Amsterdam	0.9	0.4	0.3	0.3	0.4	0.3	0.3	2.7	7.9	7.3	0.4	0.3	0.3	0.0	0.0	0.0
Frankfurt	0.5	0.3	0.2	0.2	0.4	0.2	0.3	0.3	0.1	0.1	0.4	0.2	0.3	0.0	0.0	0.0
Dubai	2.1	1.5	1.7	1.7	2.0	2.0	3.3	4.8	8.0	8.5	2.0	2.0	3.1	0.3	0.2	0.2
Overseas hubs	4.3	2.6	2.6	2.5	3.2	3.0	4.4	8.0	16.1	15.9	3.2	3.0	4.1	0.4	0.2	0.3

		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon capped	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	5.1	1.0	0.4	0.4	0.8	0.4	0.5	1.3	0.5	0.4	0.8	0.4	0.5	0.7	0.4	0.4
Gatwick	1.2	1.2	0.5	0.2	1.3	1.1	0.4	1.0	0.2	0.0	1.4	1.1	0.3	0.9	0.3	0.2
Manchester	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0
London	6.3	2.2	0.9	0.6	2.2	1.6	0.9	2.3	0.7	0.4	2.2	1.6	0.8	1.6	0.7	0.6
Paris	0.8	0.3	0.3	0.3	0.3	0.2	0.3	0.2	0.1	0.0	0.3	0.2	0.3	0.0	0.0	0.1
Amsterdam	0.9	0.4	0.3	0.3	0.3	0.2	0.2	2.6	7.2	6.8	0.3	0.2	0.2	0.0	0.0	0.0
Frankfurt	0.5	0.3	0.2	0.2	0.3	0.2	0.1	0.2	0.1	0.0	0.3	0.2	0.1	0.0	0.0	0.0
Dubai	2.1	1.4	1.5	1.6	1.4	1.4	1.5	4.4	6.8	7.4	1.4	1.4	1.5	0.3	0.2	0.2
Overseas hubs	4.3	2.4	2.3	2.4	2.3	2.0	2.2	7.4	14.1	14.3	2.3	2.0	2.2	0.4	0.2	0.3

5.35 In 2011 domestic-international transfers were a fairly small segment at Gatwick, with just over 1 million such connections. Without capacity expansion such traffic does not establish a foothold in any of the demand scenarios. The overseas hubs (especially Dubai) are generally more successful at retaining this UK originating or connecting traffic but even there traffic is lost in some scenarios as connecting traffic is either attracted to direct route start-ups from other UK airports or does not travel at all.

5.36 Without expansion, domestic-international transfers are forecast to decline dramatically at Heathrow, falling from around 5 million terminal passenger movements today, to under 1 million by the 2040s. In such congested conditions with demand more focused on routes which can be served by larger aircraft, Heathrow loses around half its domestic feeder routes. Again the competing overseas hubs capture some of this UK traffic, but other passengers switch to new but also lower frequency direct regional routes or they do not travel at all.

Baseline destinations served

5.37 The analysis presented in **Table 5.9** and **Table 5.10** summarises the number of separate route destinations served without any extra runway capacity for Gatwick, Heathrow, all five London airports, non-London airports and all UK airports. There are separate tables for the carbon-traded and capped cases. A threshold of at least one daily service throughout the year is applied. This is defined in the analysis as being at least 365 daily scheduled departures a year, or 730 annual passenger ATMs (arriving and departing). The daily threshold applied is relatively stringent. The tables include only scheduled services (both 'full-service' and LCC), and therefore exclude charter. The modelling of destinations served by each airport for each airline sector is part of the model validation process and is reported in **Appendix 1**.

5.38 Note that these tables are not additive. If a route exists at Gatwick, Heathrow and elsewhere in the London system it is counted in each table, so will appear three times; likewise between London and the regions. Similarly, destination totals cannot be derived by simple subtraction. This means that the destination count served at other London airports is not the Heathrow and Gatwick destinations subtracted from the London total likewise for London and regions.

5.39 Counting destinations served from a particular airport or region is a relatively limited measure of connectivity because the new destinations added will initially be at the margin and very often at less than daily frequencies or operating at times not convenient to many passengers.

Table 5.9: Baseline, destinations served with daily scheduled services, carbon-traded

		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon-traded	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
LGW																
Short Haul	58	67	63	61	63	61	60	65	56	51	63	61	61	69	62	57
Long Haul	13	16	18	20	19	20	21	19	21	23	19	20	21	15	18	19
All International	71	83	81	81	82	81	81	84	77	74	82	81	82	84	80	76
Domestic	9	7	8	8	8	8	8	7	7	8	8	8	8	7	8	7
Total	80	90	89	89	90	89	89	91	84	82	90	89	90	91	88	83
LHR																
Short Haul	75	68	62	55	66	53	52	69	66	55	66	53	46	72	63	60
Long Haul	57	58	61	63	62	65	65	56	57	67	62	65	65	57	61	63
All International	132	126	123	118	128	118	117	125	123	122	128	118	111	129	124	123
Domestic	7	4	3	3	4	3	3	4	3	3	4	3	3	4	3	3
Total	139	130	126	121	132	121	120	129	126	125	132	121	114	133	127	126
London																
Short Haul	104	128	127	129	127	127	128	129	128	128	127	127	126	128	133	133
Long Haul	61	74	79	83	79	85	86	72	75	87	79	85	86	72	79	82
All International	165	202	206	212	206	212	214	201	203	215	206	212	212	200	212	215
Domestic	10	9	9	9	9	9	10	9	9	9	9	9	10	9	9	9
Total	175	211	215	221	215	221	224	210	212	224	215	221	222	209	221	224
Other Modelled Airports																
Short Haul	40	73	83	99	77	98	112	72	79	93	77	98	116	72	81	91
Long Haul	6	17	21	26	18	25	39	18	20	23	18	25	40	16	19	22
All International	46	90	104	125	95	123	151	90	99	116	95	123	156	88	100	113
Domestic	25	26	26	27	26	27	27	26	26	27	26	27	27	26	26	26
Total	71	116	130	152	121	150	178	116	125	143	121	150	183	114	126	139
National																
Short Haul	105	129	128	135	127	134	136	129	128	133	127	134	135	128	133	135
Long Haul	61	74	79	83	79	85	87	72	75	87	79	85	87	72	79	82
All International	166	203	207	218	206	219	223	201	203	220	206	219	222	200	212	217
Domestic	26	26	26	27	26	27	28	26	26	27	26	27	28	26	26	26
Total	192	229	233	245	232	246	251	227	229	247	232	246	250	226	238	243

5.40 Domestic links would remain broadly static nationally and within the London system under every scenario in the 'do minimum'. This is similar to the pattern observed at Heathrow over recent years as it has approached full capacity.

5.41 Gatwick is forecast to see slight increases in destinations served in the 'do minimum' at least to 2030, whilst the number of routes seeing at least a daily service from Heathrow would decline, from 139 currently to 114-126 across the forecast scenarios.

Table 5.10: Baseline, destinations served with daily scheduled services, carbon capped																
		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon capped	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
LGW																
Short Haul	58	69	62	60	70	64	61	66	58	57	70	65	62	69	63	58
Long Haul	13	16	18	19	16	18	21	19	21	23	16	18	21	15	18	19
All International	71	85	80	79	86	82	82	85	79	80	86	83	83	84	81	77
Domestic	9	7	8	8	8	8	8	8	7	8	8	8	8	7	8	7
Total	80	92	88	87	94	90	90	93	86	88	94	91	91	91	89	84
LHR																
Short Haul	75	67	61	54	68	58	52	73	63	56	68	59	51	71	63	60
Long Haul	57	58	61	63	58	61	65	55	57	63	58	61	64	57	61	63
All International	132	125	122	117	126	119	117	128	120	119	126	120	115	128	124	123
Domestic	7	4	3	3	4	3	3	4	3	4	4	3	3	4	3	3
Total	139	129	125	120	130	122	120	132	123	123	130	123	118	132	127	126
London																
Short Haul	104	128	125	130	125	126	125	126	129	131	125	127	125	127	133	133
Long Haul	61	74	79	82	74	79	86	71	75	83	74	79	85	72	79	82
All International	165	202	204	212	199	205	211	197	204	214	199	206	210	199	212	215
Domestic	10	9	9	9	9	10	9	9	10	9	9	10	9	9	10	9
Total	175	211	213	221	208	215	220	206	214	223	208	216	219	208	222	224
Other Modelled Airports																
Short Haul	40	71	79	86	64	72	84	67	72	84	64	74	83	72	81	95
Long Haul	6	17	20	23	17	20	23	15	18	22	17	20	23	15	19	22
All International	46	88	99	109	81	92	107	82	90	106	81	94	106	87	100	117
Domestic	25	26	26	27	26	26	27	26	26	26	26	26	27	26	26	26
Total	71	114	125	136	107	118	134	108	116	132	107	120	133	113	126	143
National																
Short Haul	105	129	126	132	125	126	128	127	130	132	125	127	127	128	133	136
Long Haul	61	74	79	82	74	79	86	71	75	83	74	79	85	72	79	82
All International	166	203	205	214	199	205	214	198	205	215	199	206	212	200	212	218
Domestic	26	26	26	27	26	27	27	26	27	26	26	27	27	26	27	26
Total	192	229	231	241	225	232	241	224	232	241	225	233	239	226	239	244

5.42 With carbon capped Gatwick sees an increase in long-haul daily services in the 'do minimum' and a decline in short-haul services across all scenarios between 2030 and 2050.

5.43 Similar to the carbon-traded results the number of routes seeing at least a daily service from Heathrow would decline over time in the 'do minimum', from 139 currently to 118-126 across the forecast scenarios.

5.44 The analysis presented below in **Table 5.11** and **Table 5.12** differs from the figures above by not applying any service frequency threshold (and including charter). But, as these are modelled destinations, all routes must pass a viability threshold.

Table 5.11: Baseline, destinations served by all services, carbon-traded

		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon-traded	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
LGW																
Short Haul	158	162	166	151	160	159	139	158	152	132	160	159	143	164	157	145
Long Haul	49	41	41	42	43	41	41	49	55	51	43	41	41	40	40	43
All International	207	203	207	193	203	200	180	207	207	183	203	200	184	204	197	188
Domestic	9	8	8	8	8	8	9	8	8	8	8	8	9	8	8	8
Total	216	211	215	201	211	208	189	215	215	191	211	208	193	212	205	196
LHR																
Short Haul	80	72	68	61	71	57	56	74	72	60	71	57	47	78	68	66
Long Haul	92	85	89	89	86	90	87	85	88	90	86	90	88	84	87	89
All International	172	157	157	150	157	147	143	159	160	150	157	147	135	162	155	155
Domestic	7	4	3	3	4	3	3	4	3	3	4	3	3	4	3	3
Total	179	161	160	153	161	150	146	163	163	153	161	150	138	166	158	158
London																
Short Haul	215	227	225	225	225	224	218	228	224	223	225	224	217	227	226	227
Long Haul	107	123	128	129	123	129	127	122	128	130	123	129	128	121	124	129
All International	322	350	353	354	348	353	345	350	352	353	348	353	345	348	350	356
Domestic	10	9	10	10	9	10	10	10	10	10	9	10	10	10	10	10
Total	332	359	363	364	357	363	355	360	362	363	357	363	355	358	360	366
Other Modelled Airports																
Short Haul	179	224	230	233	224	236	241	224	226	238	224	236	239	224	229	232
Long Haul	42	70	87	99	78	99	114	60	66	76	78	99	114	77	93	103
All International	221	294	317	332	302	335	355	284	292	314	302	335	353	301	322	335
Domestic	28	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Total	249	323	346	361	331	364	384	313	321	343	331	364	382	330	351	364
National																
Short Haul	226	239	241	243	238	244	246	239	242	244	238	244	247	238	241	242
Long Haul	107	123	129	130	123	130	129	122	128	131	123	130	130	121	128	130
All International	333	362	370	373	361	374	375	361	370	375	361	374	377	359	369	372
Domestic	28	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Total	361	391	399	402	390	403	404	390	399	404	390	403	406	388	398	401

5.45 At Gatwick in the 'do minimum' there would be a decline over time in short haul-routes served under every scenario. This is more visible in the 'all services' analysis than the 'daily destinations' figures, indicating it is particularly lower frequency routes being lost, as airlines focus on the most profitable links and switch other services to alternative airports.

5.46 At Heathrow in the 'do minimum' increasing passenger demand at the airport is likely to lead to increasing concentration of services on the most popular routes, with overall destination numbers at the airport declining markedly from roughly 180 currently to 138-158 in 2050.

Table 5.12: Baseline, destinations served by all services, carbon capped

		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon capped	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
LGW																
Short Haul	158	162	157	147	162	147	148	161	147	127	162	153	146	162	157	147
Long Haul	49	41	42	42	41	44	42	47	54	54	41	42	42	40	40	43
All International	207	203	199	189	203	191	190	208	201	181	203	195	188	202	197	190
Domestic	9	8	8	8	9	8	8	9	8	8	9	8	8	8	9	8
Total	216	211	207	197	212	199	198	217	209	189	212	203	196	210	206	198
LHR																
Short Haul	80	72	66	59	73	63	55	79	69	62	73	63	53	76	69	64
Long Haul	92	85	89	89	86	89	90	82	86	88	86	89	90	84	87	89
All International	172	157	155	148	159	152	145	161	155	150	159	152	143	160	156	153
Domestic	7	4	3	3	4	3	3	4	4	4	4	3	3	4	3	3
Total	179	161	158	151	163	155	148	165	159	154	163	155	146	164	159	156
London																
Short Haul	215	226	225	222	225	227	224	226	227	225	225	226	224	227	227	227
Long Haul	107	123	127	129	123	129	130	119	126	128	123	129	130	121	124	129
All International	322	349	352	351	348	356	354	345	353	353	348	355	354	348	351	356
Domestic	10	9	10	10	9	10	10	10	10	10	9	10	10	10	10	10
Total	332	358	362	361	357	366	364	355	363	363	357	365	364	358	361	366
Other Modelled Airports																
Short Haul	179	221	228	230	213	224	225	216	220	229	213	224	226	222	229	232
Long Haul	42	65	82	94	61	80	97	58	62	70	61	80	95	76	91	103
All International	221	286	310	324	274	304	322	274	282	299	274	304	321	298	320	335
Domestic	28	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Total	249	315	339	353	303	333	351	303	311	328	303	333	350	327	349	364
National																
Short Haul	226	238	240	241	237	238	240	238	239	242	237	238	240	239	241	242
Long Haul	107	123	127	130	123	129	131	119	126	129	123	129	131	121	127	130
All International	333	361	367	371	360	367	371	357	365	371	360	367	371	360	368	372
Domestic	28	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Total	361	390	396	400	389	396	400	386	394	400	389	396	400	389	397	401

5.47 With carbon capped the number of long-haul destinations served at Gatwick without any threshold declines in all demand scenarios except *low-cost is king.* The total short-haul destinations served mostly decline, particularly after 2030 as congestion builds. Gatwick does generally maintain domestic routes.

5.48 Similar to the carbon-traded results at Heathrow, with carbon capped the total number of routes from Heathrow would decline over time in the 'do minimum', from around 180 now to between 146 and 165 across all the forecast scenarios.

Baseline catchment areas

5.49 **Chapter 2** describes how the passenger to airport allocation model represents passengers in each district choosing between available airports primarily on the basis of their costs of getting

to each airport (future surface access costs) and the availability of air services to the desired destination at each airport (frequency costs). This methodology captures the overlapping of airport catchments. In practice different passengers in particular districts choose different airports for the same journey depending on personal preferences. This methodology of modelling choice from the passenger's ground origin also captures the dynamics of catchments varying district by district as airports become full.

5.50 The figures below show the baseline (no new runway capacity) modelled catchments in 2030 for four modelled airport pairs: Gatwick and Heathrow, Luton and Stansted, Birmingham and Manchester, London City and Southend. Although the figures are arranged geographically in competing pairs, this is a simplification because a deeper examination across the set of airports shows that competition depends on the district of origin. For example, in North Kent Gatwick and Stansted compete, in North East London Stansted and London City compete, and so on. It is evident from **Figure 5.6** that the extent of Heathrow's catchment means that it competes with many airports across districts.

Figure 5.6: Baseline catchments, 2030, Gatwick and Heathrow

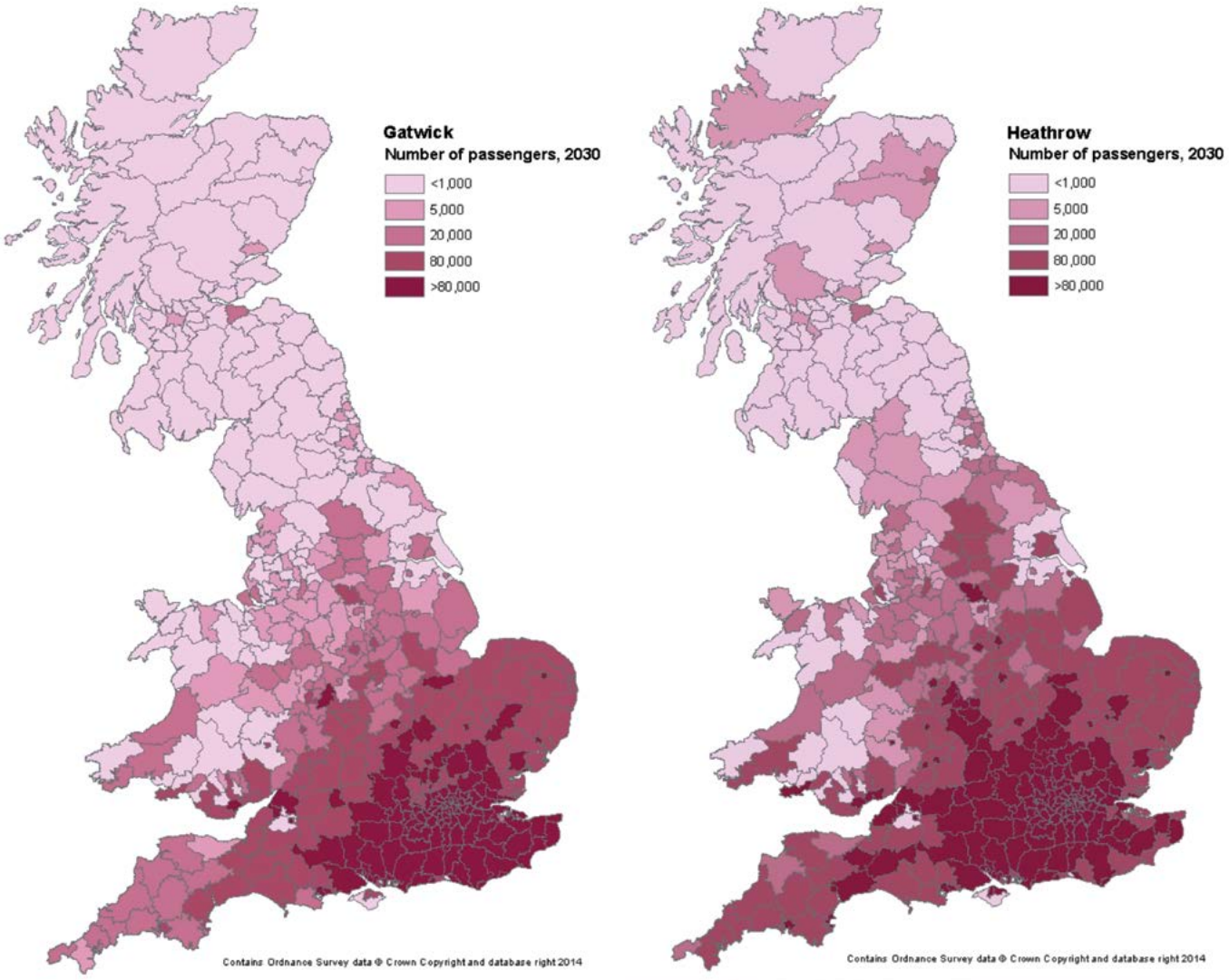


Figure 5.7: Baseline catchments, 2030, Luton and Stansted

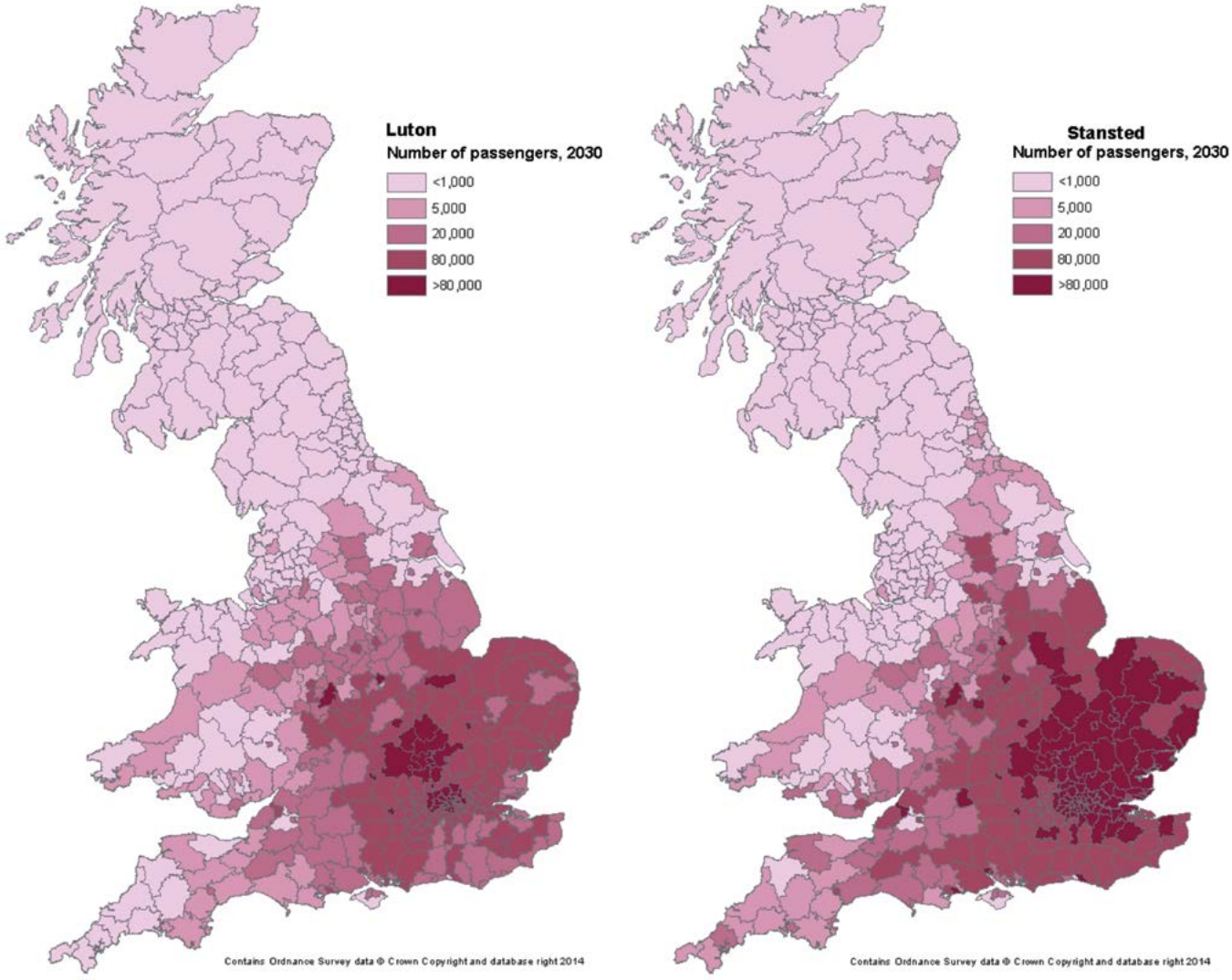
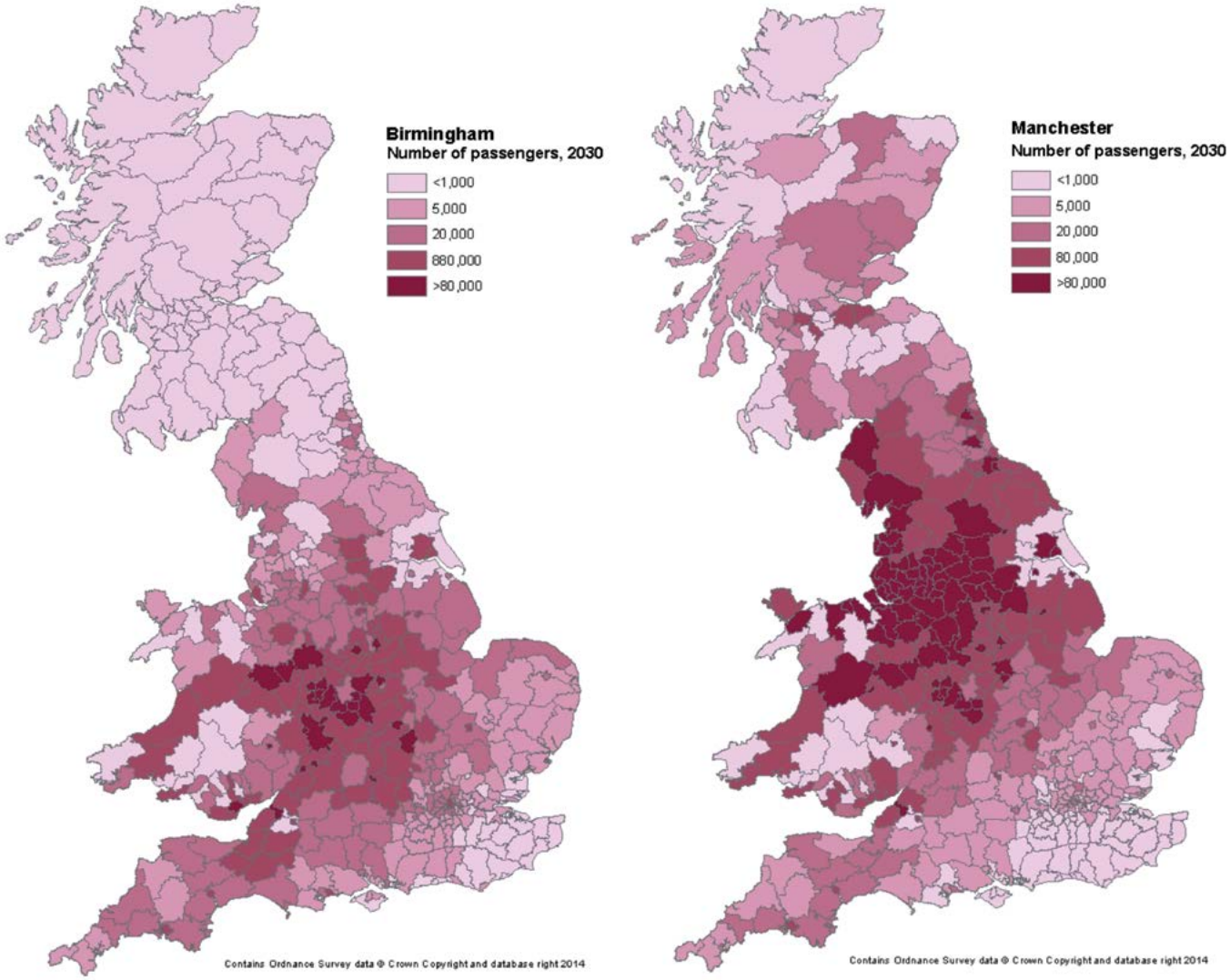


Figure 5.8: Baseline catchments, 2030, Birmingham and Manchester



Baseline air transport movements (ATMs) and CO_2 emissions by option

5.51 The following sequence of tables show modelled air transport movements (ATMs).[55] ATMs are two way, comprising departing and arriving passenger air transport movements. If an airport has incurred a runway shadow cost then its input runway capacity is shown.[56] This is the runway usage data on which the capacity timelines shown earlier in **Figure 5.4** and **Figure 5.5** are based.

55 Tables exclude freight and some miscellaneous movements such as positional flights, diplomatic flights, domestic charters and domestic flights from modelled UK airports to non-modelled UK airports

56 In the model to reach an equilibrium solution at overloaded airports with shadow costs a tolerance of +/- 1.5% may be applied at the larger airports (with an absolute tolerance for smaller airports). In these tables and the timelines a runway shadow cost indicates the airport has reached capacity and the input capacity is reported.

5.52 The CO_2 emissions summary is UK departing CO_2 as measured in a manner consistent with the National Atmospheric Emissions Inventory (NAEI).[57] In the carbon capped cases the target is for these emissions to be no higher than 37.5Mt CO_2 in 2050. The fuel efficiency improves as new aircraft types enter the fleet. During the period 2030-2050 replacements are occurring at a slower rate than passenger demand is growing, resulting in the capped CO_2 forecasts prior to 2050 often exceeding the target.

5.53 Passenger and seat-kilometres provided are two-way and they arguably provide a more precise driver of the emissions forecasts than simple numbers of ATMs.

Table 5.13: Baseline ATM forecasts (thousands), passenger and seat-km statistics, carbon-traded

Carbon-traded		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Base	**2011**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**
Heathrow	480	480	480	472	480	479	458	480	480	480	480	479	449	480	480	480
Gatwick	247	280	280	280	280	280	271	280	278	264	280	280	274	280	280	280
Stansted	143	219	210	213	223	215	215	218	220	217	223	215	212	190	205	205
Luton	79	98	117	120	119	120	120	98	118	118	119	120	122	95	120	121
London City	57	120	119	120	119	120	118	108	108	105	119	120	119	120	120	120
London	1,006	1,198	1,205	1,205	1,220	1,214	1,181	1,184	1,205	1,184	1,220	1,214	1,176	1,165	1,205	1,206
Manchester	161	218	258	318	230	284	303	212	242	298	230	284	300	212	250	310
Birmingham	86	120	169	206	141	206	201	118	166	198	141	206	199	115	157	204
Glasgow	67	77	82	88	85	90	111	76	82	90	85	90	112	72	78	87
Edinburgh	96	135	147	178	136	160	178	139	158	192	136	160	164	138	154	180
Bristol	54	67	81	105	72	106	109	72	86	101	72	106	111	60	72	100
Newcastle	45	57	62	69	60	67	93	58	63	73	60	67	97	55	59	68
Belfast International	43	59	66	68	63	65	78	59	70	75	63	65	79	57	64	73
Liverpool	45	58	62	54	60	66	107	57	72	75	60	66	107	57	62	58
East Midlands	50	75	90	128	79	114	125	74	89	129	79	114	124	74	85	100
Other modelled UK	333	498	626	795	539	747	957	498	615	827	539	747	972	678	933	1,057
Non-London annual growth rate			1.9%	2.0%		2.7%	1.7%		1.9%	2.3%		2.7%	1.8%		2.3%	1.6%
UK Total	**1,985**	**2,561**	**2,848**	**3,213**	**2,684**	**3,118**	**3,446**	**2,547**	**2,846**	**3,240**	**2,684**	**3,118**	**3,442**	**2,684**	**3,118**	**3,442**
Paris CDG	420	521	597	690	565	690	690	516	585	677	565	690	690	501	574	657
Amsterdam	322	402	460	572	443	642	750	466	602	727	443	642	750	381	437	500
Frankfurt	403	529	653	700	628	700	700	462	505	603	628	700	700	444	515	635
Dubai	237	446	537	668	517	706	1,114	506	643	823	517	706	1,121	410	488	593
Foreign Hubs Total	**1,382**	**1,899**	**2,248**	**2,630**	**2,154**	**2,738**	**3,254**	**1,950**	**2,336**	**2,830**	**2,154**	**2,738**	**3,261**	**1,736**	**2,014**	**2,385**

57 See www.naei.org.uk/. In the NAEI, UK domestic aviation CO_2 emissions are reported in the UK total and international aviation emissions are reported as a memo item.

Base		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon-traded	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
millions	Seat-Kms															
Domestic	23,453	27,489	30,185	35,178	28,567	32,882	39,205	27,068	29,891	35,401	28,567	32,882	39,340	26,016	28,773	33,301
Western Europe	280,811	402,546	468,482	528,867	421,042	515,694	569,231	397,685	457,405	516,178	421,042	515,694	572,989	398,086	468,490	535,398
OECD	221,743	267,098	278,977	305,040	281,535	308,291	326,885	243,919	238,515	271,080	281,535	308,291	328,782	250,192	252,932	264,593
NIC	259,206	379,388	464,320	582,306	425,963	565,441	729,220	406,899	521,364	694,740	425,963	565,441	731,106	357,157	432,584	537,434
LDC	25,823	41,602	48,996	58,265	49,485	67,276	82,693	40,899	46,797	57,965	49,485	67,276	83,052	37,936	43,141	49,275
All Long Haul	**506,772**	**688,088**	**792,293**	**945,611**	**756,983**	**941,008**	**1,138,798**	**691,718**	**806,675**	**1,023,785**	**756,983**	**941,008**	**1,142,940**	**645,285**	**728,657**	**851,302**
Total	**811,035**	**1,118,123**	**1,290,960**	**1,509,656**	**1,206,593**	**1,489,584**	**1,747,234**	**1,116,471**	**1,293,971**	**1,575,364**	**1,206,593**	**1,489,584**	**1,755,269**	**1,069,387**	**1,225,920**	**1,420,002**
millions	Passenger-Kms															
Domestic	15,638	19,373	21,349	24,889	20,245	23,289	27,559	18,902	20,872	24,663	20,245	23,289	27,601	17,897	19,593	22,630
Western Europe	222,975	333,216	388,140	436,329	348,702	424,321	473,127	329,506	380,360	427,659	348,702	424,321	475,688	330,155	390,211	445,426
OECD	174,661	228,544	238,499	260,740	240,907	263,586	268,353	208,450	203,407	231,039	240,907	263,586	268,943	214,281	216,539	226,503
NIC	187,338	290,131	353,583	442,852	325,211	429,991	556,607	309,269	393,486	524,108	325,211	429,991	556,659	272,928	329,752	408,425
LDC	17,983	32,219	38,242	46,018	38,496	52,912	65,990	31,450	36,130	44,995	38,496	52,912	66,233	29,367	33,658	38,819
All Long Haul	**379,982**	**550,894**	**630,323**	**749,610**	**604,614**	**746,489**	**890,949**	**549,168**	**633,023**	**800,141**	**604,614**	**746,489**	**891,835**	**516,577**	**579,950**	**673,747**
Total	**618,595**	**903,483**	**1,039,812**	**1,210,828**	**973,562**	**1,194,099**	**1,391,635**	**897,576**	**1,034,255**	**1,252,463**	**973,562**	**1,194,099**	**1,395,124**	**864,629**	**989,754**	**1,141,804**
millions	Seats															
Domestic	55	64	70	82	66	76	91	63	69	82	66	76	91	60	66	75
Western Europe	204	284	327	365	297	357	391	283	327	364	297	357	393	279	323	364
OECD	32	38	40	44	41	44	48	36	35	39	41	44	48	36	36	38
NIC	37	53	64	81	59	79	102	58	75	99	59	79	102	49	59	74
LDC	6	10	12	15	12	17	20	10	12	14	12	17	20	9	11	12
All Long Haul	**75**	**101**	**117**	**139**	**112**	**140**	**171**	**103**	**122**	**153**	**112**	**140**	**171**	**94**	**106**	**124**
Total	**333**	**449**	**513**	**585**	**475**	**572**	**653**	**450**	**518**	**599**	**475**	**572**	**655**	**433**	**495**	**564**

5.54 In the baseline with carbon-traded Gatwick's single runway remains full throughout the period to 2050. Although occasionally the numbers of ATMs dip below the assumed annual capacity of 280,000 ATMs this is a result of the model being allowed a +/- 1.5% tolerance in the search for a system equilibrium solution.[58]

5.55 Similarly in the baseline Heathrow's two runways remain full throughout. Again the throughput of ATMs occasionally dip below the assumed capacity of 480,000, but this is a result of the model being allowed a +/- 1.5% tolerance in the search for a system equilibrium solution. In the *global growth* and *low-cost is king* demand scenarios the binding constraint in the modelling has switched from a runway to a terminal capacity constraint so showing lower than capacity ATMs. But this means the airport remains effectively full.

58 The lower 2050 throughput in *relative decline of Europe* is associated with the binding constraint switching from the runway to the terminal in that year, but the airport effectively remains full.

Table 5.14: Baseline ATM forecasts (thousands), passenger and seat-km statistics, carbon capped

Carbon-traded		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Base	**2011**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**
Heathrow	480	480	480	471	480	480	476	480	480	480	480	480	472	480	480	480
Gatwick	247	278	280	280	277	280	279	278	280	280	277	280	275	280	280	280
Stansted	143	211	210	210	193	205	201	180	202	207	193	201	200	188	207	207
Luton	79	94	118	117	82	96	118	85	104	118	82	96	117	95	119	120
London City	57	115	120	120	99	120	120	120	120	120	99	120	120	120	120	120
London	1,006	1,177	1,208	1,199	1,130	1,181	1,193	1,144	1,186	1,205	1,130	1,178	1,185	1,163	1,206	1,207
Manchester	161	213	242	279	199	228	269	202	221	269	199	227	268	211	248	299
Birmingham	86	110	146	206	104	119	162	104	123	154	104	116	162	114	150	200
Glasgow	67	73	80	86	72	73	79	72	70	84	72	72	79	70	77	86
Edinburgh	96	132	141	165	123	131	157	122	138	155	123	132	157	137	152	179
Bristol	54	64	73	94	57	63	81	65	73	88	57	63	76	61	70	93
Newcastle	45	56	59	66	52	54	59	55	59	64	52	54	59	55	59	66
Belfast International	43	57	63	72	54	60	63	56	66	69	54	60	63	57	63	72
Liverpool	45	55	58	54	50	52	46	54	64	60	50	55	47	57	61	55
East Midlands	50	73	84	96	69	75	85	72	78	86	69	75	84	75	87	101
Other modelled UK	333	471	570	723	446	527	656	469	546	704	446	533	668	358	389	490
Non-London annual growth rate			1.5%	2.0%		1.2%	1.8%		1.2%	1.9%		1.2%	1.8%		1.3%	1.9%
UK Total	**1,985**	**2,481**	**2,723**	**3,040**	**2,356**	**2,562**	**2,850**	**2,415**	**2,624**	**2,939**	**2,356**	**2,563**	**2,848**	**2,356**	**2,563**	**2,848**
Paris CDG	420	507	569	650	495	559	655	480	527	599	495	559	656	501	573	655
Amsterdam	322	389	435	499	379	426	501	412	491	579	379	426	502	381	436	499
Frankfurt	403	502	606	700	511	635	700	396	413	479	511	639	700	443	511	629
Dubai	237	431	512	622	451	564	725	452	556	712	451	564	725	410	487	592
Foreign Hubs Total	**1,382**	**1,829**	**2,123**	**2,472**	**1,835**	**2,184**	**2,581**	**1,740**	**1,987**	**2,369**	**1,836**	**2,188**	**2,583**	**1,735**	**2,007**	**2,375**

Base		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon-traded	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
millions	Seat-Kms															
Domestic	23,453	26,780	29,195	33,431	25,695	28,869	33,043	26,078	28,035	32,483	25,700	28,932	32,586	25,727	28,393	32,786
Western Europe	280,811	386,102	439,015	489,077	351,649	385,820	417,434	367,842	406,921	446,572	351,750	386,189	417,636	395,015	464,332	528,981
OECD	221,743	262,335	272,573	295,309	261,892	274,767	298,781	231,661	223,987	253,147	261,938	274,978	297,624	248,169	252,471	264,880
NIC	259,206	368,600	443,690	550,946	378,698	475,141	618,277	384,485	480,585	636,634	378,770	475,154	617,213	354,409	429,427	533,116
LDC	25,823	39,870	45,848	53,545	41,433	49,730	61,177	37,365	41,966	51,564	41,444	49,807	61,068	37,581	42,739	48,774
All Long Haul	**506,772**	**670,804**	**762,111**	**899,800**	**682,023**	**799,638**	**978,234**	**653,511**	**746,538**	**941,345**	**682,153**	**799,938**	**975,905**	**640,159**	**724,637**	**846,770**
Total	**811,035**	**1,083,686**	**1,230,320**	**1,422,308**	**1,059,366**	**1,214,327**	**1,428,712**	**1,047,432**	**1,181,493**	**1,420,401**	**1,059,603**	**1,215,059**	**1,426,128**	**1,060,901**	**1,217,363**	**1,408,537**
millions	Passenger-Kms															
Domestic	15,638	18,916	20,544	23,573	18,133	20,114	23,091	18,179	19,271	22,409	18,137	20,175	22,849	17,714	19,312	22,260
Western Europe	222,975	319,510	363,670	404,766	290,604	319,115	344,981	304,686	338,498	371,334	290,689	319,230	344,796	327,691	386,601	440,613
OECD	174,661	224,468	233,023	252,394	224,066	234,842	255,303	197,980	190,969	215,731	224,106	235,002	254,267	212,550	216,137	226,742
NIC	187,338	281,748	338,283	418,550	288,943	361,849	469,061	291,918	363,452	479,922	288,998	361,775	468,596	270,783	327,360	405,116
LDC	17,983	30,804	35,580	41,970	31,831	38,223	47,424	28,535	32,170	39,598	31,840	38,272	47,365	29,093	33,308	38,352
All Long Haul	**379,982**	**537,021**	**606,886**	**712,914**	**544,840**	**634,914**	**771,788**	**518,432**	**586,590**	**735,251**	**544,944**	**635,049**	**770,228**	**512,426**	**576,806**	**670,210**
Total	**618,595**	**875,446**	**991,101**	**1,141,253**	**853,577**	**974,143**	**1,139,860**	**841,297**	**944,359**	**1,128,994**	**853,770**	**974,453**	**1,137,873**	**857,831**	**982,720**	**1,133,083**
millions	Seats															
Domestic	55	62	67	77	60	66	76	61	64	74	60	66	75	59	65	74
Western Europe	204	273	309	340	252	276	296	264	295	321	252	276	296	277	321	361
OECD	32	38	39	42	38	40	43	34	33	37	38	40	43	36	36	38
NIC	37	51	61	77	52	66	86	55	69	91	53	66	86	49	59	73
LDC	6	10	11	13	10	12	15	9	10	13	10	12	15	9	11	12
All Long Haul	**75**	**99**	**112**	**132**	**100**	**118**	**144**	**98**	**112**	**141**	**100**	**118**	**143**	**94**	**106**	**123**
Total	**333**	**434**	**488**	**549**	**412**	**460**	**516**	**422**	**471**	**535**	**412**	**461**	**514**	**429**	**491**	**559**

5.56 In the baseline with carbon capped Gatwick's single runway remains full throughout the period to 2050. Although occasionally the numbers of ATMs dip below the assumed annual capacity of 280,000 ATMs this is a result of the model being allowed a +/- 1.5% tolerance in the search for a system equilibrium solution.

5.57 As in the carbon-traded cases in the baseline Heathrow's two runways remain full throughout. Again the throughput of ATMs occasionally dip below the assumed capacity of 480,000, but this is a result of the model being allowed a +/- 1.5% tolerance in the search for a system equilibrium solution. Throughput at Heathrow remains close to 480,000 throughout, because the pressure of excess demand is less extreme than in the traded case and there is no switching from a runway constraint to a terminal constraint as the binding capacity.

Baseline Passengers per ATM

5.58 The baseline passengers per passenger ATM (p/patm) for the five demand scenarios are shown in **Table 5.15**. Note that this is not quite the same as the total terminal passengers in **Table 5.1** or **Table 5.2** divided by the ATMs in **Table 5.13** or **Table 5.14** because the ATM tables also include freight aircraft.

5.59 P/patms (or 'loads') are expected to grow as a result of airlines using larger aircraft and flying with higher load factors. Long-haul generally uses larger aircraft and a switch from domestic and short-haul routes at an airport will normally produce an increase in the p/patms. Where runway capacity is constrained and runway slots become increasingly valuable there is also a further incentive for airlines to increase both aircraft size and passenger load factor.

5.60 In the carbon-traded baseline case both Heathrow and Gatwick runways are under pressure throughout the modelled period and both airports tend to have higher aircraft loads in all scenarios and across more years than in options described in **Chapter 6** where capacity is added. As fleet investment and fleet replacement has long lead times for airlines much of these higher aircraft passenger loads in the base will be the result of higher load factors rather than newer and bigger aircraft so will often be another indication of less attractive flying conditions at capacity constrained London airports.

5.61 Generally capping carbon deters some long-haul flights through higher fares and this is reflected in lower loads in most demand scenarios. It is noticeable that under the baseline with no new runway capacity in London, the carbon capped and traded aircraft loads in the *global fragmentation* scenario are almost identical. This is because very little additional carbon cost has to be added because the carbon-traded emissions are close to the 37.5Mt CO_2e target – see **Figure 4.2**.

Table 5.15: Baseline, passengers per passenger ATM (p/patm)

Carbon-traded		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Base	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	146	178	187	202	182	202	200	175	184	204	182	202	204	173	180	189
Gatwick	137	150	160	168	156	168	166	155	169	173	156	168	164	149	158	165
Stansted	133	166	175	175	164	172	172	163	169	170	164	172	173	169	180	181
Luton	132	150	157	155	151	152	153	150	157	155	151	152	152	150	154	152
London City	54	62	58	61	60	59	67	71	72	75	60	59	67	62	60	58
Manchester	126	154	163	168	157	171	185	155	167	173	157	171	186	152	161	165
Birmingham	97	98	101	115	102	117	168	102	107	123	102	117	171	97	100	111
Glasgow	100	106	115	126	108	119	128	113	119	128	108	119	126	107	115	120
Edinburgh	94	110	116	114	111	117	116	103	107	104	111	117	127	103	107	107
UK Average	**113**	**125**	**129**	**130**	**126**	**131**	**135**	**126**	**130**	**132**	**126**	**131**	**135**	**124**	**128**	**129**
Paris CDG	137	160	165	170	164	170	178	160	166	173	164	170	178	157	162	166
Amsterdam	129	147	151	157	151	159	165	152	159	165	151	159	165	145	148	152
Frankfurt	132	152	157	162	156	160	165	152	156	161	156	160	165	150	153	158
Dubai	192	225	232	240	228	238	239	225	235	243	228	238	238	224	229	238

Carbon capped		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Heathrow	146	177	184	200	178	188	204	173	181	197	178	188	205	173	180	189
Gatwick	137	148	158	163	146	154	162	152	161	169	146	152	162	149	157	165
Stansted	133	167	176	176	167	182	184	169	183	180	167	183	186	169	180	179
Luton	132	150	155	158	149	153	156	151	153	155	149	154	156	150	154	154
London City	54	61	59	60	60	56	56	57	54	52	60	55	57	62	60	59
Manchester	126	153	161	167	151	160	166	154	163	170	151	160	167	151	160	166
Birmingham	97	97	96	103	96	87	89	99	97	97	96	88	89	98	99	111
Glasgow	100	105	112	119	104	112	125	110	122	123	104	113	125	109	114	119
Edinburgh	94	109	116	115	107	115	111	111	114	114	107	114	112	103	106	106
UK Total	**113**	**125**	**128**	**130**	**125**	**128**	**130**	**124**	**128**	**130**	**125**	**128**	**130**	**124**	**128**	**129**
Paris CDG	137	159	164	170	160	168	176	158	164	172	160	168	176	157	162	166
Amsterdam	129	146	150	155	147	153	161	149	155	162	147	153	161	145	148	152
Frankfurt	132	152	156	161	153	159	165	151	156	162	153	159	165	150	153	157
Dubai	192	225	230	239	225	234	242	224	232	240	225	234	242	224	229	238

6. Option passenger forecasts

6.1 This chapter sets out the forecasts of future airport usage when the various scenarios of future national demand described in the previous chapter are allocated by the DfT's National Air Passenger Demand Model (NAPAM) to UK and international hub airports. All forecasts are **constrained** to airport capacity. This methodology is described in **Chapter 2**. When demand exceeds capacity at individual airports a 'shadow cost' is applied and excess demand is either suppressed or moves to another airport in the system which can viably supply the air service demanded. As discussed in paragraph 2.13, this is a quite different and more realistic form of passenger allocation to particular airports than the unconstrained style of forecasts used in the assessment of overall national need in the Interim Report.

Capacity options

6.2 Airport usage forecasts are provided for the three additional capacity options:

1. **LGW 2R** Gatwick Airport Second Runway doubling the airport capacity from 280,000 to 560,000 ATMs per annum from 2025.
2. **LHR NWR** Heathrow Airport North West Runway increasing the airport capacity from 480,000 to 740,000 ATMs per annum from 2026.
3. **LHR ENR** Heathrow Airport Extended Northern Runway permitting mixed mode operations and increasing the airport capacity from 480,000 to 700,000 ATMs per annum from 2026.

6.3 In each option where new runway capacity is provided terminal capacity is assumed to be unconstrained. Terminals are therefore assumed to expand to meet the number of passengers demanding use of the runway. The passenger forecasts may therefore sometimes exceed the terminal capacities used elsewhere in the appraisal. In the Operational Efficiency module it is noted that the airport operator would be expected to increase terminal capacity to meet demand.

Demand scenarios

6.4 Forecasts have been produced for five future demand scenarios, labelled *assessment of need* to *global fragmentation*.

6.5 The *assessment of need* scenario has a range around the main case: the same approach as adopted in the Interim Report. The range has been updated as described in **Chapter 3**. In this chapter and **Appendix 3** a total demand cases for which there are airport usage forecasts are presented for the *assessment of need* scenario:

1. **Carbon-Traded**: This is the 'central' of the Monte Carlo based *assessment of need* forecasts consistent with the Interim Report case. Here 'central' means that there is a 50% probability that the outcome will be higher than the forecast and likewise a 50% probability that the outcome will be lower than the forecast. In this scenario it is assumed that carbon is traded. This means that a global emissions trading scheme is in place and passengers pay the forecast carbon-traded price, but there is no capping of UK CO_2 emissions to a target value.
2. **Carbon Capped**: This is a variant on the 'central' forecast above where UK aviation CO_2 emissions are capped to 37.5Mt in 2050.
3. **Low**: This is the low range of the Monte Carlo based *assessment of need* forecasts consistent with the Interim Report case. Here low means that it is expected that there is only a 20% probability that the outcome demand will be lower than the forecast.
4. **High**: This is the high range of the Monte Carlo based *assessment of need* forecasts consistent with the Interim Report case. Here high means that it is expected that there is only a 20% probability that the outcome demand will be higher than the forecast.

6.6 Carbon capped forecasts are not presented for the *assessment of need* low range forecasts because in this scenario with even the highest capacity increment option (LHR NWR), CO_2 emissions are within the target of 37.5Mt in 2050. Carbon capping forecasts are not presented for high range forecasts because in this scenario the excess of demand over capacity prevents the model traded carbon runs from reaching 2050. So the effect of capping carbon to the 37.5Mt target would be to produce a forecast not significantly different from the central *assessment of need* carbon capped forecast.

6.7 As **Chapters 1** and **3** describe, these scenarios have been further developed, in particular and where possible, to introduce elements of airline behaviour in response to capacity changes into the modelling. This also means that option specific supply-side effects were introduced into specific capacity options as described in **Chapter 3** (e.g. where Gatwick capacity is expanded, an alliance relocates).

6.8 ***Global growth***: this scenario sees higher passenger demand from all world regions, coupled with lower operating costs. In the Gatwick Airport Second Runway option the SkyTeam alliance moves from Heathrow to Gatwick when the second runway opens. No airport specific interventions are assumed for either of the Heathrow options.

6.9 ***Relative decline of Europe***: this scenario sees higher growth of passenger demand in emerging economies, a strengthened position of Far and Middle Eastern aviation hubs and their airlines. In the Gatwick Airport Second Runway option a Middle-Eastern airline purchases a controlling equity stake in the LCCs at Gatwick to provide feeder traffic to its hub with a corresponding increase to Dubai.[59] In the Heathrow options a Middle Eastern airline takes controlling equity stake in the airline with the most slots at Heathrow (assumed to be BA) to provide feeder services to its home hub. Long-haul North Atlantic and African services are retained but services beyond the Middle East are dropped. LCCs use the spare slots to develop a limited network of services.

6.10 ***Low-cost is king***: this scenario sees the LCC model expanding to new markets, including long haul with higher passenger demand from all world regions, and lower airline operating costs. In the Gatwick Airport Second Runway option the new capacity allows enhanced transfer opportunities and a significant growth in long-haul services fed by independently operated LCC services. In the Heathrow options LCCs are allowed to develop a limited network of services.

6.11 ***Global fragmentation***: this scenario sees world economies close themselves off by adopting more interventionist national policy models with a global decline in passenger demand coupled with higher operating costs and the UK introducing a stand-alone cap of 37.5Mt of CO_2 emissions while no global carbon agreement is reached. There are no option specific interventions at Heathrow or Gatwick.

6.12 All five scenarios are presented for both carbon-traded and carbon capped demand cases. The carbon capping does significantly diminish the differences between each of these scenarios.

Option passenger demand forecasts with capacity timelines

6.13 The following sequence of figures shows airport forecasts for all five scenarios (carbon-traded and carbon capped) for each of the three capacity options in turn. Terminal passenger tables are in millions of terminal passengers per annum for 2030, 2040 and 2050. The tables separately report the five London airports, the nine largest regional airports and the four modelled overseas hubs. The remaining 17 UK airports (although separately modelled) are grouped.

59 Note that with its effectively unlimited capacity, Dubai is treated as a proxy for other hubs in the region.

6.14 The **timelines** show when runway capacity at each of the five London airports is exhausted in red with amber indicating less than 10% of runway capacity remaining. An airport is set to red when a shadow cost has been incurred. As discussed earlier in paragraph 5.10, that shadow cost could be triggered by a runway or terminal constraint. However in the case of Heathrow and Gatwick this will be a runway constraint, as in the capacity options the expanded airport is given infinite terminal capacity. Stansted, Luton and London City can incur either a runway or terminal capacity shadow cost depending on demand scenario and runway option. If they incur terminal shadow costs they can be shown as going straight from green to red.

6.15 It should be noted that 100% utilisation of the theoretical maximum runway capacity across the whole of the London airport system is unlikely to be either desirable or feasible. It would create airspace challenges and reduce resilience. In addition, these timelines do not give an indication as to how much capacity remains at an airport until it hits 90% of its capacity, therefore they should be considered as only one piece of infomation, to be viewed alongside the passenger and ATM forecast tables rather than in isolation.

6.16 Note that all 2011 passenger data shown in the tables is from the base year validated model outputs.

Gatwick Airport Second Runway passenger forecasts, carbon-traded

Table 6.1: Gatwick Airport Second Runway terminal passenger forecasts (mppa), carbon traded

Carbon-traded		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
LGW 2R	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	70	85	91	96	86	93	91	83	88	95	82	87	97	84	87	93
Gatwick	34	50	62	82	58	86	96	49	62	83	72	91	96	40	53	68
Stansted	18	33	35	35	35	35	35	30	35	35	34	35	35	35	35	35
Luton	10	13	17	18	15	18	18	15	18	18	17	18	18	14	18	18
London City	3	7	7	8	7	8	9	8	8	8	8	8	8	6	7	8
London	135	188	213	238	201	240	249	185	210	239	213	239	254	179	201	222
London annual growth rate			1.2%	1.1%		1.8%	0.4%		1.3%	1.3%		1.2%	0.6%		1.1%	1.0%
Manchester	20	33	41	51	35	47	55	34	40	51	36	48	55	33	41	49
Birmingham	8	11	15	18	13	19	26	12	16	20	13	21	30	12	16	20
Glasgow	7	8	9	11	9	11	15	9	10	12	9	11	15	8	8	10
Edinburgh	9	14	17	19	15	18	20	15	17	20	15	19	20	14	16	19
Bristol	6	7	9	11	8	10	12	9	11	12	9	12	12	7	8	11
Newcastle	4	6	7	8	6	8	10	6	8	10	7	9	11	6	7	8
Belfast International	4	6	8	8	7	9	9	6	8	8	7	9	9	6	7	9
Liverpool	5	8	9	8	8	10	15	9	11	11	9	11	15	7	8	9
East Midlands	4	7	9	10	8	10	14	8	10	12	9	13	14	7	8	11
Other modelled UK	16	27	33	42	29	38	62	28	35	45	31	45	66	26	31	38
Non-London annual growth rate			2.0%	1.9%		2.7%	2.9%		2.0%	1.9%		3.1%	2.3%		2.0%	2.0%
UK Total	**218**	**316**	**368**	**426**	**339**	**420**	**488**	**321**	**377**	**441**	**358**	**435**	**502**	**303**	**352**	**406**
UK annual growth rate			1.5%	1.5%		2.2%	1.5%		1.6%	1.6%		2.0%	1.4%		1.5%	1.4%
Paris CDG	58	83	98	118	92	119	124	82	97	117	91	118	124	78	93	109
Amsterdam	41	59	69	87	66	95	125	71	95	118	65	94	124	55	65	76
Frankfurt	53	80	100	114	96	113	115	70	78	95	94	113	115	66	78	98
Dubai	45	100	124	159	118	166	259	114	151	199	117	166	255	92	112	141
Foreign Hubs Total	**198**	**322**	**391**	**478**	**371**	**493**	**623**	**337**	**421**	**529**	**367**	**491**	**618**	**291**	**347**	**423**
Foreign hub annual growth rate			2.0%	2.0%		2.9%	2.4%		2.2%	2.3%		3.0%	2.3%		1.8%	2.0%

6.17 In the Gatwick Airport Second Runway (LGW 2R) option a new 280,000 capacity runway is added in 2025 while all other airports retain their baseline capacities. With the new runway, the number of passengers using Gatwick by 2050 ranges from 68 mppa in *global fragmentation* to 96 mppa in *low-cost is king*. Compared to the 34 mppa who travelled through Gatwick in 2011, every scenario shows a large increase in traffic.

6.18 Overall with a Gatwick Airport Second Runway the share of national traffic handled by London airports is highest in *assessment of need* at 56% and lowest under *global growth* and *low-cost is king* (around 51%). This differs from the baseline where London has a smaller share of national traffic.

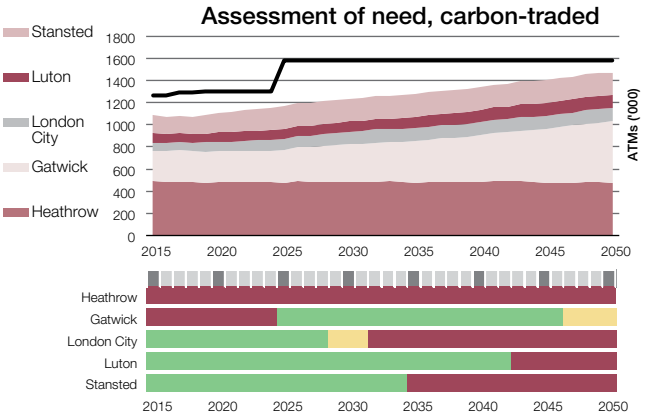
6.19 In 2050 the number of passengers using regional UK airports ranges from 184 mppa in *global fragmentation* to 248 mppa in *low-cost is king*. Traffic numbers at some regional airports vary significantly between scenarios. By 2050 Manchester's throughput lies in the relatively narrow range 50 to 55 mppa in all scenarios but Birmingham, more affected by spill from London, varies between 18 and 28 mppa. The passenger demand for the regional airports is lower in all scenarios compared to the baseline as Gatwick attracts back some demand displaced into the regions in the baseline where all London airports are full by 2050.

6.20 Gatwick Airport Limited's forecasts predict similar levels of passenger demand at the airport in 2050 as the Commission's *global growth* and *low-cost is king* scenarios, driven by significant growth in short-haul and low-cost traffic, including potential expansion by low-cost carriers into long-haul. Gatwick Airport Limited also assumes an increase in other long-haul carriers' presence at the expanded airport, which would offer an alternative option to a constrained Heathrow for accessing London's large origin-and-destination market. In contrast to the *global growth* scenario, however, it does not assume that an airline alliance would move from Heathrow to Gatwick.

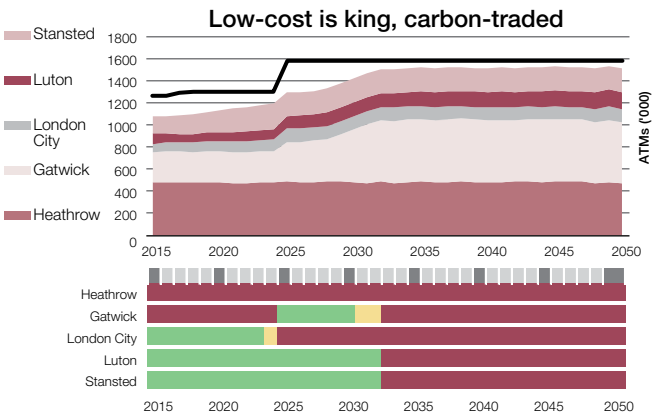
Figure 6.1: Gatwick Airport Second Runway, timelines of runway (ATM) capacity used, carbon-traded

Timeline to full capacity

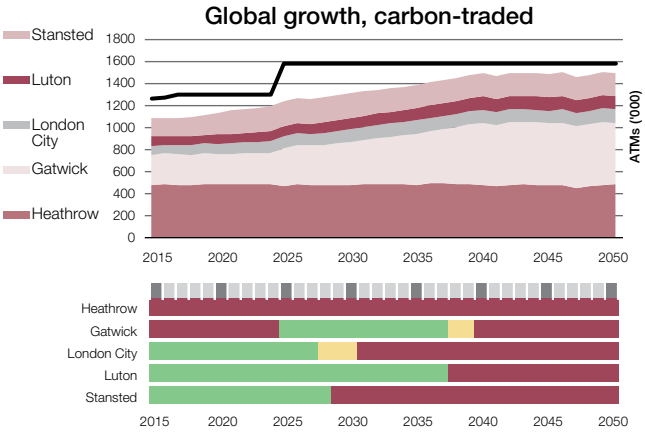
Assessment of need



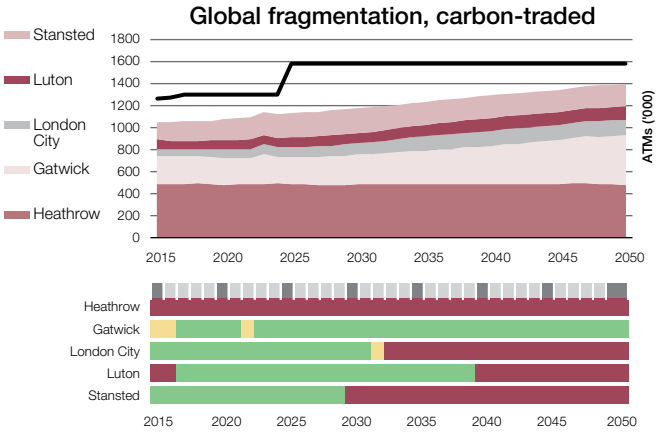
Low-cost is king



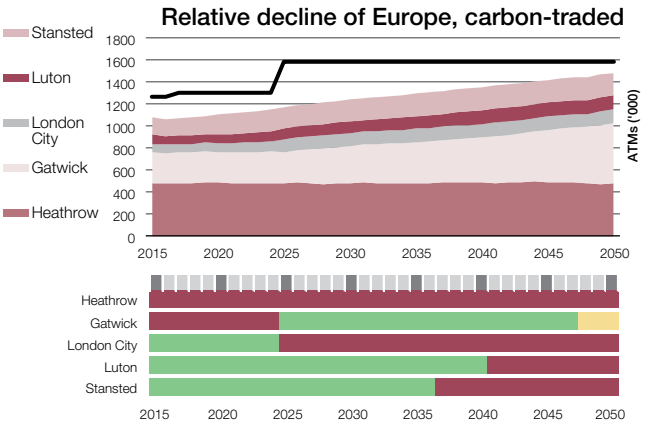
Global growth



Global fragmentation



Relative decline of Europe



6.21 The timelines in **Figure 6.1** illustrate that the new Gatwick runway is fully utilised by 2033 in *low-cost is king* and by 2040 under *global growth*. Under *global fragmentation* some capacity remains in 2050 and in the other two scenarios Gatwick is operating at over 90% of its capacity by 2050. In all five scenarios Heathrow remains at full capacity and the other three London airports are all full by 2050.

Gatwick Airport Second Runway passenger forecasts, carbon capped

Table 6.2: Gatwick Airport Second Runway terminal passenger forecasts (mppa), carbon capped

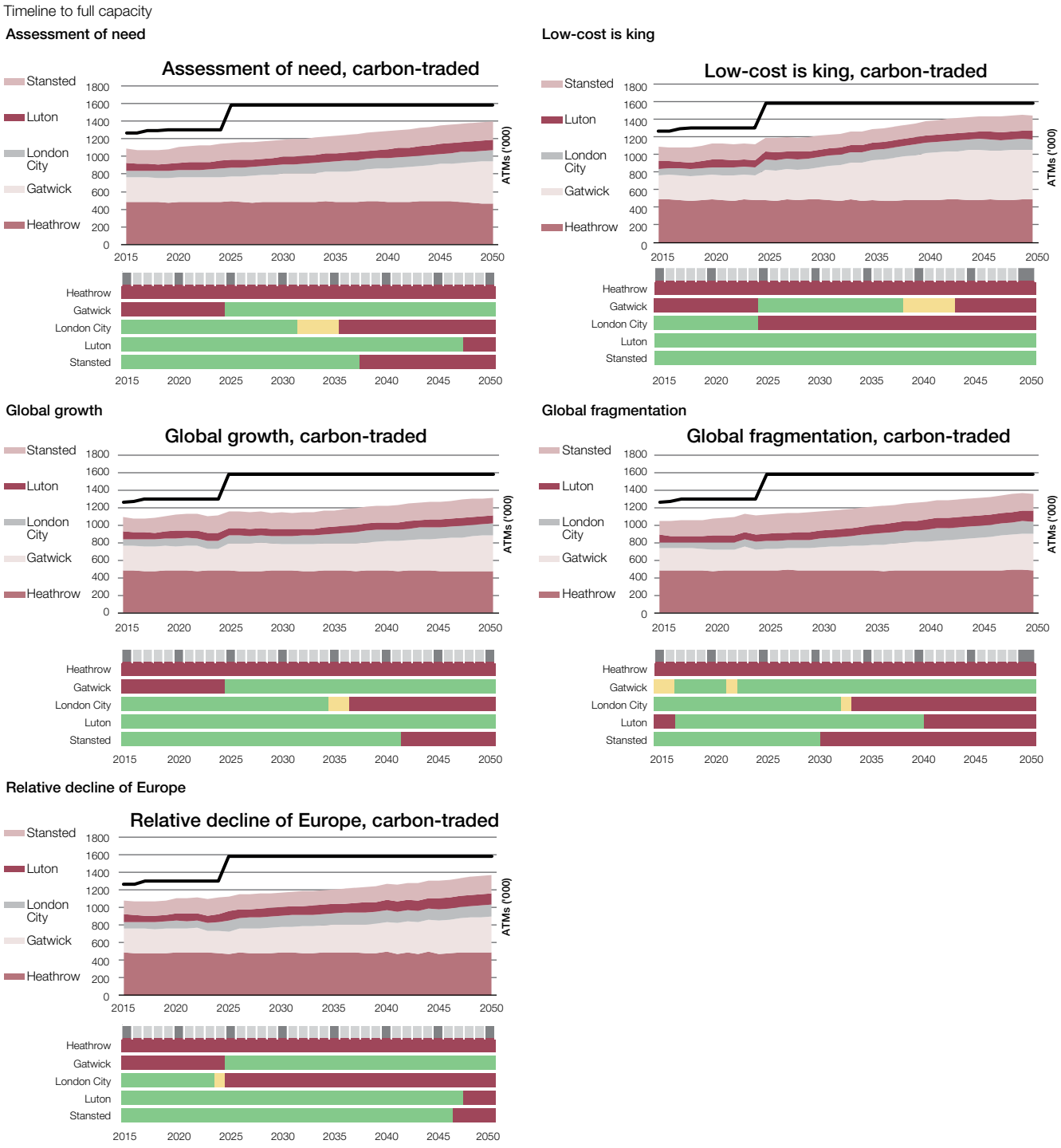
Carbon capped		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
LGW 2R	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	70	85	89	93	85	90	96	83	86	94	82	83	90	83	87	93
Gatwick	34	46	56	69	44	49	60	42	49	61	53	78	86	39	50	63
Stansted	18	31	35	35	29	34	35	26	32	35	24	26	29	35	35	35
Luton	10	13	15	18	12	12	14	14	16	18	12	11	14	13	17	18
London City	3	6	7	8	5	7	8	8	8	8	7	7	7	6	8	7
London	135	182	202	223	175	192	213	172	191	216	177	206	226	176	196	216
London annual growth rate			1.1%	1.0%		0.9%	1.1%		1.0%	1.2%		1.5%	0.9%		1.0%	1.0%
Manchester	20	32	38	45	29	34	40	31	35	43	28	33	39	32	39	47
Birmingham	8	10	13	16	9	10	11	10	12	14	8	9	9	11	14	18
Glasgow	7	8	8	10	8	8	9	8	9	10	8	8	9	7	8	9
Edinburgh	9	14	16	18	12	14	17	14	16	18	12	14	16	13	16	18
Bristol	6	7	8	10	6	7	8	8	9	11	7	7	8	7	8	10
Newcastle	4	6	6	7	5	5	6	6	7	8	5	6	6	5	6	7
Belfast International	4	6	7	8	6	7	7	6	7	8	5	6	7	6	7	8
Liverpool	5	7	8	8	6	7	8	8	10	10	7	7	7	7	8	8
East Midlands	4	7	8	9	6	7	8	8	9	9	7	8	8	6	8	10
Other modelled UK	16	24	29	36	22	25	32	26	30	36	22	23	29	25	30	37
Non-London annual growth rate			1.6%	1.7%		1.3%	1.6%		1.4%	1.6%		1.0%	1.4%		1.8%	1.8%
UK Total	**218**	**303**	**344**	**391**	**284**	**316**	**359**	**297**	**334**	**383**	**287**	**327**	**365**	**297**	**340**	**389**
UK annual growth rate			1.3%	1.3%		1.1%	1.3%		1.2%	1.4%		1.3%	1.1%		1.4%	1.4%
Paris CDG	58	80	92	107	78	92	109	75	85	101	75	86	101	78	92	108
Amsterdam	41	56	64	75	55	63	76	61	75	91	52	58	68	55	64	76
Frankfurt	53	75	91	114	75	97	117	59	63	76	70	87	107	65	76	94
Dubai	45	96	116	145	100	129	170	101	127	169	96	123	161	91	111	140
Foreign Hubs Total	**198**	**307**	**364**	**441**	**308**	**381**	**472**	**296**	**350**	**437**	**292**	**354**	**438**	**289**	**343**	**418**
Foreign hub annual growth rate			1.7%	1.9%		2.2%	2.2%		1.7%	2.2%		1.9%	2.2%		1.7%	2.0%

6.22 The effect of capping carbon emissions at a level consistent with current plans to meet UK climate targets is to reduce the level of demand in the system under every scenario, and to reduce the difference between demand scenarios in the Gatwick Airport Second Runway option. The number of passengers using Gatwick by 2050 ranges from 60 mppa in *global growth* to 86 mppa in *low-cost is king*. Carbon capping tends to favour shorter flights, so the scenario which most favours the low-cost model makes greatest use of the new capacity.

6.23 Overall carbon capping leads to national forecasts very similar to the baseline by 2050, although the allocation of demand between airports and market sectors changes more significantly. Unlike the carbon-traded case, London gains the highest share of traffic under *low-cost is king* (62%) and the lowest under *global fragmentation* – the same pattern as in the baseline.

6.24 In 2050 traffic at regional airports is similar to the baseline and ranges from 139 mppa in *low-cost is king* to 173 mppa in *global fragmentation*. Regional demand is lower than the baseline under all scenarios as London gains a higher share of traffic under all Gatwick Airport Second Runway carbon capped cases compared to the baseline.

Figure 6.2: Gatwick Airport Second Runway, timelines of runway (ATM) capacity used, carbon capped



6.25 If carbon is capped, the new Gatwick runway is fully utilised by 2050 in *low-cost is king*, where it becomes full in 2044. In all other scenarios, Gatwick has at least 10% spare capacity in 2050, although the passenger throughput is comparable to a two runway Heathrow today in most scenarios. Under all five scenarios Heathrow remains at capacity. The pattern of capacity usage at the other London airports is complex. Luton and Stansted generally experience most impact on their share of traffic, retaining spare capacity out to 2050 in some scenarios, much longer than in the equivalent carbon-traded case.

Heathrow Airport North West Runway passenger forecasts, carbon-traded

Table 6.3: Heathrow Airport North West Runway terminal passenger forecasts (mppa), carbon traded

Carbon-traded		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
LHR NWR	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	70	116	134	138	125	138	148	119	129	136	129	138	149	104	121	133
Gatwick	34	39	43	47	42	47	45	40	46	49	40	46	45	39	43	46
Stansted	18	32	35	35	35	35	35	27	32	35	31	35	35	29	35	35
Luton	10	12	14	18	13	18	18	12	13	18	13	18	18	12	13	18
London City	3	5	8	8	5	7	9	5	8	8	6	7	8	6	7	7
London	135	205	234	245	220	246	254	202	226	245	218	244	255	190	219	240
London annual growth rate			1.3%	0.5%		1.1%	0.3%		1.1%	0.8%		1.1%	0.5%		1.5%	0.9%
Manchester	20	33	41	52	35	47	56	32	39	49	35	47	56	31	39	49
Birmingham	8	10	13	19	12	19	29	11	14	17	12	18	27	10	13	17
Glasgow	7	7	8	11	8	10	15	8	9	12	8	10	15	7	8	10
Edinburgh	9	15	18	20	16	19	20	14	17	19	16	19	20	14	17	20
Bristol	6	7	9	11	8	11	12	7	9	11	7	10	12	7	8	11
Newcastle	4	6	7	8	6	8	11	6	8	9	6	8	11	6	7	8
Belfast International	4	6	8	9	7	8	9	6	8	8	7	8	9	6	7	9
Liverpool	5	8	9	9	8	10	15	8	10	10	8	10	15	8	9	9
East Midlands	4	7	9	11	8	11	14	7	8	11	7	10	14	7	9	11
Other modelled UK	16	26	32	40	28	38	61	26	32	44	28	38	61	26	31	38
Non-London annual growth rate			1.9%	2.2%		2.9%	2.9%		2.0%	2.1%		2.9%	2.9%		1.9%	2.1%
UK Total	**218**	**331**	**387**	**435**	**355**	**427**	**496**	**329**	**380**	**435**	**353**	**423**	**494**	**312**	**366**	**420**
UK annual growth rate			1.6%	1.2%		1.8%	1.5%		1.5%	1.4%		1.8%	1.6%		1.6%	1.4%
Paris CDG	58	81	96	117	90	118	124	81	96	117	91	118	124	77	90	108
Amsterdam	41	57	67	82	64	89	125	66	89	114	64	91	124	54	62	74
Frankfurt	53	71	88	113	87	113	115	66	76	95	88	113	117	62	71	88
Dubai	45	99	123	157	116	164	250	113	150	199	116	164	250	91	110	140
Foreign Hubs Total	**198**	**309**	**374**	**468**	**356**	**484**	**614**	**326**	**411**	**524**	**359**	**487**	**616**	**284**	**334**	**410**
Foreign hub annual growth rate			1.9%	2.3%		3.1%	2.4%		2.3%	2.5%		3.1%	2.4%		1.6%	2.1%

6.26 In the Heathrow Airport North West Runway (LHR NWR) option a new runway is added, increasing capacity at Heathrow to 740,000 ATMs from 2026, whilst all other airports retain their baseline capacities. With the new runway, the number of passengers using Heathrow by 2050 ranges from 133 mppa in *global fragmentation* to 149 mppa in *low-cost is king*. Nationally by 2050 the number of additional passengers relative to the baseline ranges from 17 mppa under *relative decline of Europe* to 39 mppa under *global growth*.

6.27 Overall in the Heathrow Airport North West Runway option the greatest share of passenger traffic handled by London is in *global fragmentation* at 57% and lowest in *global growth* (51%). This differs from the baseline where London has a smaller share of national traffic as these airports have more demand than capacity and regional airports pick up some of the overspill.

6.28 In 2050 in this option the number of passengers using regional UK airports ranges from 124 mppa in *global growth* to 146 mppa in *relative decline of Europe*. Traffic numbers at some regional airports vary significantly between scenarios. By 2050 Manchester handles between 49 and 56 mppa in 2050, while Birmingham, more affected by spill from London, ranges from 17 to 29 mppa. The passenger demand for the regional airports is lower in all scenarios compared to the baseline as Heathrow Airport North West Runway attracts back some demand displaced into the regions in the baseline.

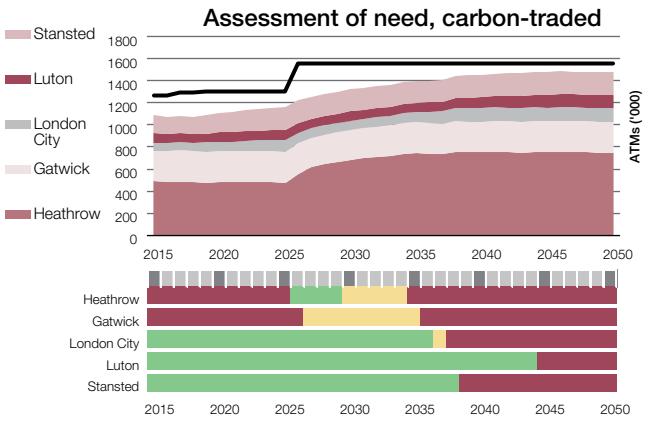
6.29 The timelines illustrate that with traded carbon the new Heathrow runway is fully utilised sometime between 2030 and 2035 in all scenarios except *global fragmentation*, which is full by 2042. The expanded Heathrow does not greatly ease congestion at Gatwick which would be full or operating over 90% capacity for the whole 2015-2050 period under every scenario. By 2050, the other 3 London airports would also be operating at full capacity.

6.30 HAL's own forecast of unconstrained growth in passengers is based on trend growth of 1% per annum till 2025, when the new runway is expected to open. Between 2025 and 2030, they have assumed a ramp-up of demand to fill the additional capacity available. This is expected to amount to a growth rate of 5% per annum till 2030, tapering off thereafter till 2040 when a passenger volume of 130 million is reached. After this, the growth rate is expected to be much lower at 0.3% per annum to 2050, leading to a passenger demand of 135 million passengers in 2050. Sensitivities have also been conducted to account for a faster than 5% per annum level of take-up of additional runway capacity. By 2040, their forecasts are closer to those prepared by the Commission, although passenger demand does not achieve the levels predicted in the *global growth* or *low-cost is king* scenarios. A sensitivity test with phased in capacity at Heathrow has been undertaken and details can be found in **Chapter 7**.

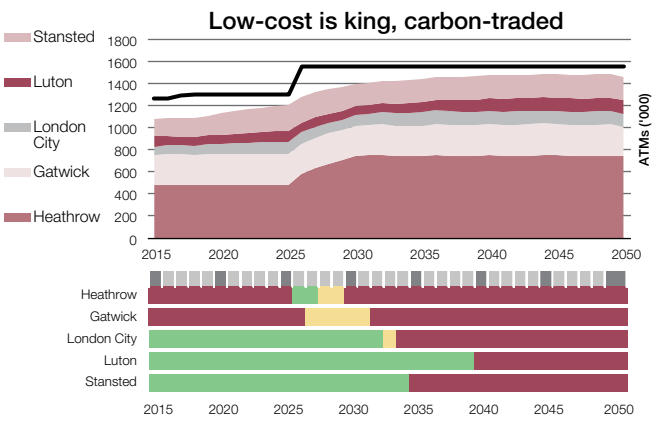
Figure 6.3: Heathrow Airport North West Runway timelines of runway (ATM) capacity used, carbon-traded

Timeline to full capacity

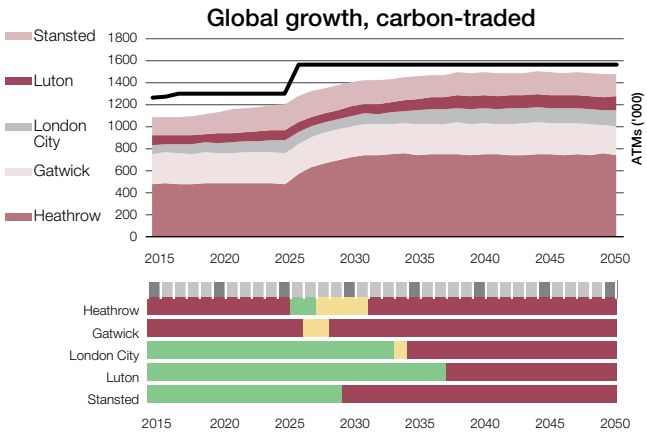
Assessment of need



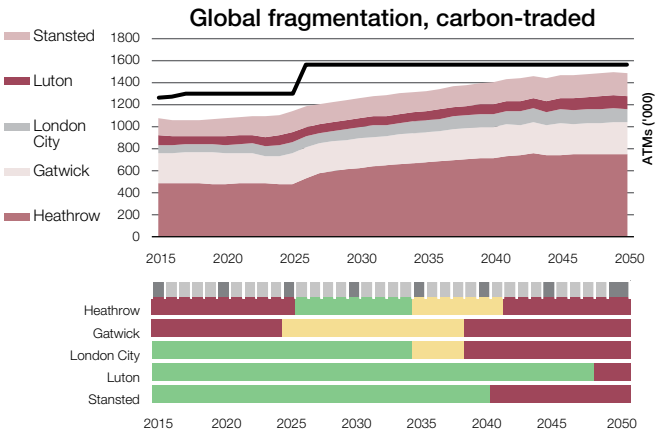
Low-cost is king



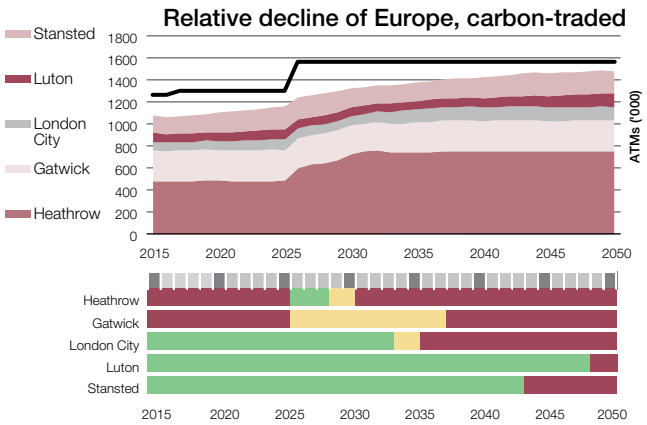
Global growth



Global fragmentation



Relative decline of Europe



Heathrow Airport North West Runway passenger forecasts, carbon capped

Table 6.4: Heathrow Airport North West Runway terminal passenger forecasts (mppa), carbon capped

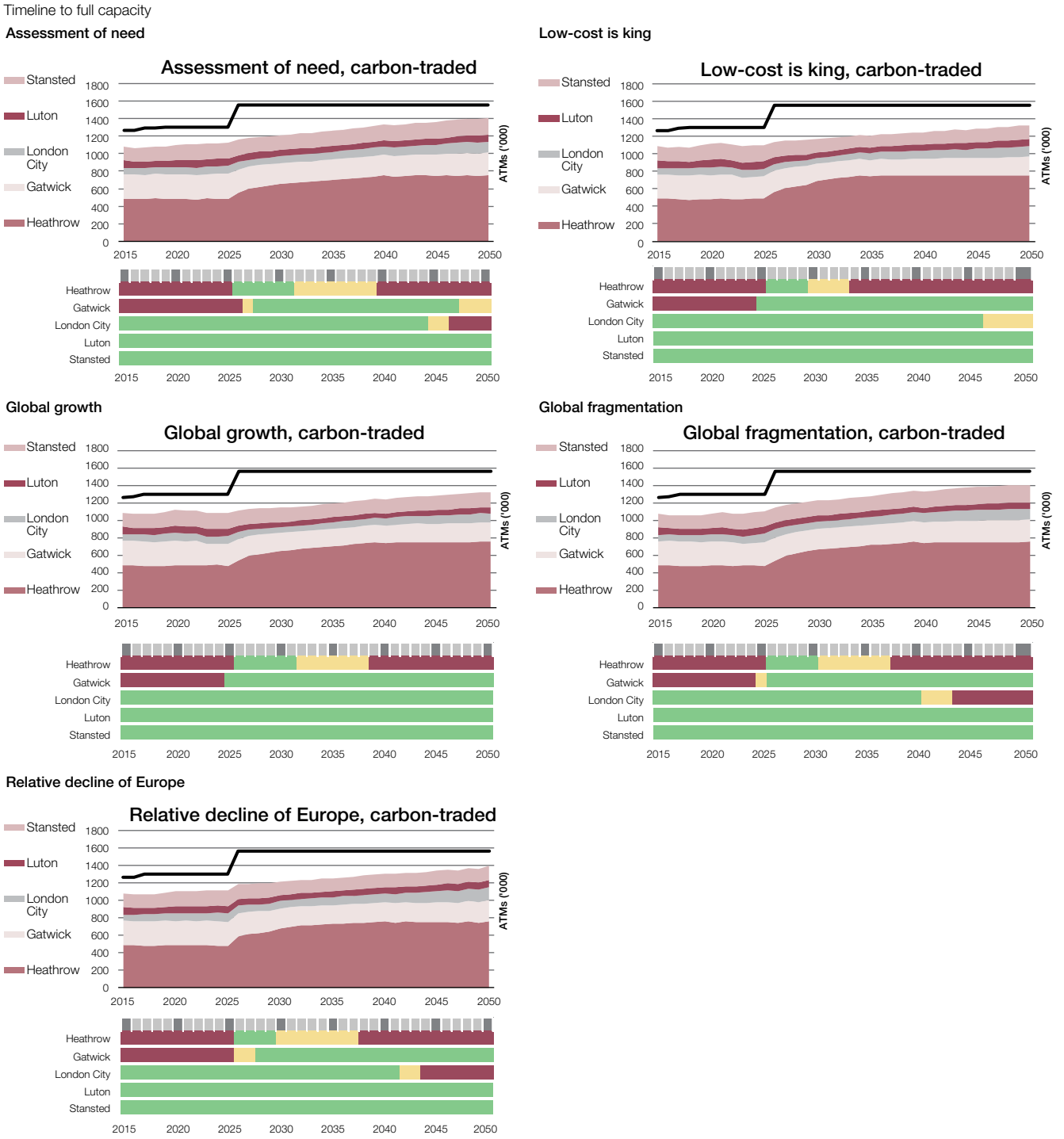
Carbon capped		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
LHR NWR	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	70	109	128	135	109	130	139	111	126	132	115	131	138	110	128	134
Gatwick	34	35	36	41	30	31	34	35	35	40	29	30	34	34	36	40
Stansted	18	27	31	34	26	27	30	24	25	27	23	23	26	27	32	35
Luton	10	10	10	11	9	8	10	10	11	13	9	10	12	10	9	11
London City	3	4	5	7	3	4	6	4	5	7	3	5	6	5	6	7
London	135	186	210	228	178	200	218	184	202	219	180	198	216	187	211	227
London annual growth rate			1.2%	0.8%		1.2%	0.8%		0.9%	0.8%		0.9%	0.9%		1.2%	0.7%
Manchester	20	29	34	40	27	29	36	29	34	41	27	30	37	29	34	40
Birmingham	8	9	8	10	7	7	8	9	8	10	7	7	9	9	10	12
Glasgow	7	7	6	8	6	6	7	7	7	9	6	6	8	6	6	7
Edinburgh	9	13	15	18	12	14	16	13	15	17	12	14	16	13	15	17
Bristol	6	6	7	8	5	6	7	6	7	9	5	6	6	6	7	8
Newcastle	4	5	6	6	5	5	5	5	6	7	5	5	6	5	5	6
Belfast International	4	6	7	7	5	6	7	6	7	8	5	6	7	5	6	7
Liverpool	5	6	7	7	6	7	6	7	8	7	6	7	6	6	8	6
East Midlands	4	7	8	8	6	7	7	6	7	8	6	7	7	7	7	8
Other modelled UK	16	22	25	30	19	21	24	22	26	30	20	22	25	22	24	29
Non-London annual growth rate			1.1%	1.4%		0.9%	1.4%		1.2%	1.5%		1.0%	1.5%		1.2%	1.4%
UK Total	**218**	**296**	**332**	**369**	**276**	**308**	**342**	**296**	**328**	**365**	**280**	**308**	**343**	**295**	**333**	**366**
UK annual growth rate			1.2%	1.0%		1.1%	1.1%		1.0%	1.1%		0.9%	1.1%		1.2%	1.0%
Paris CDG	58	73	83	96	72	83	98	74	84	99	73	85	100	74	84	95
Amsterdam	41	51	57	65	49	56	65	59	73	93	50	58	67	52	58	65
Frankfurt	53	62	70	86	62	73	93	59	64	77	64	78	100	67	80	106
Dubai	45	90	106	132	94	119	157	103	132	174	95	122	159	93	111	136
Foreign Hubs Total	**198**	**277**	**315**	**379**	**277**	**331**	**413**	**294**	**353**	**442**	**282**	**342**	**426**	**286**	**333**	**402**
Foreign hub annual growth rate			1.3%	1.9%		1.8%	2.3%		1.8%	2.3%		2.0%	2.2%		1.5%	1.9%

6.31 The effect of capping carbon emissions at a level consistent with current plans to meet UK climate targets is to reduce the level of demand in the system under every scenario and to remove much of the difference between the demand scenarios. In the Heathrow Airport North West Runway option the number of passengers using Heathrow by 2050 ranges from 132 mppa under *relative decline of Europe* to 139 mppa under *global growth*. Nationally by 2050 the total number of passengers is lower than the baseline under all five demand scenarios as increases in passengers at Heathrow result in declines at other UK airports, which benefitted from overspill traffic in the baseline.

6.32 Increased capacity for long-haul flying at Heathrow increases UK total aircraft-kilometres and seat-kilometres, thus using more of the UK carbon 'budget' in this option in terms of distance flown at the expense of greater numbers of passengers making shorter flights from other airports. Relative to the baseline, expanding Heathrow also draws back some transfer traffic exported to foreign hubs in the baseline (where their CO_2 was not counted against the UK target).

6.33 Unlike the carbon-traded case, London gains the highest share of traffic in *global growth* (64%) and the lowest in *relative decline of Europe* (60%). In 2050, the pattern at regional airports is different to the equivalent carbon-traded case: the passenger demand is lowest under *global growth* and highest under *relative decline of Europe*. There is less variability in demand levels at the regional airports and the regional total is generally lower in all scenarios.

Figure 6.4: Heathrow Airport North West Runway timelines of runway (ATM) capacity used, carbon capped



6.34 The timelines illustrate that, if carbon is capped, the new runway at Heathrow is fully utilised by 2034 in *low-cost is king* and by 2040 under the other four demand scenarios. By 2050 London City with its short-haul network would be fully utilised under three of the scenarios but none of the other 3 London airports would reach full capacity by 2050 under any of the five scenarios.

Heathrow Airport Extended Northern Runway passenger forecasts, carbon-traded

Table 6.5: Heathrow Airport Extended Northern Runway terminal passenger forecasts (mppa), carbon traded

Carbon-traded		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
LHR ENR	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	70	116	127	131	123	131	142	116	123	131	119	130	141	104	119	126
Gatwick	34	39	44	46	42	47	46	40	46	49	42	47	45	39	43	47
Stansted	18	32	35	35	35	35	35	26	33	35	32	35	35	29	35	35
Luton	10	12	15	18	13	18	18	12	13	18	13	18	18	12	13	18
London City	3	5	7	8	6	7	8	6	8	8	6	7	8	6	8	8
London	135	205	229	238	219	239	248	200	222	241	213	237	248	190	218	233
London annual growth rate			1.1%	0.4%		0.9%	0.4%		1.1%	0.8%		1.1%	0.5%		1.4%	0.6%
Manchester	20	33	41	52	35	48	55	32	39	50	35	47	56	31	39	48
Birmingham	8	10	13	20	12	20	29	10	14	19	12	20	27	10	13	18
Glasgow	7	7	8	11	8	10	15	8	9	12	8	10	15	7	8	9
Edinburgh	9	15	18	20	16	19	20	14	17	19	16	19	20	14	17	20
Bristol	6	7	9	12	8	11	12	7	9	11	7	10	12	7	8	11
Newcastle	4	6	7	8	6	8	11	6	8	9	6	8	10	6	7	8
Belfast International	4	6	8	9	7	8	9	6	8	8	7	9	9	6	7	9
Liverpool	5	8	9	9	8	10	15	8	10	10	8	10	15	8	9	9
East Midlands	4	7	9	11	8	11	14	7	8	10	7	10	14	7	9	11
Other modelled UK	16	26	32	41	28	39	63	26	33	43	28	40	64	26	31	39
Non-London annual growth rate			2.0%	2.3%		3.1%	2.9%		2.0%	2.2%		3.0%	2.9%		1.9%	2.2%
UK Total	**218**	**331**	**383**	**430**	**354**	**422**	**491**	**326**	**377**	**432**	**347**	**418**	**489**	**312**	**365**	**415**
UK annual growth rate			1.5%	1.2%		1.8%	1.5%		1.5%	1.4%		1.9%	1.6%		1.6%	1.3%
Paris CDG	58	81	97	118	90	118	125	82	96	117	91	118	125	77	90	108
Amsterdam	41	57	68	83	64	91	123	67	90	115	65	94	124	54	63	75
Frankfurt	53	71	90	113	87	113	117	67	76	95	90	113	117	62	71	90
Dubai	45	99	123	157	116	165	252	113	150	199	117	166	253	91	110	140
Foreign Hubs Total	**198**	**309**	**377**	**472**	**357**	**487**	**616**	**328**	**413**	**526**	**363**	**490**	**619**	**284**	**334**	**414**
Foreign hub annual growth rate			2.0%	2.3%		3.1%	2.4%		2.3%	2.4%		3.0%	2.4%		1.7%	2.1%

6.35 In the Heathrow Airport Extended Northern Runway option the northern runway is extended, increasing capacity at Heathrow to 700,000 ATMs from 2026, while all other airports retain their baseline capacities. With the extended runway, the number of passengers using Heathrow by 2050 with carbon-traded ranges from 126 mppa in *global fragmentation* to 142 mppa in *global growth*. Nationally by 2050 the number of additional passengers over baseline ranges from 14 mppa under *relative decline of Europe* to 34 mppa under *global growth*.

6.36 Overall with the Heathrow Airport Extended Northern Runway option the share of national traffic handled by London is highest in *global fragmentation* at 56% and lowest in *low-cost is king* at 51%. This differs from the baseline where London has a smaller share of national traffic as these airports have more demand than capacity and regional airports pick up some of the overspill.

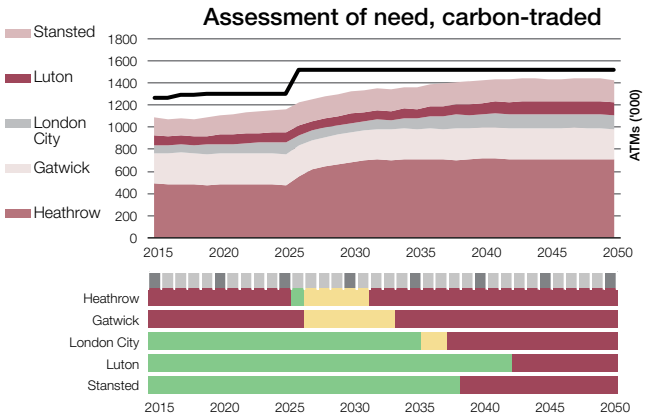
6.37 In 2050 under the Heathrow Airport Extended Northern Runway option the number of passengers using regional UK airports ranges from 182 mppa in *global fragmentation* to 243 mppa in *global growth*. The number of passengers at the larger regional airports vary significantly between scenarios. By 2050 Manchester handles between 48 and 56 mppa, but Birmingham, most affected by spill from London, varies between 18 and 29 mppa. The passenger demand for the regional airports is lower in all scenarios compared to the baseline as Heathrow attracts back some demand displaced into the regions in the baseline.

6.38 The ATM capacity timelines illustrate that, with the extended runway, Heathrow reaches full capacity between 2029 and 2032 in all scenarios except *global fragmentation*, under which Heathrow is full by 2038. Under all 5 scenarios, Gatwick would be operating at full capacity before 2050 and would be at full or at least 90% capacity for the whole 2015-2050 period. By 2050, the other 3 London airports would also be at full capacity, with Luton the last airport to fill up in all cases.

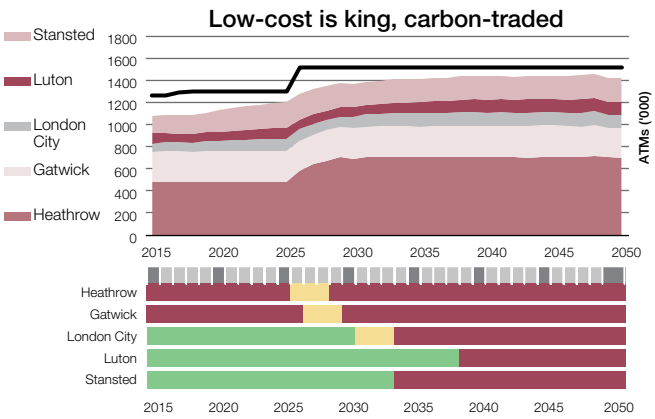
Figure 6.5: Heathrow Airport Extended Northern Runway timelines of runway (ATM) capacity used, carbon-traded

Timeline to full capacity

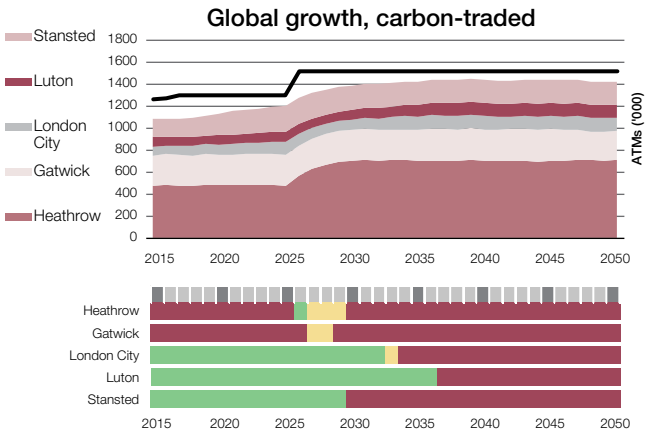
Assessment of need



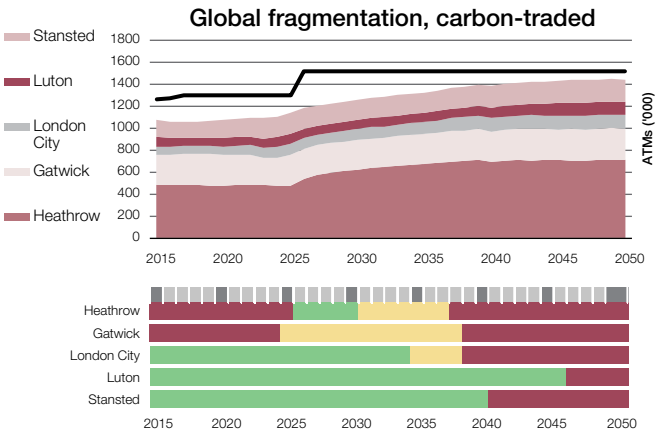
Low-cost is king



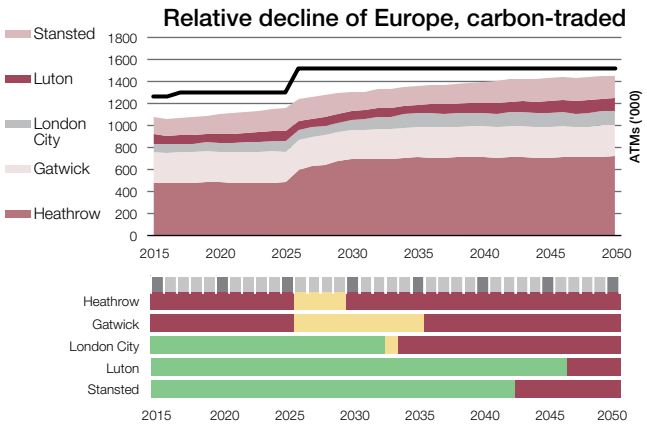
Global growth



Global fragmentation



Relative decline of Europe



Heathrow Airport Extended Northern Runway passenger forecasts, carbon capped

Table 6.6: Heathrow Airport Extended Northern Runway terminal passenger forecasts (mppa), carbon capped

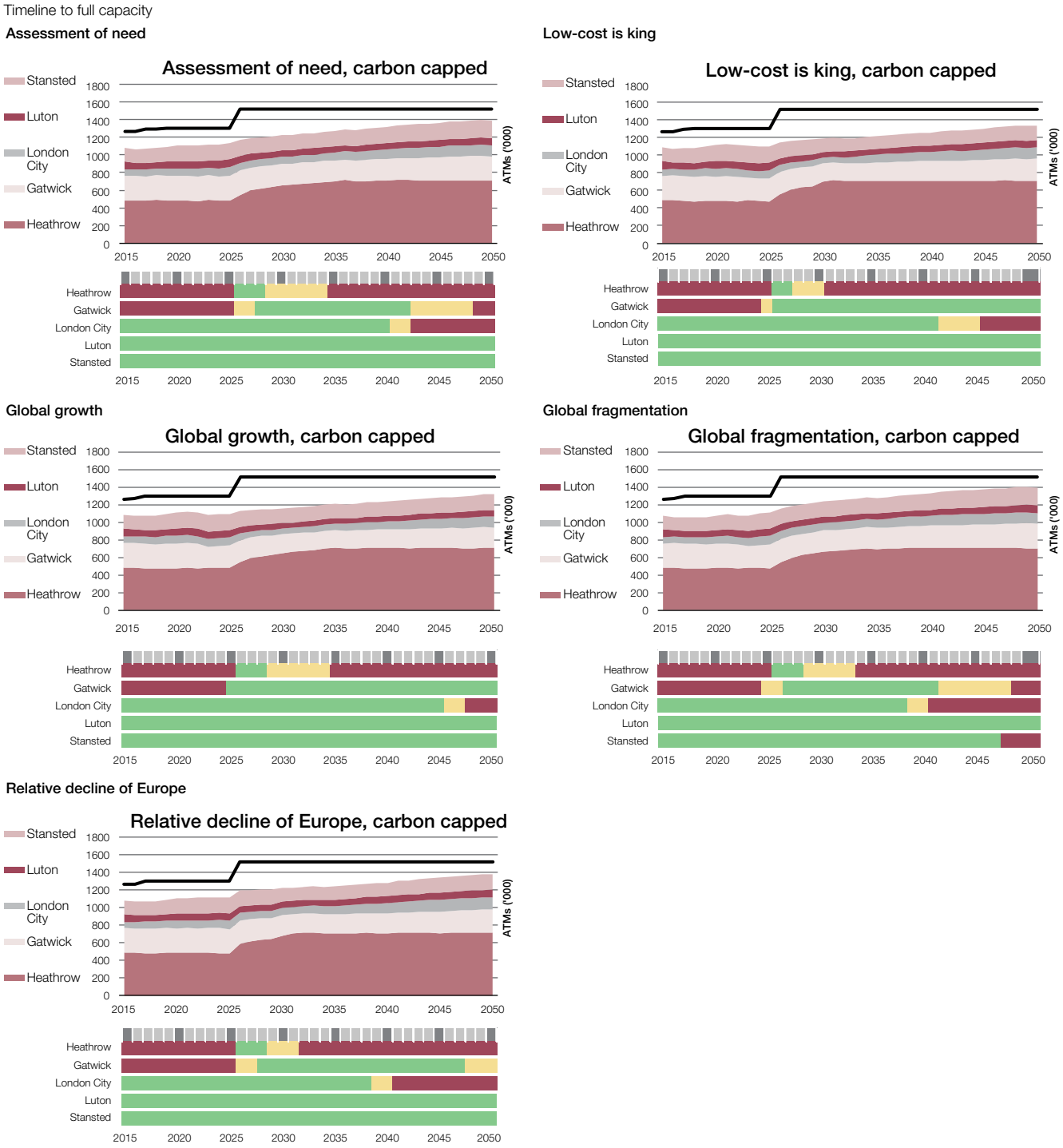
Carbon capped		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
LHR ENR	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	70	110	124	129	110	126	131	111	120	127	116	125	131	111	124	127
Gatwick	34	35	37	43	31	33	37	35	37	44	30	33	39	35	38	43
Stansted	18	27	32	35	26	28	31	24	25	29	24	24	28	27	33	35
Luton	10	11	10	12	9	9	10	10	11	14	9	11	12	11	10	13
London City	3	4	6	7	3	5	7	4	6	7	4	5	7	5	6	7
London	135	187	209	226	180	199	216	185	200	220	183	198	217	188	210	225
London annual growth rate			1.1%	0.8%		1.0%	0.8%		0.8%	1.0%		0.8%	0.9%		1.1%	0.7%
Manchester	20	30	35	41	27	30	37	29	34	41	28	32	38	30	34	41
Birmingham	8	9	9	11	7	7	9	9	9	10	8	8	9	9	10	13
Glasgow	7	7	7	8	6	6	8	7	8	9	6	7	8	6	6	8
Edinburgh	9	13	16	18	12	14	16	13	15	17	13	14	17	13	15	17
Bristol	6	6	7	8	5	6	7	6	8	8	5	6	7	6	7	8
Newcastle	4	5	6	6	5	5	5	5	6	7	5	5	6	5	5	6
Belfast International	4	6	7	8	5	6	7	6	7	8	5	6	7	6	6	7
Liverpool	5	7	8	7	6	7	6	7	8	7	6	7	6	7	8	7
East Midlands	4	7	8	8	6	7	7	6	8	8	6	7	7	7	8	7
Other modelled UK	16	22	25	31	20	22	25	23	26	31	21	22	27	22	25	31
Non-London annual growth rate			1.2%	1.5%		1.0%	1.5%		1.3%	1.5%		1.0%	1.5%		1.3%	1.4%
UK Total	**218**	**299**	**335**	**372**	**280**	**310**	**344**	**297**	**327**	**368**	**286**	**312**	**349**	**298**	**336**	**369**
UK annual growth rate			1.1%	1.1%		1.0%	1.1%		1.0%	1.2%		0.9%	1.1%		1.2%	1.0%
Paris CDG	58	74	85	98	73	84	99	74	84	100	74	87	103	74	85	97
Amsterdam	41	52	58	66	50	57	67	59	75	94	51	60	69	52	59	67
Frankfurt	53	63	72	91	63	76	99	59	65	77	66	83	107	68	83	109
Dubai	45	91	108	135	95	121	159	103	133	174	96	124	163	94	112	138
Foreign Hubs Total	**198**	**280**	**323**	**390**	**281**	**339**	**424**	**296**	**357**	**445**	**287**	**354**	**442**	**288**	**339**	**411**
Foreign hub annual growth rate			1.4%	1.9%		1.9%	2.3%		1.9%	2.2%		2.1%	2.2%		1.7%	1.9%

6.39 The effect of capping carbon emissions at a level consistent with current plans to meet UK climate targets is to reduce the level of demand in the system under every scenario and to remove much of the difference between the demand scenarios. In the Heathrow Airport Extended Northern Runway option the number of passengers using Heathrow by 2050 ranges from 127 mppa under both *relative decline of Europe* and *global fragmentation* to 131 mppa under both *global growth* and *low-cost is king*. Nationally by 2050 the total number of passengers is lower than the baseline under all five demand scenarios as increases in passengers at Heathrow result in declines at other UK airports, which are expected to capture some overspill traffic as the London system fills up in the baseline.

6.40 Increased capacity for long-haul flying at Heathrow increases UK total aircraft-kilometres and seat-kilometres, thus using more of the UK carbon 'budget' in this option at the expense of more passengers making shorter flights from other airports. Relative to the baseline, expanding Heathrow also draws backs some transfer traffic exported to foreign hubs in the baseline (where their CO_2 was not counted against the UK target) reducing the carbon capacity at other UK airports.

6.41 Unlike the carbon-traded case, London has the highest share of national traffic under *global growth* (around 63%) and the lowest under *relative decline of Europe* (60%). In the carbon capped case passenger throughputs in 2050 for regional airports is noticeably different to the carbon-traded case and significantly lower. There are most passengers at regional airports in *relative decline of Europe* and *assessment of need* and least in *global growth*. There is also less variability in passenger numbers at the larger regional airports than in the Heathrow Airport Extended Northern Runway carbon-traded case with less spill of demand from the London airports.

Figure 6.6: Heathrow Airport Extended Northern Runway timelines of runway (ATM) capacity used, carbon capped



6.42 The timelines illustrate that, if carbon is capped, Heathrow reaches full capacity between 2031 under *low-cost is king* and 2035 under *assessment of need* and *global growth*. By 2050 London City would be fully utilised under all five scenarios. Gatwick would become fully utilised in 2049 under *assessment of need* and *global fragmentation* and Stansted would be fully utilised in 2048 under *global fragmentation*. But under all other scenarios, Gatwick, Stansted and Luton would not reach full capacity by 2050.

6.43 Heathrow Hub Limited project that the underlying demand will lead to passenger growth of 122 million by 2040 and 130 million by 2050, meaning the airport's additional runway capacity would become constrained in 2035. This is a fairly similar trajectory to many of the Commission's modelled scenarios. The Heathrow Airport Extended Northern Runway submission also notes the proposed Heathrow Hub transport interchange as part of the offer increases the likelihood of the above forecasts and/or could result in higher growth forecasts than presented.

Long-haul share

6.44 Note that all 2011 passenger data shown in the tables is from the base year validated model outputs.

Table 6.7: Gatwick Airport Second Runway option, terminal passenger forecasts (mppa), long-haul/short-haul split, carbon-traded

LGW 2R	2011														
	Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon-traded	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic
Heathrow	37.8	30.2	2.1	37.8	30.2	2.1	37.8	30.2	2.1	37.8	30.2	2.1	37.8	30.4	2.1
Gatwick	6.5	25.3	2.1	6.5	25.3	2.1	6.5	25.3	2.1	6.5	25.3	2.1	6.5	22.3	2.1
Other London	0.2	27.4	3.3	0.2	27.4	3.3	0.2	27.4	3.3	0.2	27.4	3.3	0.2	30.4	3.3
London Total	**44.5**	**83.0**	**7.5**	**44.5**	**83.0**	**7.5**	**44.5**	**83.0**	**7.5**	**44.5**	**83.0**	**7.5**	**44.5**	**83.1**	**7.5**
Regional Total	**9.8**	**52.9**	**20.1**	**9.8**	**52.9**	**20.1**	**9.8**	**52.9**	**20.1**	**9.8**	**52.9**	**20.1**	**9.8**	**52.7**	**20.1**
National Total	**54.3**	**135.9**	**27.6**	**54.3**	**135.9**	**27.6**	**54.3**	**135.9**	**27.6**	**54.3**	**135.9**	**27.6**	**54.3**	**135.8**	**27.6**
2030															
Heathrow	48.8	34.9	1.4	51.5	34.0	0.9	44.4	36.9	1.8	42.9	38.7	0.8	46.7	36.5	0.9
Gatwick	10.0	37.0	2.6	13.7	41.1	2.8	13.3	32.5	2.9	30.5	37.5	4.0	7.6	30.5	2.1
Other London	2.0	45.2	6.4	2.4	47.5	7.2	1.7	45.5	5.7	2.0	50.4	6.1	1.8	46.7	6.6
London Total	**60.8**	**117.1**	**10.4**	**67.7**	**122.5**	**10.9**	**59.4**	**114.9**	**10.4**	**75.5**	**126.5**	**11.0**	**56.0**	**113.7**	**9.6**
Regional Total	**15.1**	**83.8**	**29.0**	**17.3**	**89.3**	**31.1**	**16.1**	**91.3**	**29.0**	**17.6**	**96.1**	**30.9**	**13.8**	**82.6**	**27.6**
National Total	**75.9**	**200.9**	**39.4**	**85.0**	**211.9**	**42.0**	**75.6**	**206.3**	**39.4**	**93.0**	**222.6**	**41.9**	**69.8**	**196.4**	**37.2**
2040															
Heathrow	56.1	34.3	0.9	61.1	30.9	1.0	49.0	38.1	0.8	47.8	38.4	1.0	51.1	35.3	0.9
Gatwick	10.4	48.5	3.1	20.2	61.5	4.5	18.0	40.1	3.6	44.4	40.9	5.3	9.1	40.8	2.8
Other London	2.3	49.3	7.6	2.6	51.1	7.5	2.0	51.6	7.2	0.4	54.2	6.4	1.4	52.4	7.0
London Total	**68.8**	**132.1**	**11.6**	**83.8**	**143.5**	**12.9**	**69.0**	**129.8**	**11.6**	**92.6**	**133.5**	**12.7**	**61.6**	**128.5**	**10.7**
Regional Total	**19.4**	**101.9**	**34.4**	**24.4**	**116.9**	**38.0**	**21.8**	**110.6**	**34.3**	**25.7**	**133.1**	**37.8**	**17.3**	**101.5**	**31.8**
National Total	**88.2**	**234.0**	**46.0**	**108.3**	**260.4**	**50.9**	**90.8**	**240.4**	**46.0**	**118.3**	**266.7**	**50.5**	**79.0**	**230.1**	**42.5**
2050															
Heathrow	64.8	30.3	1.0	56.8	33.1	1.4	60.7	33.3	1.0	62.8	33.1	1.2	58.8	33.3	0.9
Gatwick	12.9	64.9	4.1	30.9	61.0	4.1	23.4	54.4	5.0	45.7	44.1	6.1	11.0	53.7	3.5
Other London	2.7	48.6	8.7	4.4	47.7	9.9	0.7	52.8	7.8	0.0	53.7	7.7	0.0	53.2	8.0
London Total	**80.5**	**143.8**	**13.8**	**92.0**	**141.8**	**15.3**	**84.9**	**140.4**	**13.8**	**108.5**	**130.9**	**15.0**	**69.8**	**140.2**	**12.3**
Regional Total	**25.6**	**121.4**	**41.1**	**39.0**	**153.5**	**46.5**	**28.8**	**131.5**	**41.0**	**33.6**	**167.8**	**46.1**	**22.7**	**123.4**	**37.4**
National Total	**106.1**	**265.2**	**55.0**	**131.0**	**295.3**	**61.9**	**113.7**	**272.0**	**54.9**	**142.1**	**298.6**	**61.2**	**92.5**	**263.7**	**49.7**

6.45 In the Gatwick Airport Second Runway option with traded carbon in 2050 Gatwick attracts the least long-haul passengers in *global fragmentation* (11 mppa) and in terms of extra traffic over the baseline in 2050 this is in a range of 1mppa to 33mppa. By far the most long-haul at Gatwick is attracted in *low-cost is king*, (46mppa) where over half the passengers at Gatwick are long-haul by 2050. The *low-cost is king* scenario includes significantly improving the attractiveness to transfer passengers and gaining a third of the Heathrow long-haul network when the second runway opens. This appears a much stronger intervention at Gatwick than moving SkyTeam in *global growth* or strengthening Dubai services in *relative decline of Europe*.

6.46 Heathrow's long-haul throughput remains relatively resilient, only varying between 56 mppa and 63 mppa across all the demand scenarios and comprising between 62% and 67% of total traffic. *Global fragmentation* and *low-cost is king* also represent the low and high bounds in the 2050 long-haul range nationally. The regional share of national long-haul is generally around 25% in most scenarios, but it reaches 30% under *global growth*.

6.47 Carbon capping increases the air fare per kilometre travelled and therefore the long-haul share is penalised. In Gatwick Airport Second Runway, the balance between short-haul and long-haul demand changes and both long-haul and short-haul traffic is lower nationally. *Low-cost is king* remains the most attractive scenario for long-haul at Gatwick with 41mppa in 2050, whilst in all the other demand scenarios long-haul at the expanded Gatwick ranges from 11mppa to 16mppa. Heathrow long-haul in 2050 ranges from 52mppa in to 67mppa in *global growth*.

Table 6.8: Gatwick Airport Second Runway option, terminal passenger forecasts (mppa), long-haul/short-haul split, carbon capped

LGW 2R															
	Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon capped	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic
2011															
Heathrow	37.8	30.2	2.1	37.8	30.2	2.1	37.8	30.2	2.1	37.8	30.2	2.1	37.8	30.4	2.1
Gatwick	6.5	25.3	2.1	6.5	25.3	2.1	6.5	25.3	2.1	6.5	25.3	2.1	6.5	22.3	2.1
Other London	0.2	27.4	3.3	0.2	27.4	3.3	0.2	27.4	3.3	0.2	27.4	3.3	0.2	30.4	3.3
London Total	**44.5**	**83.0**	**7.5**	**44.5**	**83.0**	**7.5**	**44.5**	**83.0**	**7.5**	**44.5**	**83.0**	**7.5**	**44.5**	**83.1**	**7.5**
Regional Total	**9.8**	**52.9**	**20.1**	**9.8**	**52.9**	**20.1**	**9.8**	**52.9**	**20.1**	**9.8**	**52.9**	**20.1**	**9.8**	**52.7**	**20.1**
National Total	**54.3**	**135.9**	**27.6**	**54.3**	**135.9**	**27.6**	**54.3**	**135.9**	**27.6**	**54.3**	**135.9**	**27.6**	**54.3**	**135.8**	**27.6**
2030															
Heathrow	49.0	35.0	1.5	48.5	35.1	1.0	43.3	37.3	2.1	42.0	38.8	0.8	46.0	36.3	0.8
Gatwick	8.1	35.2	2.4	10.3	31.5	2.2	11.2	28.5	2.5	20.7	28.6	3.2	7.4	29.1	2.2
Other London	1.9	42.5	6.1	1.7	38.3	6.2	1.2	41.1	5.2	1.0	36.6	5.1	1.8	46.7	6.1
London Total	**59.0**	**112.6**	**10.0**	**60.5**	**105.0**	**9.4**	**55.8**	**106.9**	**9.8**	**63.6**	**104.0**	**9.1**	**55.1**	**112.2**	**9.2**
Regional Total	**14.3**	**78.9**	**27.9**	**13.6**	**69.0**	**26.5**	**14.7**	**82.7**	**27.0**	**13.1**	**71.4**	**25.4**	**13.5**	**80.3**	**26.8**
National Total	**73.2**	**191.5**	**37.8**	**74.1**	**174.0**	**35.9**	**70.4**	**189.6**	**36.8**	**76.7**	**175.4**	**34.5**	**68.6**	**192.5**	**36.0**
2040															
Heathrow	54.1	34.4	0.8	56.7	32.7	0.8	48.4	37.2	0.8	43.8	38.6	0.8	50.4	35.4	0.8
Gatwick	9.6	43.1	2.9	9.8	36.3	2.6	12.7	33.9	2.7	35.2	38.1	4.6	8.8	38.4	2.6
Other London	2.3	47.4	7.3	2.6	43.7	7.0	2.3	46.4	7.1	0.8	39.5	4.7	1.2	51.4	6.8
London Total	**66.0**	**124.9**	**11.0**	**69.2**	**112.7**	**10.4**	**63.4**	**117.5**	**10.5**	**79.8**	**116.2**	**10.1**	**60.3**	**125.2**	**10.2**
Regional Total	**17.6**	**92.0**	**32.3**	**17.0**	**76.8**	**30.3**	**18.8**	**93.2**	**31.0**	**16.3**	**76.1**	**28.6**	**16.6**	**97.5**	**30.3**
National Total	**83.6**	**216.9**	**43.3**	**86.3**	**189.4**	**40.7**	**82.2**	**210.7**	**41.5**	**96.1**	**192.3**	**38.7**	**76.9**	**222.7**	**40.5**
2050															
Heathrow	61.4	30.2	0.9	67.2	28.4	0.9	58.3	34.5	0.9	51.6	37.0	0.9	57.5	34.6	0.9
Gatwick	11.6	54.3	3.5	12.0	44.7	3.1	16.2	41.3	3.2	41.1	39.8	5.5	10.5	49.5	3.3
Other London	2.7	49.9	8.4	3.4	45.5	8.2	3.0	50.7	8.1	1.0	43.8	5.3	0.7	52.1	7.5
London Total	**75.7**	**134.5**	**12.8**	**82.7**	**118.6**	**12.2**	**77.4**	**126.4**	**12.2**	**93.7**	**120.6**	**11.7**	**68.7**	**136.1**	**11.6**
Regional Total	**22.8**	**106.7**	**38.2**	**22.9**	**86.6**	**36.0**	**24.5**	**106.0**	**36.4**	**21.7**	**83.9**	**33.8**	**21.4**	**116.3**	**35.1**
National Total	**98.6**	**241.3**	**51.0**	**105.5**	**205.2**	**48.2**	**101.9**	**232.4**	**48.6**	**115.4**	**204.5**	**45.5**	**90.1**	**252.5**	**46.7**

Table 6.9: Heathrow Airport North West Runway option, terminal passenger forecasts (mppa), long-haul/short-haul split, carbon-traded

LGW NWR															
	Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon capped	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic
2011															
Heathrow	37.8	30.2	2.1	37.8	30.2	2.1	37.8	30.2	2.1	37.8	30.2	2.1	37.8	30.2	2.1
Gatwick	6.5	25.3	2.1	6.5	25.3	2.1	6.5	25.3	2.1	6.5	25.3	2.1	6.5	25.3	2.1
Other London	0.2	27.4	3.3	0.2	27.4	3.3	0.2	27.4	3.3	0.2	27.4	3.3	0.2	27.4	3.3
London Total	**44.5**	**83.0**	**7.5**	**44.5**	**83.0**	**7.5**	**44.5**	**83.0**	**7.5**	**44.5**	**83.0**	**7.5**	**44.5**	**83.0**	**7.5**
Regional Total	**9.8**	**52.9**	**20.1**	**9.8**	**52.9**	**20.1**	**9.8**	**52.9**	**20.1**	**9.8**	**52.9**	**20.1**	**9.8**	**52.9**	**20.1**
National Total	**54.3**	**135.9**	**27.6**	**54.3**	**135.9**	**27.6**	**54.3**	**135.9**	**27.6**	**54.3**	**135.9**	**27.6**	**54.3**	**135.9**	**27.6**
2030															
Heathrow	59.7	53.7	2.8	66.4	56.2	2.5	56.1	59.7	3.0	64.9	61.2	2.5	52.2	48.7	2.7
Gatwick	7.6	29.8	2.1	8.7	31.1	2.1	10.0	27.6	2.1	8.7	29.5	2.2	7.1	30.3	2.0
Other London	1.5	42.2	5.7	2.0	44.6	6.5	1.2	37.1	5.4	2.1	41.0	6.4	0.9	40.5	5.3
London Total	**68.8**	**125.6**	**10.5**	**77.1**	**132.0**	**11.1**	**67.3**	**124.4**	**10.5**	**75.7**	**131.7**	**11.1**	**60.3**	**119.5**	**9.9**
Regional Total	**14.8**	**82.2**	**28.9**	**16.9**	**87.6**	**30.8**	**15.8**	**81.7**	**28.8**	**17.0**	**86.2**	**30.8**	**13.5**	**81.1**	**27.3**
National Total	**83.6**	**207.8**	**39.4**	**94.0**	**219.5**	**41.9**	**83.1**	**206.2**	**39.4**	**92.7**	**217.9**	**42.0**	**73.9**	**200.6**	**37.2**
2040															
Heathrow	69.7	61.1	3.1	77.4	57.7	3.4	59.9	66.1	2.8	74.0	60.9	2.8	60.0	58.2	2.8
Gatwick	8.9	32.1	2.5	11.0	33.6	2.3	13.4	29.5	2.6	11.5	32.4	2.3	8.1	32.4	2.5
Other London	1.1	49.5	6.4	1.0	52.3	7.2	1.5	43.9	6.6	2.0	50.5	7.8	1.1	48.6	5.9
London Total	**79.6**	**142.6**	**12.0**	**89.5**	**143.6**	**12.9**	**74.8**	**139.5**	**12.0**	**87.5**	**143.7**	**12.9**	**69.1**	**139.2**	**11.1**
Regional Total	**19.0**	**99.6**	**34.1**	**24.5**	**118.3**	**37.8**	**21.4**	**98.1**	**34.1**	**24.6**	**116.4**	**37.9**	**16.8**	**98.5**	**31.5**
National Total	**98.6**	**242.3**	**46.1**	**114.0**	**261.8**	**50.7**	**96.2**	**237.6**	**46.0**	**112.1**	**260.2**	**50.8**	**85.9**	**237.6**	**42.6**
2050															
Heathrow	76.1	58.6	3.1	91.6	52.9	3.1	69.1	63.9	2.6	88.3	58.6	2.1	68.3	61.7	3.0
Gatwick	10.8	33.3	2.7	12.1	30.8	2.4	16.6	29.4	2.7	14.4	28.2	2.3	9.5	34.2	2.7
Other London	0.0	52.9	8.1	0.0	51.6	9.8	1.7	50.8	8.5	0.0	50.6	10.8	0.3	53.1	7.1
London Total	**86.8**	**144.8**	**13.9**	**103.8**	**135.3**	**15.3**	**87.4**	**144.1**	**13.9**	**102.7**	**137.5**	**15.2**	**78.1**	**149.1**	**12.8**
Regional Total	**25.6**	**123.5**	**40.9**	**35.3**	**159.5**	**46.3**	**28.9**	**119.9**	**40.9**	**35.0**	**157.1**	**46.5**	**22.1**	**120.7**	**37.0**
National Total	**112.4**	**268.3**	**54.8**	**139.1**	**294.8**	**61.6**	**116.3**	**264.0**	**54.8**	**137.8**	**294.6**	**61.8**	**100.2**	**269.8**	**49.8**

6.48 In the Heathrow Airport North West Runway option when a North West runway is added, under traded carbon by 2050 Heathrow serves the least long-haul passengers in *global fragmentation* (68 mppa) consistent with the lower world GDP, trade and reduced transfers in the scenario and the most in *global growth* (92 mppa) where the scenario includes 2% higher GDP for NICs and LDC destinations and an enhanced role for hubs. Long-haul varies between 51% and 62% of total Heathrow passengers in these two options. Compared to the two runway baseline in 2050 Heathrow gains least extra long-haul passengers (3mppa) in *relative decline of Europe* where IAG (BA) has been assumed to be taken over by a Middle-Eastern airline serving its hub. It gains most in *global growth* with 31mppa more long-haul passengers. European international short-haul tends to give way to long-haul in *global growth* with 54mppa in 2050, but peaking at 64mppa in *relative decline of Europe*.

6.49 Long-haul passengers at Gatwick in 2050 are in the relatively narrow range of 10mppa in *global fragmentation* to 17mppa in *relative decline of Europe*. This compares to 7mppa in 2011. *Global fragmentation* and *global growth* define the lower and upper bounds of UK long-haul nationally in 2050 with a range of 100mppa to 139mppa, varying between 24% and 28% of total national traffic. Long-haul at regional airports follow this trend ranging between 22mppa in *global fragmentation* and 35mppa in *global growth* by 2050 with 22% to 25% shares of total national long-haul traffic. Heathrow has the least short-haul traffic in *global growth* (53 mppa) and the most in *relative decline of Europe* (64 mppa).

Table 6.10: Heathrow Airport North West Runway option, terminal passenger forecasts (mppa), long-haul/short-haul split, carbon capped

LHR NWR															
	Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon capped	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic
2011															
Heathrow	37.8	30.2	2.1	37.8	30.2	2.1	37.8	30.2	2.1	37.8	30.2	2.1	37.8	30.2	2.1
Gatwick	6.5	25.3	2.1	6.5	25.3	2.1	6.5	25.3	2.1	6.5	25.3	2.1	6.5	25.3	2.1
Other London	0.2	27.4	3.3	0.2	27.4	3.3	0.2	27.4	3.3	0.2	27.4	3.3	0.2	27.4	3.3
London Total	**44.5**	**83.0**	**7.5**	**44.5**	**83.0**	**7.5**	**44.5**	**83.0**	**7.5**	**44.5**	**83.0**	**7.5**	**44.5**	**83.0**	**7.5**
Regional Total	**9.8**	**52.9**	**20.1**	**9.8**	**52.9**	**20.1**	**9.8**	**52.9**	**20.1**	**9.8**	**52.9**	**20.1**	**9.8**	**52.9**	**20.1**
National Total	**54.3**	**135.9**	**27.6**	**54.3**	**135.9**	**27.6**	**54.3**	**135.9**	**27.6**	**54.3**	**135.9**	**27.6**	**54.3**	**135.9**	**27.6**
2030															
Heathrow	55.4	51.2	2.7	56.6	49.9	2.6	52.5	55.3	3.0	57.0	55.3	2.6	56.0	52.0	2.4
Gatwick	6.7	25.9	2.1	6.6	21.9	1.9	8.6	23.9	2.0	6.7	20.4	1.9	6.2	26.4	1.9
Other London	0.8	36.1	4.8	0.9	32.8	4.5	0.9	33.2	4.6	0.9	30.6	4.6	0.8	36.8	4.3
London Total	**62.9**	**113.2**	**9.5**	**64.0**	**104.6**	**9.0**	**62.1**	**112.4**	**9.6**	**64.6**	**106.3**	**9.1**	**62.9**	**115.3**	**8.6**
Regional Total	**12.9**	**71.1**	**26.2**	**12.4**	**61.3**	**24.7**	**13.9**	**71.2**	**26.3**	**12.6**	**62.3**	**25.0**	**12.1**	**72.4**	**23.8**
National Total	**75.8**	**184.3**	**35.7**	**76.4**	**165.9**	**33.7**	**76.0**	**183.6**	**35.9**	**77.2**	**168.6**	**34.2**	**75.0**	**187.6**	**32.4**
2040															
Heathrow	64.7	60.3	2.9	68.8	58.2	2.6	56.9	66.1	2.9	66.1	62.3	2.4	64.8	60.6	2.3
Gatwick	7.3	26.5	2.2	7.3	21.6	2.2	11.0	22.1	2.3	7.9	19.4	2.3	6.5	27.3	2.3
Other London	0.7	39.6	5.4	0.5	33.7	5.1	1.0	34.5	5.4	0.8	31.2	5.4	0.8	41.7	4.6
London Total	**72.7**	**126.4**	**10.6**	**76.7**	**113.6**	**9.9**	**68.9**	**122.7**	**10.6**	**74.8**	**113.0**	**10.1**	**72.1**	**129.6**	**9.2**
Regional Total	**15.2**	**78.0**	**29.4**	**14.8**	**65.2**	**27.6**	**17.7**	**78.2**	**29.6**	**15.3**	**66.5**	**28.1**	**14.1**	**82.1**	**25.6**
National Total	**88.0**	**204.4**	**40.0**	**91.5**	**178.7**	**37.5**	**86.6**	**201.0**	**40.2**	**90.1**	**179.5**	**38.2**	**86.2**	**211.7**	**34.8**
2050															
Heathrow	72.1	60.0	2.9	79.2	56.8	2.7	63.8	65.1	2.9	75.3	60.7	2.3	70.9	61.0	2.2
Gatwick	9.0	29.0	2.7	9.6	22.3	2.5	14.3	23.2	2.9	10.3	21.1	2.6	7.6	29.7	2.4
Other London	0.9	44.5	6.6	0.0	38.2	6.6	1.5	39.2	6.4	1.0	36.0	6.9	0.9	46.4	5.7
London Total	**81.9**	**133.4**	**12.2**	**88.8**	**117.3**	**11.7**	**79.6**	**127.6**	**12.3**	**86.7**	**117.8**	**11.8**	**79.4**	**137.1**	**10.3**
Regional Total	**19.5**	**87.6**	**34.2**	**19.8**	**71.7**	**32.3**	**23.0**	**88.4**	**34.6**	**20.4**	**73.7**	**33.1**	**17.6**	**92.9**	**28.9**
National Total	**101.4**	**221.0**	**46.4**	**108.7**	**189.0**	**44.0**	**102.6**	**216.0**	**46.8**	**107.1**	**191.5**	**44.9**	**97.0**	**229.9**	**39.2**

6.50 Carbon capping increases the air fare per kilometre travelled and therefore the long-haul share is penalised for the UK as a whole. With the north west runway expansion, the range of long-haul handled narrows significantly by 2050 to 64mppa (*relative decline of Europe*)

to 79mppa in *global growth*. These are still significant volumes and long-haul ranges between 48% and 57% of Heathrow throughput in these two options. In the carbon capped world Heathrow takes a greater share of the reduced national total of long-haul with 62% (*relative decline of Europe*) and 71% (*global growth*). This compares to 59% to 66% when carbon is traded. Gatwick loses long-haul traffic compared to the 2050 baseline in all demand scenarios with a Heathrow expansion.

Table 6.11: Heathrow Airport Extended Northern Runway option, terminal passenger forecasts (mppa), long-haul/short-haul split, carbon-traded

LHR ENR															
	Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon capped	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic
2011															
Heathrow	37.8	30.2	2.1	37.8	30.2	2.1	37.8	30.2	2.1	37.8	30.2	2.1	37.8	30.2	2.1
Gatwick	6.5	25.3	2.1	6.5	25.3	2.1	6.5	25.3	2.1	6.5	25.3	2.1	6.5	25.3	2.1
Other London	0.2	27.4	3.3	0.2	27.4	3.3	0.2	27.4	3.3	0.2	27.4	3.3	0.2	27.4	3.3
London Total	**44.5**	**83.0**	**7.5**	**44.5**	**83.0**	**7.5**	**44.5**	**83.0**	**7.5**	**44.5**	**83.0**	**7.5**	**44.5**	**83.0**	**7.5**
Regional Total	**9.8**	**52.9**	**20.1**	**9.8**	**52.9**	**20.1**	**9.8**	**52.9**	**20.1**	**9.8**	**52.9**	**20.1**	**9.8**	**52.9**	**20.1**
National Total	**54.3**	**135.9**	**27.6**	**54.3**	**135.9**	**27.6**	**54.3**	**135.9**	**27.6**	**54.3**	**135.9**	**27.6**	**54.3**	**135.9**	**27.6**
2030															
Heathrow	59.8	53.7	2.8	65.7	54.8	2.5	54.7	58.9	2.9	61.9	54.8	2.3	52.3	48.7	2.7
Gatwick	7.6	29.8	2.1	8.7	31.3	2.1	10.1	27.5	2.1	8.9	30.8	2.2	7.1	30.3	2.0
Other London	1.5	42.2	5.7	2.0	44.9	6.4	1.1	36.6	5.5	2.2	42.9	6.6	0.9	40.5	5.3
London Total	**68.8**	**125.7**	**10.6**	**76.4**	**131.1**	**11.1**	**65.9**	**123.1**	**10.5**	**73.0**	**128.5**	**11.1**	**60.3**	**119.5**	**9.9**
Regional Total	**14.8**	**82.1**	**28.9**	**17.0**	**87.7**	**30.8**	**15.9**	**81.5**	**28.8**	**17.2**	**86.9**	**30.8**	**13.5**	**81.1**	**27.3**
National Total	**83.7**	**207.8**	**39.4**	**93.4**	**218.7**	**41.9**	**81.9**	**204.5**	**39.4**	**90.2**	**215.3**	**41.9**	**73.9**	**200.6**	**37.2**
2040															
Heathrow	67.2	57.0	2.9	75.1	53.1	3.2	58.0	62.0	2.6	71.3	55.7	2.6	59.6	57.1	2.7
Gatwick	9.0	32.4	2.5	11.1	33.7	2.2	13.4	29.9	2.6	11.6	33.1	2.1	8.1	32.5	2.5
Other London	1.2	49.9	6.6	0.8	51.9	7.4	1.8	45.2	6.7	1.9	50.3	8.2	1.1	48.9	5.9
London Total	**77.5**	**139.4**	**12.0**	**87.0**	**138.8**	**12.8**	**73.2**	**137.1**	**11.9**	**84.8**	**139.1**	**12.9**	**68.7**	**138.5**	**11.1**
Regional Total	**19.1**	**100.6**	**34.0**	**24.8**	**120.6**	**37.8**	**21.6**	**98.7**	**34.1**	**24.9**	**118.6**	**37.9**	**16.8**	**98.6**	**31.5**
National Total	**96.6**	**240.0**	**46.0**	**111.8**	**259.3**	**50.7**	**94.8**	**235.8**	**46.0**	**109.8**	**257.8**	**50.7**	**85.5**	**237.1**	**42.6**
2050															
Heathrow	72.9	54.9	3.0	87.7	51.1	3.1	68.1	61.1	2.0	85.8	53.8	1.9	65.9	57.3	2.8
Gatwick	11.1	32.6	2.7	13.6	29.6	2.5	16.4	29.5	2.7	13.9	28.7	2.5	9.7	34.3	2.5
Other London	0.0	52.6	8.1	0.0	50.6	9.7	1.5	50.3	8.9	0.0	50.5	10.8	0.0	53.0	7.3
London Total	**84.0**	**140.1**	**13.7**	**101.2**	**131.3**	**15.3**	**86.1**	**140.9**	**13.6**	**99.7**	**132.9**	**15.2**	**75.6**	**144.7**	**12.7**
Regional Total	**26.0**	**125.7**	**40.9**	**35.8**	**160.7**	**46.2**	**29.2**	**121.7**	**41.1**	**36.0**	**159.1**	**46.4**	**22.5**	**122.4**	**37.0**
National Total	**109.9**	**265.8**	**54.6**	**137.1**	**292.0**	**61.5**	**115.2**	**262.5**	**54.7**	**135.7**	**292.0**	**61.6**	**98.1**	**267.1**	**49.7**

6.51 In the Heathrow Airport Extended Northern Runway option, under traded carbon by 2050 Heathrow serves the least long-haul passengers in *global fragmentation* (66 mppa) consistent with the lower world GDP, trade and reduced transfers in the scenario and the most in *global growth* (88 mppa) where the scenario includes 2% higher GDP for NICs and LDC destinations and an enhanced role for hubs. Long-haul varies between 52% and 62% of total Heathrow passengers in these two options. Compared to the two runway baseline in 2050 Heathrow gains least extra long-haul passengers (3mppa) in *relative decline of Europe* where IAG (BA) has been assumed to be taken over by a Middle-Eastern airline serving its hub. It gains most in *global growth* with 27mppa more long-haul passengers. European international short-haul tends to give way to long-haul in *global growth* with 51mppa in 2050, but peaking at 61mppa in *relative decline of Europe*.

6.52 Long-haul passengers at Gatwick in 2050 are in the relatively narrow range of 10mppa in *global fragmentation* to 17mppa in *relative decline of Europe*. This compares to 7mppa in 2011. *Global fragmentation* and *global growth* define the lower and upper bounds of UK long-haul nationally in 2050 with a range of 98mppa to 137mppa, varying between 24% and 28% of total national traffic. Long-haul at regional airports follow this trend ranging between 22mppa in *global fragmentation* and 35mppa in *global growth* by 2050 with 23% to 27% shares of total national long-haul traffic. Heathrow has the least short-haul traffic in *global growth* (51 mppa) and the most in *relative decline of Europe* (61 mppa).

Table 6.12: Heathrow Airport Extended Northern Runway option, terminal passenger forecasts (mppa), long-haul/short-haul split, carbon capped

LHR ENR	Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon capped	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic	Long Haul	Short Haul	Domestic
2011															
Heathrow	37.8	30.2	2.1	37.8	30.2	2.1	37.8	30.2	2.1	37.8	30.2	2.1	37.8	30.2	2.1
Gatwick	6.5	25.3	2.1	6.5	25.3	2.1	6.5	25.3	2.1	6.5	25.3	2.1	6.5	25.3	2.1
Other London	0.2	27.4	3.3	0.2	27.4	3.3	0.2	27.4	3.3	0.2	27.4	3.3	0.2	27.4	3.3
London Total	**44.5**	**83.0**	**7.5**	**44.5**	**83.0**	**7.5**	**44.5**	**83.0**	**7.5**	**44.5**	**83.0**	**7.5**	**44.5**	**83.0**	**7.5**
Regional Total	**9.8**	**52.9**	**20.1**	**9.8**	**52.9**	**20.1**	**9.8**	**52.9**	**20.1**	**9.8**	**52.9**	**20.1**	**9.8**	**52.9**	**20.1**
National Total	**54.3**	**135.9**	**27.6**	**54.3**	**135.9**	**27.6**	**54.3**	**135.9**	**27.6**	**54.3**	**135.9**	**27.6**	**54.3**	**135.9**	**27.6**
2030															
Heathrow	55.8	51.2	2.8	57.0	50.1	2.6	52.7	55.5	3.0	57.4	55.9	2.6	56.2	52.2	2.5
Gatwick	6.8	26.5	1.9	6.7	22.5	1.9	8.7	24.2	2.0	7.0	21.5	2.0	6.2	26.9	1.9
Other London	0.8	36.6	5.0	0.9	33.3	4.6	1.0	33.3	4.7	1.0	31.0	4.7	0.8	37.2	4.4
London Total	**63.5**	**114.3**	**9.7**	**64.6**	**105.8**	**9.1**	**62.3**	**112.9**	**9.6**	**65.5**	**108.4**	**9.3**	**63.3**	**116.3**	**8.8**
Regional Total	**13.1**	**72.4**	**26.5**	**12.6**	**62.6**	**25.0**	**14.0**	**71.6**	**26.4**	**12.9**	**64.4**	**25.5**	**12.3**	**73.6**	**24.2**
National Total	**76.6**	**186.7**	**36.2**	**77.2**	**168.4**	**34.1**	**76.3**	**184.5**	**36.0**	**78.4**	**172.7**	**34.8**	**75.5**	**189.9**	**33.0**
2040															
Heathrow	63.8	57.0	2.8	67.3	55.7	2.5	55.4	61.9	2.8	64.5	58.0	2.3	63.5	58.2	2.1
Gatwick	7.6	27.5	2.3	7.7	22.5	2.3	11.3	23.1	2.4	8.5	22.7	2.2	6.8	28.4	2.3
Other London	0.8	41.5	5.7	0.8	35.1	5.3	1.1	36.2	5.5	0.9	33.4	5.9	0.9	43.2	4.9
London Total	**72.2**	**125.9**	**10.7**	**75.8**	**113.4**	**10.1**	**67.8**	**121.2**	**10.6**	**73.9**	**114.1**	**10.4**	**71.2**	**129.8**	**9.3**
Regional Total	**15.6**	**80.6**	**29.8**	**15.2**	**67.2**	**28.0**	**17.9**	**79.4**	**29.8**	**15.9**	**69.4**	**28.8**	**14.5**	**84.5**	**26.3**
National Total	**87.8**	**206.5**	**40.6**	**91.1**	**180.6**	**38.1**	**85.7**	**200.7**	**40.4**	**89.9**	**183.5**	**39.1**	**85.7**	**214.3**	**35.6**
2050															
Heathrow	70.3	55.6	2.7	76.3	52.8	2.4	64.0	60.0	2.9	72.8	55.7	2.2	68.7	56.2	1.9
Gatwick	9.5	31.0	2.8	10.1	24.3	2.5	14.4	26.4	2.9	11.2	25.1	2.8	8.3	32.6	2.5
Other London	1.0	46.3	6.8	1.0	39.8	6.9	1.4	42.0	6.5	1.4	38.4	7.0	0.9	47.9	6.2
London Total	**80.7**	**133.0**	**12.3**	**87.3**	**116.9**	**11.8**	**79.8**	**128.4**	**12.3**	**85.4**	**119.3**	**12.1**	**77.8**	**136.7**	**10.6**
Regional Total	**20.1**	**91.0**	**34.9**	**20.3**	**74.6**	**33.0**	**23.2**	**89.3**	**34.8**	**21.3**	**77.4**	**34.0**	**18.2**	**96.4**	**29.8**
National Total	**100.8**	**224.0**	**47.2**	**107.6**	**191.5**	**44.8**	**103.0**	**217.6**	**47.0**	**106.7**	**196.7**	**46.0**	**96.0**	**233.0**	**40.4**

6.53 Carbon capping increases the air fare per kilometre travelled and therefore the long-haul share is penalised for the UK as a whole. With the northern runway extension in Heathrow Airport Extended Northern Runway, the range of long-haul handled in 2050 narrows to 64mppa (*relative decline of Europe*) to 76mppa in *global growth*. These are still significant volumes and long-haul ranges between 50% and 58% of Heathrow throughput in these two options. In the carbon capped world Heathrow takes a greater share of the reduced national total of long-haul with 62% (*relative decline of Europe*) and 72% in *global fragmentation*. This compares to 59%-67% when carbon is traded. Gatwick loses long-haul compared to the 2050 baseline in all demand scenarios.

Journey purpose

6.54 Note that all 2011 passenger data shown in the tables is from the base year validated model outputs.

Table 6.13: Option Gatwick Airport Second Runway, journey purpose split, 2030 & 2050, million terminal passengers, carbon-traded

LGW 2R	2030							
	UK Business	UK Leisure	Foreign Business	Foreign Leisure	Dom. Business	Dom. Leisure	I to I	Total
Carbon-traded	**Assessment of need**							
Heathrow	12.7	25.1	9.6	15.7	0.8	0.6	20.6	85.1
Gatwick	3.8	29.5	2.8	9.5	1.1	1.5	1.3	49.6
Other London	4.2	28.8	3.3	10.3	3.8	2.7	0.6	53.7
London Total	**20.7**	**83.4**	**15.8**	**35.5**	**5.7**	**4.7**	**22.5**	**188.3**
Regional Total	**6.8**	**72.9**	**4.9**	**14.0**	**14.6**	**14.4**	**0.3**	**127.9**
National Total	**27.5**	**156.3**	**20.7**	**49.5**	**20.3**	**19.1**	**22.8**	**316.2**
	Global growth							
Heathrow	13.5	24.4	10.1	15.9	0.5	0.4	21.6	86.4
Gatwick	4.7	33.1	3.5	11.3	1.2	1.5	2.3	57.6
Other London	4.6	30.0	3.5	11.0	4.3	2.9	0.8	57.1
London Total	**22.8**	**87.4**	**17.1**	**38.2**	**6.0**	**4.9**	**24.7**	**201.1**
Regional Total	**7.4**	**78.3**	**5.4**	**15.2**	**15.8**	**15.3**	**0.3**	**137.7**
National Total	**30.2**	**165.8**	**22.5**	**53.4**	**21.8**	**20.2**	**25.0**	**338.8**
	Relative decline of Europe							
Heathrow	12.9	25.3	10.3	17.2	1.1	0.7	15.7	83.1
Gatwick	4.0	27.0	3.1	9.9	1.3	1.6	1.8	48.7
Other London	4.4	27.7	3.6	10.9	3.3	2.4	0.7	52.9
London Total	**21.2**	**80.0**	**16.9**	**38.1**	**5.7**	**4.7**	**18.2**	**184.8**
Regional Total	**7.3**	**78.0**	**5.4**	**16.5**	**14.6**	**14.4**	**0.3**	**136.4**
National Total	**28.6**	**157.9**	**22.3**	**54.6**	**20.3**	**19.1**	**18.4**	**321.2**
	Low-cost is king							
Heathrow	13.0	22.8	10.0	15.6	0.4	0.4	20.2	82.5
Gatwick	4.9	36.9	3.9	14.3	2.1	1.9	8.0	72.0
Other London	4.9	30.5	3.9	12.1	3.5	2.6	0.9	58.5
London Total	**22.8**	**90.2**	**17.8**	**42.1**	**6.1**	**4.9**	**29.1**	**212.9**
Regional Total	**7.8**	**82.6**	**5.7**	**17.3**	**15.7**	**15.2**	**0.3**	**144.6**
National Total	**30.6**	**172.8**	**23.4**	**59.4**	**21.8**	**20.1**	**29.4**	**357.5**
	Global fragmentation							
Heathrow	11.7	26.3	9.2	16.1	0.5	0.4	19.9	84.1
Gatwick	2.8	26.0	1.9	6.6	0.9	1.2	0.7	40.2
Other London	4.1	28.7	3.3	11.7	3.8	2.8	0.6	55.1
London Total	**18.6**	**81.1**	**14.4**	**34.4**	**5.2**	**4.4**	**21.2**	**179.3**
Regional Total	**6.1**	**72.0**	**4.5**	**13.6**	**13.8**	**13.8**	**0.3**	**124.0**
National Total	**24.7**	**153.0**	**18.9**	**48.0**	**19.0**	**18.2**	**21.5**	**303.3**

6.55 In the heavily constrained carbon-traded baseline business passengers at the single runway Gatwick lie in the relatively narrow range from 6.4m with the low GDP growth of

global fragmentation to 7.4m in *relative decline of Europe* in 2030.[60] This is between 15%-17% of Gatwick's passengers. By 2050 with more price inelastic business passengers more willing to pay the higher costs of using the crowded airport the range widens to 7.2m (*relative decline of Europe*) to 9.7m (*low-cost is king*) and business passengers represent between 16%-22% of Gatwick passengers. When a second Gatwick runway is added, the numbers of business passengers at Gatwick approximately doubles in all the scenarios except *relative decline of Europe* by 2050, but the overall proportion of business passengers remains similar to the baseline.

LGW 2R	2050							
	UK Business	UK Leisure	Foreign Business	Foreign Leisure	Dom. Business	Dom. Leisure	I to I	Total
Carbon-traded	**Assessment of need**							
Heathrow	17.3	35.4	12.2	18.8	0.5	0.5	11.4	96.1
Gatwick	7.8	47.3	5.7	15.7	1.7	2.3	1.3	81.9
Other London	5.4	31.3	3.9	10.6	5.1	3.6	0.0	60.0
London Total	**30.5**	**114.1**	**21.9**	**45.1**	**7.3**	**6.5**	**12.8**	**238.1**
Regional Total	**10.6**	**108.6**	**7.7**	**19.9**	**20.5**	**20.6**	**0.3**	**188.2**
National Total	**41.1**	**222.6**	**29.6**	**65.0**	**27.8**	**27.1**	**13.0**	**426.3**
	Global growth							
Heathrow	20.0	28.6	14.5	18.2	0.7	0.7	8.5	91.3
Gatwick	9.5	52.9	6.8	19.6	1.9	2.1	3.1	96.0
Other London	6.4	29.1	4.7	11.7	5.8	4.1	0.1	61.9
London Total	**35.9**	**110.7**	**26.1**	**49.5**	**8.5**	**6.9**	**11.7**	**249.1**
Regional Total	**13.9**	**140.2**	**9.7**	**28.4**	**23.5**	**23.0**	**0.3**	**239.0**
National Total	**49.7**	**250.8**	**35.8**	**77.8**	**32.0**	**29.8**	**12.1**	**488.1**
	Relative decline of Europe							
Heathrow	19.3	33.5	14.8	20.4	0.5	0.5	5.9	95.0
Gatwick	8.3	43.5	6.2	17.8	2.3	2.7	2.1	82.8
Other London	5.6	31.1	4.5	12.2	4.5	3.3	0.0	61.3
London Total	**33.1**	**108.1**	**25.6**	**50.5**	**7.3**	**6.5**	**8.0**	**239.1**
Regional Total	**11.7**	**115.9**	**8.5**	**24.0**	**20.5**	**20.6**	**0.2**	**201.4**
National Total	**44.8**	**224.0**	**34.1**	**74.5**	**27.8**	**27.1**	**8.2**	**440.5**
	Low-cost is king							
Heathrow	19.7	33.8	14.1	19.7	0.5	0.6	8.6	97.1
Gatwick	8.8	48.0	6.6	17.7	3.6	2.5	8.6	95.9
Other London	7.0	27.2	5.9	13.6	4.2	3.6	0.0	61.5
London Total	**35.4**	**109.0**	**26.7**	**51.0**	**8.3**	**6.7**	**17.2**	**254.4**
Regional Total	**14.5**	**144.7**	**10.3**	**31.6**	**23.3**	**22.8**	**0.2**	**247.5**
National Total	**49.9**	**253.6**	**37.1**	**82.7**	**31.7**	**29.5**	**17.4**	**501.9**
	Global fragmentation							
Heathrow	14.5	38.0	10.8	18.6	0.5	0.4	10.2	93.0
Gatwick	5.7	42.5	3.9	12.0	1.4	2.1	0.7	68.2
Other London	4.6	31.8	3.7	13.0	4.5	3.5	0.0	61.1
London Total	**24.8**	**112.3**	**18.4**	**43.6**	**6.3**	**6.0**	**10.9**	**222.4**
Regional Total	**8.7**	**111.1**	**6.5**	**19.7**	**18.4**	**18.9**	**0.2**	**183.5**
National Total	**33.5**	**223.4**	**24.9**	**63.4**	**24.8**	**25.0**	**11.1**	**405.9**

60 In interpreting the purpose split tables, it is assumed that the international to international transfer passengers who are modelled as a separate purpose category split 27% business / 73% leisure which is the currently observed journey purpose split. Leisure passengers include the 'visiting friends and relatives' (VFR) journey purpose.

6.56 Nationally, by 2050 the new runway allows between 1.3m more business passengers (*global fragmentation*) and 6.9m more business passengers (*low-cost is king*). Gatwick expansion is forecast to support slightly higher numbers of domestic passengers to London and, as Gatwick would continue to serve a higher number of domestic routes than Heathrow, expansion at Gatwick would also provide benefits for regional connectivity.

Table 6.14: Option Gatwick Airport Second Runway, journey purpose split, 2030 & 2050, million terminal passengers, carbon capped

LGW 2R	2030							
	UK Business	UK Leisure	Foreign Business	Foreign Leisure	Dom. Business	Dom. Leisure	I to I	Total
Carbon capped	**Assessment of need**							
Heathrow	12.8	24.9	9.7	15.8	0.9	0.6	20.8	85.5
Gatwick	3.8	27.1	2.8	8.4	1.0	1.4	1.1	45.6
Other London	4.2	26.9	3.2	9.5	3.6	2.5	0.5	50.5
London Total	**20.8**	**79.0**	**15.7**	**33.7**	**5.5**	**4.5**	**22.4**	**181.6**
Regional Total	**6.6**	**68.3**	**4.8**	**13.1**	**14.1**	**13.8**	**0.3**	**121.1**
National Total	**27.4**	**147.3**	**20.5**	**46.9**	**19.6**	**18.2**	**22.8**	**302.6**
	Global growth							
Heathrow	14.4	21.8	10.7	14.6	0.5	0.5	22.2	84.6
Gatwick	4.0	25.1	2.9	8.3	1.0	1.2	1.5	44.0
Other London	4.2	23.7	3.2	8.4	3.9	2.3	0.5	46.3
London Total	**22.5**	**70.6**	**16.8**	**31.3**	**5.4**	**4.0**	**24.3**	**174.9**
Regional Total	**6.6**	**59.3**	**4.9**	**11.6**	**13.7**	**12.8**	**0.2**	**109.1**
National Total	**29.1**	**129.9**	**21.6**	**42.9**	**19.1**	**16.8**	**24.5**	**284.1**
	Relative decline of Europe							
Heathrow	13.3	24.7	10.6	17.1	1.2	0.9	14.9	82.7
Gatwick	3.7	23.6	2.8	8.4	1.1	1.4	1.2	42.2
Other London	4.1	24.8	3.4	9.6	3.2	2.1	0.5	47.6
London Total	**21.1**	**73.1**	**16.7**	**35.2**	**5.5**	**4.3**	**16.6**	**172.5**
Regional Total	**7.1**	**69.9**	**5.2**	**14.9**	**13.7**	**13.3**	**0.2**	**124.3**
National Total	**28.2**	**143.0**	**22.0**	**50.1**	**19.2**	**17.6**	**16.8**	**296.8**
	Low-cost is king							
Heathrow	13.9	20.6	10.6	14.6	0.4	0.4	21.0	81.6
Gatwick	4.2	26.6	3.2	10.5	1.8	1.4	4.8	52.5
Other London	4.0	21.5	3.3	8.2	3.2	1.9	0.6	42.7
London Total	**22.2**	**68.7**	**17.2**	**33.3**	**5.4**	**3.8**	**26.4**	**176.8**
Regional Total	**6.9**	**59.7**	**5.1**	**12.6**	**13.1**	**12.2**	**0.2**	**109.9**
National Total	**29.1**	**128.3**	**22.3**	**45.9**	**18.5**	**16.0**	**26.6**	**286.7**
	Global fragmentation							
Heathrow	11.8	25.8	9.2	15.9	0.5	0.4	19.6	83.1
Gatwick	2.7	25.0	1.8	6.2	1.0	1.2	0.7	38.7
Other London	4.1	28.8	3.4	11.6	3.6	2.6	0.6	54.6
London Total	**18.6**	**79.7**	**14.4**	**33.7**	**5.0**	**4.2**	**20.9**	**176.5**
Regional Total	**6.0**	**69.9**	**4.5**	**13.2**	**13.4**	**13.3**	**0.3**	**120.6**
National Total	**24.6**	**149.5**	**18.9**	**46.9**	**18.5**	**17.5**	**21.2**	**297.1**

LGW 2R	2050							
	UK Business	UK Leisure	Foreign Business	Foreign Leisure	Dom. Business	Dom. Leisure	I to I	Total
Carbon capped	**Assessment of need**							
Heathrow	17.4	33.0	12.3	17.9	0.4	0.5	11.0	92.6
Gatwick	7.2	39.7	5.2	12.8	1.5	2.0	1.1	69.4
Other London	5.9	31.8	4.3	10.7	5.0	3.4	0.1	61.1
London Total	**30.4**	**104.5**	**21.8**	**41.4**	**6.9**	**5.9**	**12.1**	**223.1**
Regional Total	**9.9**	**94.9**	**7.3**	**17.2**	**19.2**	**19.0**	**0.2**	**167.8**
National Total	**40.4**	**199.5**	**29.1**	**58.5**	**26.2**	**24.9**	**12.3**	**390.9**
	Global growth							
Heathrow	22.0	28.1	15.4	18.4	0.3	0.6	11.6	96.5
Gatwick	7.7	32.3	5.5	10.1	1.4	1.7	1.1	59.8
Other London	6.5	28.0	4.8	9.6	5.3	2.9	0.1	57.1
London Total	**36.2**	**88.4**	**25.7**	**38.2**	**7.1**	**5.1**	**12.8**	**213.5**
Regional Total	**10.7**	**76.0**	**7.7**	**14.8**	**18.6**	**17.4**	**0.2**	**145.4**
National Total	**46.9**	**164.4**	**33.4**	**53.0**	**25.7**	**22.5**	**13.1**	**358.9**
	Relative decline of Europe							
Heathrow	20.0	30.7	15.5	19.9	0.4	0.5	6.7	93.7
Gatwick	6.8	32.5	5.0	12.3	1.4	1.9	0.9	60.6
Other London	6.3	30.7	4.9	11.7	4.9	3.2	0.1	61.7
London Total	**33.1**	**93.8**	**25.4**	**43.9**	**6.7**	**5.5**	**7.6**	**216.1**
Regional Total	**10.6**	**92.7**	**7.9**	**19.2**	**18.4**	**18.0**	**0.1**	**166.8**
National Total	**43.7**	**186.6**	**33.3**	**63.1**	**25.1**	**23.5**	**7.7**	**382.9**
	Low-cost is king							
Heathrow	21.4	24.6	15.2	16.3	0.4	0.5	11.2	89.6
Gatwick	9.4	38.2	7.1	16.5	3.5	2.0	9.6	86.3
Other London	5.8	25.3	4.6	9.1	3.0	2.3	0.0	50.1
London Total	**36.6**	**88.0**	**26.9**	**41.9**	**6.9**	**4.8**	**20.8**	**226.0**
Regional Total	**10.5**	**72.3**	**7.8**	**14.9**	**17.5**	**16.2**	**0.1**	**139.3**
National Total	**47.2**	**160.3**	**34.7**	**56.7**	**24.4**	**21.1**	**20.9**	**365.3**
	Global fragmentation							
Heathrow	14.8	36.9	11.0	18.3	0.4	0.4	11.1	92.9
Gatwick	5.3	39.5	3.6	11.0	1.3	1.9	0.7	63.3
Other London	4.8	31.5	3.8	12.7	4.3	3.2	0.0	60.3
London Total	**24.8**	**107.9**	**18.4**	**42.0**	**6.1**	**5.6**	**11.7**	**216.5**
Regional Total	**8.4**	**104.4**	**6.3**	**18.4**	**17.4**	**17.7**	**0.2**	**172.8**
National Total	**33.2**	**212.3**	**24.7**	**60.4**	**23.5**	**23.2**	**11.9**	**389.2**

6.57 In the baseline in the less heavily constrained carbon capped case, business passengers at the single runway Gatwick lie in the range from 7.2m with the low GDP growth of *global fragmentation* to 10.6m in *global growth* in 2050 and business passengers represent between 16%-24% of all Gatwick passengers. When a second Gatwick runway is added, the numbers of business passengers at Gatwick doubles in *low-cost is king*. In the other demand scenarios the growth in business users of the expanded airport ranges from 31% (*relative decline of Europe*) to 58% (*assessment of need*).

6.58 Nationally by 2050 under carbon capping there are no additional business passengers in *global fragmentation* with a maximum increase of 2.6m business passengers in *low-cost is king*. The national business proportion remains largely unchanged from the baseline at between 22% and 30% depending on the demand scenario.

Table 6.15: Option Heathrow Airport North West Runway, journey purpose split, 2030 & 2050, million terminal passengers, carbon-traded

LHR NWR	2030							
	UK Business	UK Leisure	Foreign Business	Foreign Leisure	Dom. Business	Dom. Leisure	I to I	Total
Carbon-traded	**Assessment of need**							
Heathrow	14.5	33.5	11.2	19.9	1.5	1.3	34.4	116.2
Gatwick	2.9	24.9	1.9	7.0	0.9	1.2	0.7	39.5
Other London	3.7	27.0	2.9	9.5	3.4	2.3	0.6	49.3
London Total	**21.0**	**85.3**	**16.0**	**36.4**	**5.8**	**4.8**	**35.8**	**205.0**
Regional Total	**6.5**	**71.8**	**4.8**	**13.6**	**14.5**	**14.4**	**0.3**	**125.9**
National Total	**27.5**	**157.1**	**20.7**	**49.9**	**20.3**	**19.1**	**36.1**	**330.9**
	Global growth							
Heathrow	15.9	35.0	12.0	21.3	1.3	1.2	38.4	125.2
Gatwick	3.2	25.9	2.2	7.5	0.9	1.2	1.0	41.9
Other London	4.1	28.4	3.2	10.2	3.9	2.5	0.8	53.1
London Total	**23.1**	**89.4**	**17.4**	**39.1**	**6.2**	**4.9**	**40.1**	**220.1**
Regional Total	**7.1**	**77.0**	**5.2**	**14.7**	**15.6**	**15.2**	**0.4**	**135.4**
National Total	**30.3**	**166.4**	**22.5**	**53.8**	**21.8**	**20.1**	**40.5**	**355.5**
	Relative decline of Europe							
Heathrow	15.6	37.2	12.2	22.0	1.7	1.4	28.8	118.9
Gatwick	3.0	24.5	2.0	7.3	0.9	1.2	0.8	39.7
Other London	3.3	23.7	2.6	8.2	3.2	2.2	0.5	43.7
London Total	**21.8**	**85.5**	**16.7**	**37.5**	**5.8**	**4.8**	**30.1**	**202.2**
Regional Total	**6.6**	**71.8**	**4.8**	**14.0**	**14.5**	**14.4**	**0.3**	**126.4**
National Total	**28.4**	**157.3**	**21.6**	**51.5**	**20.3**	**19.1**	**30.4**	**328.6**
	Low-cost is king							
Heathrow	16.4	38.6	12.5	22.9	1.4	1.1	35.5	128.6
Gatwick	3.0	25.1	2.0	7.0	0.9	1.3	1.0	40.4
Other London	3.7	26.5	2.8	9.3	3.8	2.6	0.8	49.5
London Total	**23.2**	**90.3**	**17.4**	**39.2**	**6.2**	**4.9**	**37.3**	**218.5**
Regional Total	**7.1**	**76.1**	**5.1**	**14.5**	**15.6**	**15.2**	**0.4**	**134.1**
National Total	**30.3**	**166.4**	**22.5**	**53.8**	**21.8**	**20.2**	**37.7**	**352.6**
	Global fragmentation							
Heathrow	12.9	31.5	10.2	18.7	1.4	1.3	27.6	103.6
Gatwick	2.6	25.0	1.8	7.3	0.8	1.2	0.7	39.4
Other London	3.3	26.3	2.6	8.9	3.2	2.1	0.4	46.8
London Total	**18.8**	**82.8**	**14.6**	**34.9**	**5.3**	**4.6**	**28.7**	**189.7**
Regional Total	**5.9**	**70.8**	**4.4**	**13.3**	**13.7**	**13.7**	**0.3**	**122.0**
National Total	**24.7**	**153.5**	**19.0**	**48.2**	**19.0**	**18.2**	**29.0**	**311.7**

LHR NWR	2050							
	UK Business	UK Leisure	Foreign Business	Foreign Leisure	Dom. Business	Dom. Leisure	I to I	Total
Carbon-traded	**Assessment of need**							
Heathrow	22.0	47.9	16.0	25.8	1.7	1.4	23.0	137.8
Gatwick	3.7	30.3	2.3	7.7	1.1	1.5	0.1	46.7
Other London	5.0	32.8	3.8	11.3	4.7	3.4	-0.0	61.0
London Total	**30.7**	**110.9**	**22.1**	**44.8**	**7.5**	**6.4**	**23.1**	**245.5**
Regional Total	**10.4**	**110.9**	**7.6**	**20.1**	**20.4**	**20.5**	**0.1**	**190.0**
National Total	**41.0**	**221.9**	**29.7**	**64.9**	**27.9**	**26.9**	**23.2**	**435.4**
	Global growth							
Heathrow	26.0	48.3	18.9	28.3	1.9	1.2	23.0	147.6
Gatwick	4.2	27.4	2.8	8.5	1.2	1.3	0.1	45.4
Other London	5.6	29.6	4.3	12.1	5.5	4.3	-0.0	61.3
London Total	**35.9**	**105.3**	**26.1**	**48.8**	**8.6**	**6.7**	**23.1**	**254.4**
Regional Total	**13.5**	**142.8**	**9.6**	**28.8**	**23.3**	**23.0**	**0.1**	**241.1**
National Total	**49.4**	**248.0**	**35.7**	**77.6**	**31.9**	**29.7**	**23.2**	**495.5**
	Relative decline of Europe							
Heathrow	24.6	48.1	18.8	28.7	1.4	1.2	12.8	135.6
Gatwick	4.5	29.9	2.8	8.5	1.2	1.5	0.3	48.8
Other London	5.0	32.7	3.7	11.0	4.9	3.6	0.0	61.0
London Total	**34.0**	**110.8**	**25.3**	**48.3**	**7.5**	**6.4**	**13.2**	**245.4**
Regional Total	**10.6**	**109.3**	**7.8**	**20.9**	**20.4**	**20.6**	**0.2**	**189.7**
National Total	**44.6**	**220.1**	**33.0**	**69.2**	**27.8**	**27.0**	**13.4**	**435.1**
	Low-cost is king							
Heathrow	25.9	51.2	18.9	30.0	1.3	0.8	21.0	149.0
Gatwick	4.1	27.6	2.9	7.9	1.2	1.2	0.1	45.0
Other London	5.9	28.7	4.4	11.7	6.0	4.8	0.0	61.5
London Total	**35.9**	**107.5**	**26.1**	**49.5**	**8.5**	**6.8**	**21.1**	**255.4**
Regional Total	**13.5**	**140.9**	**9.5**	**28.1**	**23.4**	**23.2**	**0.1**	**238.7**
National Total	**49.4**	**248.4**	**35.7**	**77.6**	**31.8**	**29.9**	**21.2**	**494.1**
	Global fragmentation							
Heathrow	17.9	49.6	13.6	25.2	1.5	1.4	23.7	132.9
Gatwick	3.0	30.7	1.9	7.8	1.1	1.6	0.2	46.4
Other London	4.3	34.3	3.2	11.6	4.0	3.1	0.0	60.6
London Total	**25.2**	**114.6**	**18.7**	**44.7**	**6.7**	**6.1**	**24.0**	**239.9**
Regional Total	**8.3**	**109.1**	**6.2**	**19.0**	**18.2**	**18.8**	**0.2**	**179.8**
National Total	**33.5**	**223.6**	**24.9**	**63.7**	**24.9**	**25.0**	**24.2**	**419.8**

6.59 In the baseline in 2030 under the carbon-traded case, Heathrow is full and congested. Business passengers are less sensitive to fare rises than leisure passengers and so as shadow costs push up passengers fares leisure passengers are more affected. The business component at the unexpanded Heathrow would remain substantial, varying between 31% and 34% of all passengers and between 26 and 30 million in terms of absolute passenger numbers. The current proportion is 31%, so business passenger proportions remain solid, whichever future demand scenario is considered. But, these passengers will face higher fares, increasingly congested conditions, and greater service unreliability.

6.60 Providing a new North West runway at Heathrow sees around a 30% share of business passengers in all the different passenger scenarios, although the actual number of passengers travelling ranges between 31 million in *global fragmentation* and 39 million in *low-cost is king*. This is between 5 and 9 million more business passengers per year compared to the baseline.

6.61 Nationally in 2030, the share of business passengers at all airports is the same as without expansion, ranging between 22% and 24% of total UK passengers. But between 2 million (*global fragmentation*) and 5 million (*global growth*) more business passengers pass through UK airports.

6.62 In 2050 the level of congestion has risen substantially in the baseline and the business proportion of passengers (less sensitive to the potential fare rises) has risen to 31%-42% as increasing numbers of more marginal leisure passengers are driven out to less convenient airports. Shortage of runway slots disproportionately affects transfer passengers who effectively require double use of the scarce runway capacity and as leisure passengers are more price sensitive, this also drives up the business share under congested conditions. By 2050 the additional 260,000 ATM slots from the new Heathrow capacity has been fully utilised for many years in all the demand scenarios.[61] The pressure on runway resources varies considerably between the demand scenarios. The excess of demand is lowest under *global fragmentation* where the business share is 29%. The excess of demand is highest in *global growth* where the business share has risen to 35%. Overall Heathrow serves between 10 and 14 million more business passengers with the new runway in place.

6.63 Nationally by 2050 without airport expansion the business proportion varies between 21% in *global fragmentation* and 25% with the higher levels of economic growth and world trade in the *global growth* and *low-cost is king* scenarios. With the extra capacity provided by the Heathrow North West Runway, the business share continues to range between 21%-25%, but there are between 5 and 7 million more business passengers at all UK airports.

61 Ranging from 2032 in *global growth* to 2042 in *global fragmentation*.

Table 6.16: Option Heathrow Airport North West Runway, journey purpose split, 2030 & 2050, million terminal passengers, carbon capped

LHR NWR	2030							
	UK Business	UK Leisure	Foreign Business	Foreign Leisure	Dom. Business	Dom. Leisure	I to I	Total
Carbon capped	**Assessment of need**							
Heathrow	14.8	30.3	11.3	18.4	1.5	1.3	31.8	109.3
Gatwick	2.7	21.6	1.8	5.9	0.9	1.1	0.6	34.7
Other London	3.4	22.7	2.7	7.8	3.0	1.8	0.4	41.7
London Total	**20.8**	**74.6**	**15.7**	**32.1**	**5.4**	**4.2**	**32.8**	**185.6**
Regional Total	**6.1**	**61.4**	**4.6**	**11.6**	**13.3**	**12.9**	**0.3**	**110.2**
National Total	**26.9**	**136.0**	**20.3**	**43.8**	**18.7**	**17.0**	**33.1**	**295.8**
	Global growth							
Heathrow	16.3	27.3	12.3	17.7	1.6	1.1	32.9	109.1
Gatwick	2.7	18.5	1.7	5.0	0.9	1.0	0.6	30.4
Other London	3.4	20.1	2.7	6.9	2.9	1.6	0.5	38.1
London Total	**22.4**	**66.0**	**16.8**	**29.5**	**5.3**	**3.7**	**33.9**	**177.7**
Regional Total	**6.2**	**52.5**	**4.6**	**10.2**	**12.8**	**11.9**	**0.3**	**98.4**
National Total	**28.6**	**118.5**	**21.3**	**39.7**	**18.1**	**15.6**	**34.2**	**276.0**
	Relative decline of Europe							
Heathrow	15.8	33.2	12.2	20.2	1.7	1.3	26.5	110.9
Gatwick	2.7	21.2	1.8	6.1	0.8	1.1	0.7	34.5
Other London	3.2	21.0	2.5	7.1	2.9	1.8	0.4	38.8
London Total	**21.7**	**75.3**	**16.5**	**33.4**	**5.4**	**4.2**	**27.6**	**184.1**
Regional Total	**6.2**	**61.9**	**4.6**	**12.1**	**13.3**	**12.9**	**0.3**	**111.4**
National Total	**27.9**	**137.2**	**21.1**	**45.5**	**18.7**	**17.1**	**27.8**	**295.5**
	Low-cost is king							
Heathrow	16.7	30.9	12.7	19.2	1.6	1.1	32.8	115.0
Gatwick	2.6	17.8	1.6	4.6	0.9	1.1	0.6	29.1
Other London	3.2	18.9	2.5	6.4	2.9	1.6	0.5	36.1
London Total	**22.5**	**67.6**	**16.8**	**30.1**	**5.4**	**3.8**	**33.9**	**180.1**
Regional Total	**6.2**	**53.5**	**4.6**	**10.4**	**13.0**	**12.1**	**0.3**	**99.9**
National Total	**28.7**	**121.1**	**21.4**	**40.5**	**18.4**	**15.8**	**34.2**	**280.0**
	Global fragmentation							
Heathrow	13.1	29.8	10.3	17.7	1.3	1.1	37.0	110.4
Gatwick	2.4	21.7	1.6	6.1	0.8	1.1	0.8	34.5
Other London	3.1	23.5	2.5	8.0	2.7	1.6	0.5	41.9
London Total	**18.6**	**75.0**	**14.4**	**31.9**	**4.8**	**3.8**	**38.3**	**186.8**
Regional Total	**5.6**	**62.5**	**4.2**	**11.7**	**12.1**	**11.7**	**0.4**	**108.2**
National Total	**24.3**	**137.5**	**18.7**	**43.6**	**16.9**	**15.5**	**38.6**	**295.0**

LHR NWR	2050							
	UK Business	UK Leisure	Foreign Business	Foreign Leisure	Dom. Business	Dom. Leisure	I to I	Total
Carbon capped	**Assessment of need**							
Heathrow	22.2	41.3	16.0	22.7	1.7	1.3	29.9	135.0
Gatwick	3.5	26.0	2.1	6.0	1.1	1.6	0.3	40.6
Other London	4.9	27.6	3.7	9.1	4.0	2.5	0.0	52.0
London Total	**30.6**	**95.0**	**21.8**	**37.8**	**6.8**	**5.4**	**30.2**	**227.6**
Regional Total	**8.7**	**77.8**	**6.5**	**13.8**	**17.3**	**16.9**	**0.2**	**141.3**
National Total	**39.3**	**172.8**	**28.3**	**51.6**	**24.1**	**22.3**	**30.5**	**368.9**
	Global growth							
Heathrow	27.3	36.3	19.6	23.1	1.6	1.0	29.9	138.7
Gatwick	4.0	20.6	2.3	4.8	1.1	1.4	0.3	34.4
Other London	5.0	22.2	3.8	7.2	4.3	2.3	0.0	44.8
London Total	**36.3**	**79.0**	**25.7**	**35.0**	**7.0**	**4.7**	**30.1**	**217.8**
Regional Total	**9.4**	**62.9**	**6.9**	**12.1**	**16.8**	**15.5**	**0.3**	**123.9**
National Total	**45.6**	**141.9**	**32.6**	**47.1**	**23.8**	**20.3**	**30.4**	**341.7**
	Relative decline of Europe							
Heathrow	25.0	44.4	18.9	25.7	1.7	1.2	14.9	131.8
Gatwick	4.2	23.8	2.6	6.5	1.2	1.7	0.4	40.4
Other London	4.4	24.7	3.3	8.2	3.9	2.5	0.1	47.2
London Total	**33.7**	**93.0**	**24.9**	**40.3**	**6.8**	**5.4**	**15.3**	**219.4**
Regional Total	**9.3**	**79.6**	**7.0**	**15.4**	**17.4**	**17.1**	**0.2**	**146.0**
National Total	**42.9**	**172.5**	**31.9**	**55.7**	**24.3**	**22.6**	**15.5**	**365.4**
	Low-cost is king							
Heathrow	27.7	38.8	20.0	24.3	1.4	0.9	25.2	138.3
Gatwick	4.1	20.3	2.3	4.4	1.1	1.5	0.3	34.0
Other London	4.5	22.1	3.4	7.0	4.5	2.4	0.0	44.0
London Total	**36.3**	**81.2**	**25.7**	**35.7**	**7.0**	**4.8**	**25.5**	**216.3**
Regional Total	**9.6**	**64.7**	**7.1**	**12.5**	**17.1**	**15.9**	**0.3**	**127.1**
National Total	**45.9**	**145.9**	**32.8**	**48.2**	**24.2**	**20.7**	**25.8**	**343.4**
	Global fragmentation							
Heathrow	17.8	41.3	13.4	21.3	1.2	0.9	38.1	134.1
Gatwick	2.8	26.4	1.7	6.1	1.0	1.5	0.2	39.7
Other London	4.3	29.7	3.3	10.0	3.5	2.3	0.0	53.0
London Total	**24.9**	**97.4**	**18.4**	**37.5**	**5.7**	**4.6**	**38.3**	**226.7**
Regional Total	**7.4**	**83.0**	**5.6**	**14.4**	**14.5**	**14.4**	**0.0**	**139.4**
National Total	**32.2**	**180.5**	**24.0**	**51.9**	**20.2**	**19.0**	**38.3**	**366.1**

6.64 In the carbon capped baseline in 2050, business passengers at Heathrow lie in the range from 29 to 41 million passengers, representing between 31%-43% of the total passengers, a similar share to the traded carbon case. When the new north west runway is added, there are between 10 million (*relative decline of Europe*) and 14 million (*global growth*) more business passengers using Heathrow. As the airport has an excess of demand in both carbon cases, the additional business passenger demand is very similar to the carbon-traded case. Heathrow has a relatively high base of business passengers and so the growth in business demand over the baseline is more muted ranging between 25% (*relative decline of Europe*) and 42% (*global fragmentation*).

6.65 Nationally, by 2050 without airport expansion the business proportion varies between 21% in the poorer economic conditions of global fragmentation to 30% with the higher levels of economic growth in *global growth* and *low-cost is king.* With the extra capacity provided by the new north west runway the national business share of total UK passengers rises to between 23% in *global fragmentation* to 32% in *global growth* and *low-cost is king* because business passengers are more willing to pay the surcharge needed to bring emissions below the cap.

Table 6.17: Option Heathrow Airport Extended Northern Runway, journey purpose split, 2030 & 2050, million terminal passengers, carbon-traded

LHR ENR	2030							
	UK Business	UK Leisure	Foreign Business	Foreign Leisure	Dom. Business	Dom. Leisure	I to I	Total
Carbon-traded	**Assessment of need**							
Heathrow	14.5	33.5	11.2	19.9	1.5	1.3	34.4	116.3
Gatwick	2.8	24.9	1.9	7.0	0.9	1.2	0.7	39.5
Other London	3.7	27.0	2.9	9.5	3.4	2.3	0.6	49.4
London Total	**21.0**	**85.4**	**16.0**	**36.4**	**5.8**	**4.8**	**35.8**	**205.1**
Regional Total	**6.5**	**71.7**	**4.8**	**13.6**	**14.5**	**14.4**	**0.3**	**125.8**
National Total	**27.5**	**157.1**	**20.7**	**49.9**	**20.3**	**19.1**	**36.1**	**330.9**
	Global growth							
Heathrow	15.9	34.5	12.0	21.1	1.4	1.1	37.1	123.1
Gatwick	3.2	26.1	2.2	7.6	0.9	1.2	1.0	42.1
Other London	4.1	28.6	3.2	10.3	3.9	2.6	0.8	53.4
London Total	**23.1**	**89.2**	**17.4**	**39.0**	**6.2**	**4.9**	**38.9**	**218.6**
Regional Total	**7.1**	**77.1**	**5.2**	**14.8**	**15.6**	**15.2**	**0.4**	**135.5**
National Total	**30.2**	**166.3**	**22.5**	**53.8**	**21.8**	**20.1**	**39.3**	**354.1**
	Relative decline of Europe							
Heathrow	15.7	36.8	12.3	22.0	1.6	1.3	26.8	116.4
Gatwick	2.9	24.6	2.0	7.3	0.9	1.2	0.8	39.7
Other London	3.2	23.6	2.5	8.0	3.3	2.2	0.5	43.3
London Total	**21.8**	**85.0**	**16.7**	**37.3**	**5.8**	**4.8**	**28.1**	**199.5**
Regional Total	**6.6**	**71.7**	**4.8**	**13.9**	**14.5**	**14.4**	**0.3**	**126.2**
National Total	**28.4**	**156.7**	**21.6**	**51.3**	**20.2**	**19.1**	**28.4**	**325.7**
	Low-cost is king							
Heathrow	16.0	35.7	12.2	21.6	1.4	1.0	31.1	119.1
Gatwick	3.1	25.9	2.1	7.4	0.9	1.3	1.0	41.8
Other London	3.9	27.7	3.0	9.8	3.9	2.6	0.8	51.7
London Total	**23.1**	**89.3**	**17.3**	**38.8**	**6.2**	**4.9**	**32.9**	**212.5**
Regional Total	**7.1**	**76.6**	**5.2**	**14.7**	**15.6**	**15.2**	**0.4**	**134.9**
National Total	**30.2**	**165.9**	**22.5**	**53.6**	**21.8**	**20.1**	**33.3**	**347.4**
	Global fragmentation							
Heathrow	12.9	31.5	10.2	18.7	1.4	1.3	27.7	103.6
Gatwick	2.6	25.0	1.8	7.3	0.8	1.2	0.7	39.4
Other London	3.3	26.3	2.6	8.9	3.2	2.1	0.4	46.7
London Total	**18.8**	**82.8**	**14.6**	**34.9**	**5.3**	**4.6**	**28.7**	**189.8**
Regional Total	**5.9**	**70.7**	**4.4**	**13.3**	**13.6**	**13.7**	**0.3**	**121.9**
National Total	**24.7**	**153.5**	**19.0**	**48.2**	**19.0**	**18.2**	**29.0**	**311.7**

LHR ENR	2050							
	UK Business	UK Leisure	Foreign Business	Foreign Leisure	Dom. Business	Dom. Leisure	I to I	Total
Carbon-traded	**Assessment of need**							
Heathrow	21.6	46.1	15.7	25.1	1.6	1.4	19.3	130.8
Gatwick	3.8	30.0	2.3	7.5	1.1	1.5	0.1	46.4
Other London	5.1	32.2	3.9	11.4	4.7	3.4	0.0	60.6
London Total	**30.4**	**108.3**	**21.9**	**44.0**	**7.5**	**6.3**	**19.4**	**237.8**
Regional Total	**10.5**	**112.7**	**7.7**	**20.7**	**20.4**	**20.5**	**0.1**	**192.6**
National Total	**41.0**	**221.0**	**29.6**	**64.7**	**27.8**	**26.8**	**19.5**	**430.4**
	Global growth							
Heathrow	25.7	46.2	18.7	28.0	2.0	1.1	20.2	141.9
Gatwick	4.5	27.4	2.9	8.2	1.2	1.3	0.1	45.6
Other London	5.6	28.6	4.4	12.1	5.3	4.3	0.0	60.3
London Total	**35.7**	**102.2**	**26.0**	**48.3**	**8.5**	**6.7**	**20.2**	**247.8**
Regional Total	**13.5**	**144.2**	**9.7**	**29.0**	**23.3**	**23.0**	**0.1**	**242.8**
National Total	**49.3**	**246.4**	**35.7**	**77.4**	**31.8**	**29.7**	**20.4**	**490.6**
	Relative decline of Europe							
Heathrow	24.3	47.2	18.5	28.0	1.1	1.0	11.2	131.3
Gatwick	4.6	29.4	2.9	8.6	1.2	1.5	0.3	48.5
Other London	4.9	32.2	3.7	10.9	5.1	3.9	0.0	60.8
London Total	**33.8**	**108.8**	**25.2**	**47.6**	**7.4**	**6.3**	**11.6**	**240.6**
Regional Total	**10.7**	**110.6**	**7.9**	**21.4**	**20.5**	**20.6**	**0.2**	**191.9**
National Total	**44.5**	**219.4**	**33.0**	**69.0**	**27.8**	**26.9**	**11.8**	**432.5**
	Low-cost is king							
Heathrow	25.1	49.9	18.3	29.0	1.2	0.7	17.3	141.5
Gatwick	4.7	26.6	3.1	8.1	1.2	1.3	0.1	45.1
Other London	5.9	28.3	4.5	11.7	6.1	4.7	0.0	61.2
London Total	**35.7**	**104.8**	**25.9**	**48.8**	**8.5**	**6.7**	**17.4**	**247.8**
Regional Total	**13.7**	**143.0**	**9.7**	**28.6**	**23.3**	**23.1**	**0.2**	**241.5**
National Total	**49.4**	**247.8**	**35.6**	**77.4**	**31.8**	**29.8**	**17.6**	**489.3**
	Global fragmentation							
Heathrow	17.7	47.7	13.4	24.5	1.5	1.3	20.0	126.0
Gatwick	3.1	30.8	1.9	7.9	1.1	1.5	0.2	46.6
Other London	4.2	34.0	3.2	11.6	4.0	3.2	0.0	60.3
London Total	**25.0**	**112.5**	**18.6**	**44.0**	**6.6**	**6.0**	**20.2**	**232.9**
Regional Total	**8.4**	**110.4**	**6.3**	**19.5**	**18.2**	**18.8**	**0.2**	**181.9**
National Total	**33.4**	**222.9**	**24.9**	**63.4**	**24.8**	**24.9**	**20.4**	**414.8**

6.66 In the baseline in 2030 under the carbon-traded case, Heathrow is full and congested. Business passengers are less sensitive to fare rises than leisure passengers and so as shadow costs push up passengers fares leisure passengers are more affected. The business component at the unexpanded Heathrow would remain substantial varying between 31% and 34% of all passengers and between 26 and 30 million in terms of absolute passenger numbers. The current proportion is 31%, so business passenger proportions remain steady, whichever future demand scenario is considered, however these passengers will face higher fares and increasingly congested conditions, and greater service unreliability.

6.67 Extending the existing northern runway at Heathrow sees a 30%-31% share of business passengers across the different passenger scenarios. The actual number of passengers travelling ranges between 31 million in *global fragmentation* and 38 million in *global growth*. This is between 5 and 8 million more business passengers per year compared to the baseline.

6.68 Nationally in 2030, the share of business passengers at all airports is the same as without expansion, ranging between 22% and 24% of total UK passengers. But between 2 million (*global fragmentation*) and 5 million (*global growth*) more business passengers pass through UK airports.

6.69 In 2050 the level of congestion has risen substantially in the baseline and the proportion of business passengers (less sensitive to the potential fare rises) has risen to between 31% to 42% as increasing numbers of more marginal leisure passengers are driven out to less convenient airports. Shortage of runway slots disproportionately affects transfer passengers who effectively require double use of the scarce runway capacity and as the majority of passengers are leisure, this also drives up the business share under congested conditions. By 2050 the additional 220,000 ATM slots from the extended runway capacity has been fully utilised for many years in all the demand scenarios.[62] The pressure on runway resources now varies considerably between the demand scenarios. The excess of demand is lowest under *global fragmentation* where the business share is 29%. The excess of demand is highest in *global growth* where the business share has risen to 36%. Overall Heathrow serves between 8 and 12 million more business passengers with the extended runway in place.

6.70 Nationally by 2050 without airport expansion the business proportion varies between 21% in the poorer economic conditions of *global fragmentation* and 25% with the higher levels of economic growth and world trade in the *global growth* and *low-cost is king* scenarios. With the extra capacity provided by the Heathrow Extended Northern runway, the business share continues to range between 21%-25%, but there are between 3 and 6 million more business passengers at all UK airports.

62 Ranging from 2032 in *global growth* to 2042 in *global fragmentation*.

Table 6.18: Option Heathrow Airport Extended Northern Runway, journey purpose split, 2030 & 2050, million terminal passengers, carbon capped

LHR ENR	2030							
	UK Business	UK Leisure	Foreign Business	Foreign Leisure	Dom. Business	Dom. Leisure	I to I	Total
Carbon capped	**Assessment of need**							
Heathrow	14.7	30.6	11.2	18.5	1.5	1.3	32.0	109.8
Gatwick	2.7	22.0	1.8	6.1	0.8	1.1	0.6	35.2
Other London	3.4	23.0	2.7	7.9	3.1	1.9	0.4	42.4
London Total	**20.8**	**75.6**	**15.7**	**32.5**	**5.4**	**4.3**	**33.1**	**187.5**
Regional Total	**6.2**	**62.5**	**4.6**	**11.9**	**13.5**	**13.0**	**0.3**	**111.9**
National Total	**27.0**	**138.1**	**20.3**	**44.4**	**18.9**	**17.3**	**33.4**	**299.4**
	Global growth							
Heathrow	16.3	27.5	12.3	17.9	1.6	1.1	33.0	109.7
Gatwick	2.7	19.0	1.8	5.1	0.9	1.1	0.6	31.1
Other London	3.4	20.6	2.7	7.0	2.9	1.6	0.5	38.8
London Total	**22.5**	**67.1**	**16.8**	**30.0**	**5.4**	**3.8**	**34.0**	**179.6**
Regional Total	**6.2**	**53.6**	**4.6**	**10.4**	**13.0**	**12.0**	**0.3**	**100.2**
National Total	**28.7**	**120.8**	**21.4**	**40.4**	**18.3**	**15.8**	**34.4**	**279.8**
	Relative decline of Europe							
Heathrow	15.8	33.3	12.2	20.3	1.7	1.3	26.5	111.2
Gatwick	2.7	21.4	1.8	6.2	0.8	1.1	0.7	34.8
Other London	3.2	21.0	2.5	7.1	2.9	1.8	0.4	38.9
London Total	**21.7**	**75.7**	**16.5**	**33.6**	**5.4**	**4.2**	**27.7**	**184.9**
Regional Total	**6.3**	**62.3**	**4.6**	**12.2**	**13.4**	**13.0**	**0.3**	**112.0**
National Total	**27.9**	**138.0**	**21.2**	**45.8**	**18.8**	**17.2**	**27.9**	**296.8**
	Low-cost is king							
Heathrow	16.7	31.4	12.6	19.5	1.5	1.1	33.1	115.9
Gatwick	2.7	18.6	1.7	4.9	0.9	1.1	0.7	30.5
Other London	3.2	19.3	2.5	6.5	3.0	1.7	0.5	36.7
London Total	**22.6**	**69.3**	**16.9**	**30.9**	**5.4**	**3.9**	**34.2**	**183.1**
Regional Total	**6.3**	**55.3**	**4.6**	**10.7**	**13.2**	**12.3**	**0.3**	**102.8**
National Total	**28.9**	**124.6**	**21.5**	**41.6**	**18.7**	**16.2**	**34.6**	**285.9**
	Global fragmentation							
Heathrow	13.1	30.1	10.3	17.9	1.4	1.1	36.9	110.9
Gatwick	2.4	22.1	1.6	6.3	0.8	1.1	0.8	35.1
Other London	3.1	23.7	2.5	8.1	2.7	1.7	0.5	42.4
London Total	**18.7**	**76.0**	**14.5**	**32.3**	**4.9**	**3.9**	**38.2**	**188.4**
Regional Total	**5.7**	**63.7**	**4.2**	**11.9**	**12.3**	**11.9**	**0.4**	**110.1**
National Total	**24.3**	**139.7**	**18.7**	**44.2**	**17.2**	**15.8**	**38.6**	**298.5**

LHR ENR	2050							
	UK Business	UK Leisure	Foreign Business	Foreign Leisure	Dom. Business	Dom. Leisure	I to I	Total
Carbon capped	**Assessment of need**							
Heathrow	21.6	40.2	15.5	22.1	1.6	1.2	26.5	128.6
Gatwick	3.9	27.3	2.3	6.6	1.1	1.6	0.4	43.3
Other London	5.1	28.7	3.9	9.6	4.2	2.7	0.0	54.1
London Total	**30.5**	**96.2**	**21.8**	**38.2**	**6.9**	**5.5**	**27.0**	**226.0**
Regional Total	**8.9**	**80.8**	**6.7**	**14.4**	**17.6**	**17.3**	**0.2**	**146.0**
National Total	**39.5**	**177.0**	**28.4**	**52.7**	**24.4**	**22.7**	**27.2**	**372.0**
Global growth								
Heathrow	26.8	34.4	19.2	22.4	1.5	0.9	26.3	131.4
Gatwick	4.3	22.2	2.4	5.1	1.1	1.5	0.3	36.9
Other London	5.2	23.6	4.0	7.9	4.5	2.4	0.0	47.7
London Total	**36.2**	**80.1**	**25.6**	**35.5**	**7.0**	**4.8**	**26.7**	**216.0**
Regional Total	**9.7**	**65.4**	**7.1**	**12.6**	**17.1**	**15.9**	**0.3**	**127.9**
National Total	**45.9**	**145.5**	**32.8**	**48.0**	**24.1**	**20.7**	**27.0**	**343.9**
Relative decline of Europe								
Heathrow	24.5	41.4	18.5	24.7	1.7	1.2	14.8	126.9
Gatwick	4.4	26.0	2.8	7.2	1.2	1.7	0.3	43.7
Other London	4.8	26.4	3.6	8.7	3.9	2.5	0.0	49.8
London Total	**33.7**	**93.8**	**24.9**	**40.6**	**6.8**	**5.5**	**15.2**	**220.4**
Regional Total	**9.4**	**80.4**	**7.0**	**15.5**	**17.5**	**17.2**	**0.2**	**147.3**
National Total	**43.0**	**174.2**	**31.9**	**56.2**	**24.4**	**22.7**	**15.4**	**367.7**
Low-cost is king								
Heathrow	27.1	37.3	19.4	23.6	1.3	0.9	21.1	130.7
Gatwick	4.5	23.2	2.7	5.5	1.3	1.6	0.4	39.1
Other London	4.8	23.8	3.6	7.6	4.6	2.5	0.0	46.9
London Total	**36.4**	**84.2**	**25.7**	**36.8**	**7.1**	**4.9**	**21.5**	**216.8**
Regional Total	**9.8**	**68.2**	**7.3**	**13.1**	**17.6**	**16.4**	**0.3**	**132.6**
National Total	**46.2**	**152.5**	**33.0**	**49.9**	**24.7**	**21.3**	**21.8**	**349.4**
Global fragmentation								
Heathrow	17.4	39.9	13.1	20.8	1.1	0.8	33.7	126.8
Gatwick	3.2	28.3	2.0	7.1	1.0	1.5	0.3	43.4
Other London	4.3	30.8	3.3	10.3	3.7	2.5	0.0	54.9
London Total	**24.8**	**99.1**	**18.4**	**38.2**	**5.8**	**4.8**	**34.0**	**225.0**
Regional Total	**7.5**	**86.2**	**5.7**	**15.0**	**14.9**	**14.9**	**0.0**	**144.4**
National Total	**32.4**	**185.4**	**24.1**	**53.2**	**20.7**	**19.7**	**34.0**	**369.4**

6.71 In the carbon capped baseline in 2050 business passengers at Heathrow lie in the range from 29 to 41 million passengers, representing between 31% and 43% of the total passengers, a similar share to the traded carbon case. When the capacity of the extended northern runway is added, there are between 9 million (*relative decline of Europe*) and 13 million (*global growth*) more business passengers using Heathrow. As the airport has an excess of demand in both carbon cases, the additional business passenger demand is very similar to the carbon-traded case.

6.72 Nationally, by 2050 without airport expansion the business proportion varies between 21% in the poorer economic outlook of global fragmentation to 30% with the higher levels of economic growth in *global growth* and *low-cost is king.* This is more than when carbon is traded because the effect of the high carbon surcharge has been to increase the business share by causing more price sensitive leisure passengers to cease travelling. With the extra capacity provided by the northern runway extension the national business share of total UK passengers rises to between 23% in *global fragmentation* to 32% in *global growth* because business passengers are more willing to pay the surcharge needed to bring emissions below the cap. But, the increase in actual passengers is very small, amounting to less than 1.3 million in all the scenarios.

Transfers

6.73 As described in the previous chapter in paragraph 5.29, three types of transfer at hub airports are reported in the tables below. This section of the previous chapter also describes in more detail how such passengers are counted towards total passenger numbers at an airport. In brief:

6.74 Three types of transfer at hub airports are reported in the tables below:

1. **'International-to-international'**: these passengers are passing through the country of the hub airport and do not stay there more than 24 hours; at present at all the hubs airports this is much the largest group of transfer passengers. These are shown in **Table 6.19, Table 6.21,** and **Table 6.23** for the three capacity expansion options.

2. **'Domestic-interliners'**: in the model these are only forecast at UK hub airports, they are passengers bound for or originating in the UK (both UK and foreign residents) who fly to or from Heathrow, Gatwick or another UK hub on a feeder service from another UK airport. These are the UK hub totals reported in the top half of **Table 6.20, Table 6.22** and **Table 6.24** for each of the capacity options.

3. **'International-interliners'**: are similar to domestic interliners in that they are bound for or originating in the UK but they are to or from one of the overseas hubs on a feeder service from another UK airport i.e. they use Amsterdam Schiphol or Paris CDG as an alternative hub to using Heathrow or Gatwick. 'International interliners' are the overseas hub totals reported in the lower half of **Table 6.20, Table 6.22** and **Table 6.24** for each of the capacity options. Note these figures are not the total transfer activity at the overseas hubs, but just the total arrivals and departures from connecting passengers starting or ending their journeys in the UK.

6.75 Paragraph 5.30 in the previous chapter explains why transfer traffic is particularly sensitive to shadow costs at congested airports and hence why it reduces at a faster rate than most point-to-point traffic. The UK originating or destined domestic and international-interliners reduce most rapidly of all.

6.76 Note that all 2011 passenger data reported in the tables is from model outputs validated against actual observations.

Table 6.19: Option Gatwick Airport Second Runway, international – international transfers at hub airports, million terminal passengers

		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon-traded	**2011**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**
Heathrow	18	21	16	11	22	18	9	16	10	6	20	13	9	20	14	10
Gatwick	1	1	1	1	2	4	3	2	2	2	8	10	9	1	1	1
Paris CDG	16	19	20	24	22	28	13	17	15	14	21	27	13	16	16	16
Amsterdam	13	15	16	23	19	34	49	26	39	50	18	33	48	12	12	12
Frankfurt	26	38	49	53	51	55	42	27	25	28	49	55	42	26	28	37
Dubai	18	30	33	39	39	53	99	37	45	51	38	53	94	23	22	24
Heathrow %	20%	16%	12%	8%	14%	9%	4%	13%	8%	4%	13%	7%	4%	20%	15%	10%
Gatwick %	1%	1%	1%	1%	1%	2%	1%	1%	1%	1%	5%	5%	4%	1%	1%	1%
% of Heathrow pax	26%	24%	18%	12%	25%	19%	9%	18%	11%	6%	24%	14%	9%	23%	16%	11%
% of Gatwick pax	3%	3%	2%	2%	5%	6%	4%	4%	3%	3%	16%	17%	10%	1%	1%	1%

		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon capped	**2011**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**
Heathrow	18	21	17	11	22	17	12	15	10	7	21	16	11	20	15	11
Gatwick	1	1	1	1	2	1	1	1	1	1	5	10	10	1	1	1
Paris CDG	16	18	19	19	19	20	21	14	11	11	17	17	18	16	15	15
Amsterdam	13	14	14	15	14	15	18	19	25	31	13	13	13	12	11	12
Frankfurt	26	35	44	58	37	51	60	19	15	17	33	43	53	25	26	34
Dubai	18	29	30	33	30	34	38	28	29	32	28	31	34	23	21	23
Heathrow %	20%	18%	13%	8%	18%	12%	8%	15%	11%	7%	18%	12%	8%	21%	16%	12%
Gatwick %	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	4%	8%	7%	1%	1%	1%
% of Heathrow pax	26%	24%	19%	12%	26%	19%	13%	17%	11%	7%	25%	17%	12%	23%	16%	12%
% of Gatwick pax	3%	2%	2%	2%	3%	2%	2%	3%	1%	1%	10%	18%	14%	1%	1%	1%

6.77 In the baseline without capacity expansion international-to-international interlining does not have a strong presence at Gatwick in any of the range of demand scenarios. With a second runway this market rises above its current level in the *global growth, relative decline of Europe and low-cost is king* scenarios with carbon-traded and only in the *low-cost is king* scenario when carbon is capped. In the carbon-traded world of the *global growth* scenario, the inter-continental interlining market grows strongly and the SkyTeam alliance is also assumed to move from Heathrow to Gatwick. The expanded Gatwick attracts up to 4 million international-to-international transfer passengers by 2040 before numbers fall back as capacity constraints return by 2050. It is in the *low-cost is king* scenario that Gatwick becomes most attractive to international connecting passengers with a reduced hubbing penalty representing better interchange facilities, low-cost airlines

providing feeder services and through ticketing and a third of Heathrow's long-haul services transferring to Gatwick. In these conditions Gatwick achieves around half the level of international-to-international transfer passengers that currently use Heathrow.

6.78 In all scenarios when carbon is traded, the UK loses some of its current national share of 21% of the modelled international market for connections. Under the *assessment of need*, *low-cost is king* and *global fragmentation scenarios*, the share is held to around 20% in 2030, but by 2050 with Heathrow still full and congestion returning to expanded Gatwick, the UK share is generally below 10%. Where there is a global carbon capping regime the UK does retain more of its current share of this overall market as airports such as Frankfurt and Dubai with their highly developed long-haul markets are hit harder.

Table 6.20: Option Gatwick Airport Second Runway, transfers at hub airports by passengers bound for or originating in the UK, domestic and international interliners, million terminal passengers

Carbon-traded		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
LGW 2R	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	5.1	0.8	0.3	0.3	0.4	0.4	0.3	0.8	0.4	0.1	0.2	0.2	0.2	0.5	0.3	0.3
Gatwick	1.2	2.0	1.9	2.2	2.4	3.2	0.3	2.1	1.2	1.2	10.9	13.6	7.6	0.9	0.6	0.7
Manchester	0.2	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
London	6.3	2.8	2.2	2.6	2.8	3.6	0.6	2.9	1.6	1.3	11.0	13.8	7.8	1.4	0.9	1.0
Paris	0.8	0.3	0.2	0.2	0.4	0.3	0.3	0.2	0.1	0.0	0.2	0.2	0.3	0.0	0.0	0.0
Amsterdam	0.9	0.3	0.2	0.2	0.4	0.2	0.3	2.7	7.3	7.0	0.2	0.2	0.2	0.0	0.0	0.0
Frankfurt	0.5	0.3	0.2	0.1	0.3	0.2	0.2	0.3	0.1	0.1	0.3	0.2	0.2	0.0	0.0	0.0
Dubai	2.1	1.5	1.5	1.4	2.0	1.9	2.7	5.0	7.9	8.7	1.5	1.4	2.1	0.3	0.1	0.2
Overseas hubs	4.3	2.5	2.1	1.9	3.0	2.7	3.5	8.1	15.5	15.7	2.2	2.0	2.8	0.5	0.2	0.2

Carbon capped		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
LGW 2R	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	5.1	1.0	0.3	0.3	0.7	0.4	0.5	1.0	0.4	0.2	0.3	0.5	0.5	0.5	0.3	0.3
Gatwick	1.2	1.8	2.0	1.8	1.8	1.8	1.8	1.7	0.9	0.5	7.8	16.4	15.6	0.9	0.6	0.6
Manchester	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
London	6.3	2.8	2.3	2.2	2.4	2.3	2.3	2.6	1.3	0.7	8.1	16.9	16.2	1.4	0.9	0.9
Paris	0.8	0.3	0.2	0.2	0.3	0.2	0.2	0.2	0.1	0.0	0.2	0.1	0.1	0.0	0.0	0.0
Amsterdam	0.9	0.3	0.2	0.2	0.3	0.2	0.2	2.2	6.0	5.7	0.2	0.1	0.1	0.0	0.0	0.0
Frankfurt	0.5	0.3	0.2	0.1	0.3	0.2	0.1	0.3	0.1	0.0	0.2	0.1	0.1	0.0	0.0	0.0
Dubai	2.1	1.4	1.3	1.3	1.5	1.3	1.3	4.7	7.0	7.0	1.3	0.9	0.7	0.3	0.1	0.2
Overseas hubs	4.3	2.3	2.0	1.8	2.5	1.8	1.7	7.4	13.2	12.7	2.0	1.2	1.0	0.4	0.2	0.2

6.79 In all demand scenarios (except *global fragmentation*) where Gatwick adds a second runway and carbon is traded, the volume of transfers between domestic and international flights increases, often quite significantly. Domestic services are bolstered in the *global growth* and especially the *low-cost is king* scenarios. The effect of facilitating transfers between short-haul and long-haul operators in the *low-cost is king* scenario is striking with the level of transfers almost double that of Heathrow today once the second runway is

available. The pattern is broadly similar when carbon is capped, though the levels of domestic-international transfers are even higher in the *low-cost is king* scenario later in the model period.

6.80 The use of the overseas hubs by UK-bound or originating passengers generally drops from the current level of some 4 million passengers in all scenarios except *relative decline of Europe* where Amsterdam and Dubai build up greater market shares. In the *assessment of need*, *global growth* and *global fragmentation* scenarios there is an overall reduction in the numbers of UK passengers making connections at either a domestic or foreign hub. Whilst in the *relative decline of Europe* the total number of connecting UK passengers rises from 11 million today to up to 17 million (mainly at Amsterdam and Dubai) and in *low-cost is king* by up to 16 million (mainly at Gatwick).

Table 6.21: Option Heathrow Airport North West Runway, international – international transfers at hub airports, million terminal passengers

		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon-traded	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	18	34	34	23	38	31	23	29	22	13	35	27	21	28	28	24
Gatwick	1	1	1	0	1	1	0	1	1	0	1	1	0	1	0	0
Paris CDG	16	18	18	22	20	27	12	15	14	14	21	27	13	15	13	15
Amsterdam	13	13	14	18	16	27	49	21	33	46	17	29	48	11	10	11
Frankfurt	26	30	37	52	42	55	42	23	22	28	43	55	44	22	21	28
Dubai	18	29	31	37	37	51	89	36	44	50	37	52	90	22	21	23
Heathrow %	20%	27%	25%	15%	25%	16%	11%	23%	16%	8%	23%	14%	10%	28%	30%	24%
Gatwick %	1%	1%	0%	0%	1%	0%	0%	1%	0%	0%	1%	0%	0%	1%	1%	0%
% of Heathrow pax	26%	30%	25%	17%	33%	23%	17%	25%	16%	9%	31%	20%	15%	24%	21%	17%
% of Gatwick pax	3%	2%	1%	0%	2%	1%	0%	2%	2%	1%	2%	1%	0%	2%	1%	1%

		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon capped	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	18	32	34	30	33	36	30	26	23	15	33	31	25	37	42	38
Gatwick	1	1	1	0	1	0	0	1	0	0	1	0	0	1	1	0
Paris CDG	16	16	15	17	16	17	17	14	12	12	16	18	17	18	19	20
Amsterdam	13	11	11	12	12	12	12	18	25	35	12	13	13	13	13	14
Frankfurt	26	25	26	35	26	30	41	20	17	20	27	34	47	31	38	57
Dubai	18	25	25	28	27	29	32	31	36	40	27	30	33	30	34	38
Heathrow %	20%	29%	30%	25%	29%	29%	23%	24%	21%	12%	28%	25%	19%	28%	28%	23%
Gatwick %	1%	1%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	1%	0%	0%
% of Heathrow pax	26%	29%	27%	22%	30%	28%	22%	24%	18%	11%	30%	24%	19%	34%	33%	28%
% of Gatwick pax	3%	2%	1%	1%	2%	1%	1%	2%	1%	1%	2%	1%	1%	2%	2%	1%

6.81 When a new north west runway is added at Heathrow with carbon-traded, the airport increases its volume of international-to-international transfer passengers from current levels in all scenarios throughout the period. It sees most connecting passengers in the *global growth* scenario where these connections are 33% of all passengers in 2030. Under *global growth* and *low-cost is king* scenarios Heathrow has over 20 million more international-to-international transfer passengers than in the two runway baseline in 2050 despite the expanded airport operating with renewed capacity constraints. The international-to-international market is also strong at the expanded Heathrow in the carbon capped cases. In most demand scenarios Heathrow serves between 25-40 million international-to-international transfer passengers between 2030 and 2050. The exception is the *relative decline of Europe* scenario where passengers range from 15 to 26 million and Heathrow loses out to Amsterdam and Dubai.

6.82 In all scenarios when carbon is traded, in 2030, when the runway is newly open and has spare capacity, the national share of the international connecting market has increased to 24%-29%. This share declines to 11%-24% by 2050 depending on the scenario when the additional capacity has been fully utilised for many years already. There is a similar pattern in 2030 with the lower volumes of connecting passengers in the carbon capped world. The UK share of the market rises to 25%-30%, depending on scenario. In 2050 the high carbon costs applied to long-haul connecting traffic affect competitors as much as the UK in most scenarios and the UK retains a share of the market between 12%-25%.

Table 6.22: Option Heathrow Airport North West Runway, transfers at hub airports by passengers bound for or originating in the UK, domestic and international interliners, million terminal passengers

Carbon-traded		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
LHR NWR	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	5.1	3.1	3.2	2.4	2.8	2.4	0.9	3.7	1.3	0.5	2.6	1.9	0.7	1.6	1.2	1.3
Gatwick	1.2	0.8	0.5	0.3	0.8	0.3	0.0	0.7	0.4	0.1	1.0	0.4	0.0	0.5	0.2	0.2
Manchester	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
London	6.3	3.9	3.7	2.7	3.6	2.7	1.0	4.5	1.7	0.6	3.6	2.3	0.8	2.1	1.4	1.4
Paris	0.8	0.3	0.2	0.2	0.3	0.2	0.3	0.2	0.1	0.0	0.3	0.3	0.3	0.0	0.0	0.0
Amsterdam	0.9	0.3	0.2	0.2	0.3	0.3	0.3	2.4	6.9	7.0	0.3	0.3	0.3	0.0	0.0	0.0
Frankfurt	0.5	0.3	0.1	0.1	0.3	0.2	0.2	0.2	0.1	0.0	0.3	0.2	0.2	0.0	0.0	0.0
Dubai	2.1	1.3	1.1	1.5	1.4	1.6	2.1	4.2	7.0	7.6	1.5	1.6	2.1	0.2	0.1	0.1
Overseas hubs	4.3	2.1	1.6	2.0	2.4	2.3	2.9	7.0	14.1	14.7	2.4	2.3	2.9	0.3	0.1	0.1

Carbon capped		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
LHR NWR	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	5.1	3.1	3.7	3.2	2.9	3.5	3.2	3.7	1.7	0.7	2.9	3.0	2.3	1.7	1.5	1.1
Gatwick	1.2	0.7	0.5	0.7	0.6	0.3	0.5	0.6	0.4	0.2	0.7	0.5	0.6	0.5	0.2	0.2
Manchester	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
London	6.3	3.9	4.2	3.9	3.6	3.8	3.8	4.3	2.1	0.9	3.6	3.5	2.9	2.2	1.7	1.3
Paris	0.8	0.3	0.1	0.1	0.3	0.1	0.1	0.2	0.1	0.0	0.3	0.2	0.1	0.0	0.0	0.0
Amsterdam	0.9	0.3	0.2	0.1	0.3	0.2	0.1	2.3	6.2	6.1	0.3	0.2	0.2	0.0	0.0	0.0
Frankfurt	0.5	0.3	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.0	0.2	0.1	0.1	0.0	0.0	0.0
Dubai	2.1	1.1	0.8	0.9	1.1	0.8	1.0	3.7	6.2	6.2	1.1	0.9	1.0	0.2	0.1	0.1
Overseas hubs	4.3	2.0	1.3	1.2	1.9	1.3	1.3	6.5	12.5	12.4	1.9	1.4	1.3	0.3	0.1	0.1

6.83 The volume of domestic to international transfers at Heathrow generally declines into the future regardless of demand scenario in both carbon-traded and capped cases. But, compared to the 2050 'do minimum' baseline many more of these passengers are retained with an expanded Heathrow.

6.84 The use of the overseas hubs by UK-bound or originating passengers generally drops from the current level of some 4 million passengers in all scenarios except *relative decline of Europe* where Amsterdam and Dubai build up dominant market shares. In all the scenarios except *relative decline of Europe* there is also an overall reduction in the total numbers of UK passengers transferring at either a domestic or foreign hub. In the *relative decline of Europe* scenario the total of connecting UK passengers rises from 11 million today to up to 16 million with carbon-traded and 15 million with carbon capped (mainly at Amsterdam and Dubai). But the total number of UK bound or originating passengers using a UK hub airport to transfer is lower than at present in all demand scenarios and in both carbon cases.

Table 6.23: Option Heathrow Airport Extended Northern Runway, international – international transfers at hub airports, million terminal passengers

		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon-traded	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	18	34	30	19	37	28	20	27	19	11	31	24	17	28	27	20
Gatwick	1	1	1	0	1	0	0	1	1	0	1	1	0	1	0	0
Paris CDG	16	17	19	23	21	27	13	16	14	14	22	27	14	15	14	15
Amsterdam	13	13	14	19	17	29	47	22	35	47	17	32	48	11	10	11
Frankfurt	26	30	40	51	42	55	44	24	23	28	45	55	44	22	22	30
Dubai	18	29	32	38	37	52	91	36	44	51	38	53	92	22	21	24
Heathrow %	20%	28%	22%	13%	24%	14%	9%	21%	14%	7%	20%	12%	8%	28%	29%	20%
Gatwick %	1%	1%	1%	0%	1%	0%	0%	1%	1%	0%	1%	0%	0%	1%	1%	0%
% of Heathrow pax	26%	30%	24%	15%	32%	22%	15%	23%	15%	9%	27%	19%	13%	24%	21%	15%
% of Gatwick pax	3%	2%	2%	0%	2%	1%	0%	2%	2%	1%	3%	1%	0%	2%	1%	1%

		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon capped	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	18	32	32	27	33	33	26	27	21	15	33	28	21	37	39	34
Gatwick	1	1	1	0	1	1	0	1	0	0	1	1	0	1	1	0
Paris CDG	16	16	16	17	16	17	17	14	12	12	17	18	18	18	19	20
Amsterdam	13	12	12	12	12	13	13	18	27	35	12	14	14	13	14	15
Frankfurt	26	25	28	39	27	33	46	20	18	20	28	39	53	31	40	60
Dubai	18	26	26	29	27	30	33	32	36	41	28	31	34	30	34	39
Heathrow %	20%	29%	28%	21%	29%	26%	19%	24%	18%	12%	28%	22%	15%	28%	26%	20%
Gatwick %	1%	1%	0%	0%	0%	0%	0%	1%	0%	0%	1%	0%	0%	1%	0%	0%
% of Heathrow pax	26%	29%	26%	21%	30%	27%	20%	24%	17%	12%	30%	23%	16%	34%	31%	26%
% of Gatwick pax	3%	2%	1%	1%	2%	1%	1%	2%	1%	1%	2%	1%	1%	2%	2%	1%

6.85 With a Northern Runway Extension and when carbon is traded, Heathrow increases its volume of international-to-international transfer passengers from current levels in all scenarios throughout the period. It sees most connecting passengers in the *global growth* scenario where these connections are 32% of all passengers in 2030. Under *global growth* and *low-cost is king* scenarios Heathrow has over 19 and 17 million more international-to-international transfer passengers respectively than in the two runway baseline in 2050 despite the expanded airport operating with renewed capacity constraints. The international-to-international market is also strong at the expanded Heathrow in the carbon capped cases. In most demand scenarios Heathrow serves between 20-35 million international-to-international transfer passengers between 2030 and 2050. The exception is the *relative decline of Europe* scenario where numbers range from 15 to 27 million and Heathrow loses out to Amsterdam and Dubai.

6.86 In all scenarios when carbon is traded, the UK eventually loses some of its current national share of 21% of the international market for connections by 2050. But in all the demand scenarios in 2030, when the runway is newly open and has spare capacity, the national share of international connecting market is constant at 21% in the *low-cost is king* scenario and ranges between 22% and 29% in the others. This share declines to 8% to 20% by 2050 depending on scenario when the capacity is fully utilised once more. There is a similar pattern in 2030 with the lower volumes of connecting passengers in the carbon capped world. The UK share of the market rises to between 25% and 29%, depending on scenario. In 2050 the high carbon costs applied to long-haul connecting traffic affect competitors as much as the UK in most scenarios and the UK retains a share of the market between 12% and 22%.

Table 6.24: Option Heathrow Airport Extended Northern Runway, transfers at hub airports by passengers bound for or originating in the UK, domestic and international interliners, million terminal passengers

Carbon-traded		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
LHR ENR	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	5.1	3.1	2.7	2.1	2.7	2.0	0.9	3.1	1.1	0.3	2.0	1.6	0.6	1.6	1.2	1.2
Gatwick	1.2	0.8	0.6	0.3	0.9	0.3	0.0	0.8	0.4	0.1	1.1	0.4	0.0	0.5	0.2	0.2
Manchester	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
London	6.3	3.9	3.2	2.4	3.6	2.3	0.9	3.9	1.5	0.4	3.1	1.9	0.7	2.1	1.4	1.3
Paris	0.8	0.3	0.2	0.2	0.3	0.3	0.3	0.2	0.1	0.0	0.3	0.3	0.3	0.0	0.0	0.0
Amsterdam	0.9	0.3	0.2	0.2	0.3	0.3	0.3	2.5	7.1	7.1	0.3	0.3	0.3	0.0	0.0	0.0
Frankfurt	0.5	0.3	0.1	0.1	0.3	0.2	0.2	0.2	0.1	0.0	0.3	0.2	0.2	0.0	0.0	0.0
Dubai	2.1	1.3	1.2	1.5	1.5	1.6	2.4	4.3	7.1	7.7	1.5	1.6	2.3	0.2	0.1	0.1
Overseas hubs	4.3	2.1	1.8	2.0	2.4	2.4	3.2	7.3	14.4	14.9	2.4	2.4	3.1	0.3	0.1	0.1

Carbon capped		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
LHR ENR	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	5.1	3.1	3.2	2.7	3.0	3.2	2.5	3.7	1.4	0.7	2.9	2.4	1.8	1.7	1.4	1.0
Gatwick	1.2	0.7	0.6	0.9	0.6	0.4	0.6	0.6	0.4	0.2	0.7	0.9	1.0	0.5	0.3	0.2
Manchester	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
London	6.3	3.9	3.7	3.6	3.6	3.7	3.0	4.4	1.8	0.9	3.6	3.2	2.9	2.2	1.7	1.2
Paris	0.8	0.3	0.2	0.1	0.3	0.1	0.1	0.2	0.1	0.0	0.3	0.2	0.1	0.0	0.0	0.0
Amsterdam	0.9	0.3	0.2	0.1	0.3	0.2	0.2	2.3	6.3	6.3	0.3	0.2	0.1	0.0	0.0	0.0
Frankfurt	0.5	0.3	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.0	0.2	0.1	0.1	0.0	0.0	0.0
Dubai	2.1	1.2	0.9	1.0	1.1	0.9	1.0	3.8	6.3	6.2	1.1	1.0	1.1	0.2	0.1	0.1
Overseas hubs	4.3	2.0	1.4	1.3	1.9	1.3	1.3	6.5	12.8	12.5	1.9	1.5	1.4	0.3	0.1	0.1

6.87 The volume of domestic to international transfers at Heathrow generally declines into the future regardless of demand scenario in both carbon-traded and capped cases. But, compared to the 2050 'do minimum' baseline many more of these passengers are retained with an expanded Heathrow.

6.88 The use of the overseas hubs by UK-bound or originating passengers generally drops from the current level of some 4 million passengers in all scenarios except *relative decline of Europe* where Amsterdam and Dubai build up larger market shares. In all the scenarios except *relative decline of Europe* there is also an overall reduction in the total numbers of UK passengers transferring at either a domestic or foreign hub. In the *relative decline of Europe* scenario the total of connecting UK passengers rises from 11 million today to up to 16 million with carbon-traded and 15 million with carbon capped (mainly at Amsterdam and Dubai). But the total number of UK bound or originating passengers using a UK hub airport to transfer is lower than at present in all demand scenarios and in both carbon cases.

Destinations served: daily scheduled services

6.89 The analysis presented in the tables below from **Table 6.25** through to **Table 6.30** summarise the number of separate route destinations served from the airport with capacity development for the five London airports, the rest of the UK airports and a national total. There are separate tables for the carbon-traded and capped cases. A threshold of daily services is applied. This is defined as being at least 365 daily scheduled departures a year, or 730 annual passenger ATMs (arriving and departing) air transport movements. The daily threshold applied is relatively stringent. It includes only scheduled services (both 'full-service' and LCC), and therefore excludes charter. The modelling of destinations served by each airport for each airline sector is part of the model validation process and is reported in **Appendix 1**.

6.90 Note that the tables are not additive. If a route exists at the airport with the capacity development and also elsewhere in the London system, it is counted in both tables, likewise between London and the regions. Similarly destination totals cannot be derived by simple subtraction. This means that the national total of destinations served is not the sum of London and the other regional airports, as the latter will normally have most, if not all, destinations in common with London.

6.91 As discussed earlier in paragraph 5.39, counting destinations served from a particular airport or region is a limited measure of connectivity because the new destinations added will initially be at the margin often operating at less than daily frequencies or at times inconvenient to many passengers. Destinations with daily services might be seen as more relevant at airports with significant proportions of business travellers, but at airports with a range of seasonal and charter traffic, the total destinations served without a threshold may be just as relevant.

Table 6.25: Option Gatwick Airport Second Runway, destinations served with daily scheduled services, carbon-traded

LGW 2R		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon-traded	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
LGW																
Short Haul	58	75	88	113	82	103	102	64	69	83	68	72	72	62	68	88
Long Haul	13	20	18	21	27	33	39	23	26	32	50	55	61	15	18	20
All International	71	95	106	134	109	136	141	87	95	115	118	127	133	77	86	108
Domestic	9	7	8	8	8	7	7	7	7	7	10	9	8	7	8	8
Total	80	102	114	142	117	143	148	94	102	122	128	136	141	84	94	116
London																
Short Haul	104	127	132	143	131	143	145	123	126	130	126	124	127	128	137	148
Long Haul	61	75	81	88	81	86	86	72	76	86	74	79	95	73	79	83
All International	165	202	213	231	212	229	231	195	202	216	200	203	222	201	216	231
Domestic	10	9	10	10	9	9	9	9	9	9	10	10	9	9	10	10
Total	175	211	223	241	221	238	240	204	211	225	210	213	231	210	226	241
Other Modelled Airports																
Short Haul	40	71	79	81	76	86	101	73	80	88	76	95	108	71	84	83
Long Haul	6	17	21	25	18	23	36	18	20	23	17	21	26	16	19	22
All International	46	88	100	106	94	109	137	91	100	111	93	116	134	87	103	105
Domestic	25	26	26	27	26	27	27	26	26	27	26	27	27	26	26	26
Total	71	114	126	133	120	136	164	117	126	138	119	143	161	113	129	131
National																
Short Haul	105	128	133	143	132	143	145	128	132	139	131	132	135	129	137	148
Long Haul	61	75	81	88	81	86	86	72	76	86	74	79	95	73	79	83
All International	166	203	214	231	213	229	231	200	208	225	205	211	230	202	216	231
Domestic	26	26	27	28	26	27	27	26	26	27	26	27	27	26	27	27
Total	192	229	241	259	239	256	258	226	234	252	231	238	257	228	243	258

6.92 In the Gatwick Airport Second Runway option with traded carbon there are gains in the number of destinations served nationally and these are made primarily by Gatwick and other London airports whilst regional airports lose destinations they gained in the 'do minimum' baseline when Gatwick is full. In *relative decline of Europe* the loss of destinations by regional airports is not as pronounced compared to those gained by London. In *low-cost is king* Gatwick sees large gains in long haul destinations served whilst in all other scenarios Gatwick gains more short-haul than long-haul destinations.

Table 6.26: Option Gatwick Airport Second Runway, destinations served with daily scheduled services, carbon capped

LGW 2R		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon capped	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
LGW																
Short Haul	58	74	82	94	70	74	84	60	65	74	60	67	71	60	66	81
Long Haul	13	16	18	20	20	18	21	20	21	23	37	49	51	15	18	19
All International	71	90	100	114	90	92	105	80	86	97	97	116	122	75	84	100
Domestic	9	7	8	8	8	8	8	7	7	8	9	8	8	10	8	8
Total	80	97	108	122	98	100	113	87	93	105	106	124	130	85	92	108
London																
Short Haul	104	125	131	137	125	125	130	120	125	125	116	120	123	129	134	146
Long Haul	61	75	81	85	75	80	88	71	75	83	71	77	80	72	79	82
All International	165	200	212	222	200	205	218	191	200	208	187	197	203	201	213	228
Domestic	10	9	10	10	9	10	10	9	9	10	9	9	9	10	10	10
Total	175	209	222	232	209	215	228	200	209	218	196	206	212	211	223	238
Other Modelled Airports																
Short Haul	40	71	76	80	60	70	73	67	72	77	63	63	71	70	81	82
Long Haul	6	17	19	22	15	19	21	15	18	21	14	17	21	15	19	21
All International	46	88	95	102	75	89	94	82	90	98	77	80	92	85	100	103
Domestic	25	26	26	27	26	26	27	26	25	26	26	26	26	26	26	26
Total	71	114	121	129	101	115	121	108	115	124	103	106	118	111	126	129
National																
Short Haul	105	126	132	137	125	126	130	125	130	133	122	125	126	129	134	147
Long Haul	61	75	81	85	75	80	88	71	75	83	71	77	80	72	79	82
All International	166	201	213	222	200	206	218	196	205	216	193	202	206	201	213	229
Domestic	26	26	27	28	26	27	28	26	25	27	26	26	26	27	27	27
Total	192	227	240	250	226	233	246	222	230	243	219	228	232	228	240	256

6.93 With the Gatwick Airport Second Runway option when carbon is capped, the national gain in destinations is much less than under traded carbon. Gatwick and other London airports make the most significant gains in destination numbers except in *relative decline of Europe* and *low-cost is king* where the other London airports lose destinations overall relative to Gatwick.

Table 6.27: Option Heathrow Airport North West Runway, destinations served with daily scheduled services, carbon-traded

LHR NWR		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon-traded	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
LHR																
Short Haul	75	86	87	81	87	84	73	93	104	100	98	98	94	83	89	88
Long Haul	57	68	73	75	72	75	84	61	63	69	71	74	80	64	67	70
All International	132	154	160	156	159	159	157	154	167	169	169	172	174	147	156	158
Domestic	7	4	4	4	4	4	4	5	4	3	4	4	4	4	4	4
Total	139	158	164	160	163	163	161	159	171	172	173	176	178	151	160	162
London																
Short Haul	104	131	135	137	132	137	135	129	139	141	131	138	136	130	135	136
Long Haul	61	81	87	92	85	90	100	76	82	90	84	90	101	77	81	86
All International	165	212	222	229	217	227	235	205	221	231	215	228	237	207	216	222
Domestic	10	10	10	10	10	10	9	10	10	10	10	10	9	10	10	10
Total	175	222	232	239	227	237	244	215	231	241	225	238	246	217	226	232
Other Modelled Airports																
Short Haul	40	69	80	85	72	89	100	67	74	84	72	82	94	71	80	84
Long Haul	6	17	20	23	18	22	29	18	20	23	18	22	28	14	19	21
All International	46	86	100	108	90	111	129	85	94	107	90	104	122	85	99	105
Domestic	25	26	26	27	26	27	27	26	26	27	26	27	27	26	26	26
Total	71	112	126	135	116	138	156	111	120	134	116	131	149	111	125	131
National																
Short Haul	105	131	135	137	132	137	137	129	139	141	131	138	138	130	135	136
Long Haul	61	81	87	92	85	90	100	76	82	90	84	90	101	77	81	86
All International	166	212	222	229	217	227	237	205	221	231	215	228	239	207	216	222
Domestic	26	27	27	28	27	28	27	27	27	28	27	28	27	27	27	27
Total	192	239	249	257	244	255	264	232	248	259	242	256	266	234	243	249

6.94 In the Heathrow Airport North West Runway option with carbon-traded, there is a national gain in the number of destinations available. But, with the exception of *global fragmentation*, and to a lesser extent *relative decline of Europe*, these gains in destinations served are focused on London and at Heathrow in particular. *Relative decline of Europe* and *low-cost is king* see Heathrow gain significantly more short-haul than long-haul destinations.

Table 6.28: Option Heathrow Airport North West Runway, destinations served with daily scheduled services, carbon capped

LHR NWR		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon capped	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
LHR																
Short Haul	75	85	89	86	85	88	87	91	104	107	93	100	97	85	89	86
Long Haul	57	65	71	73	67	72	76	60	61	65	67	72	74	67	71	72
All International	132	150	160	159	152	160	163	151	165	172	160	172	171	152	160	158
Domestic	7	4	4	4	4	4	4	5	4	3	4	4	4	4	4	3
Total	139	154	164	163	156	164	167	156	169	175	164	176	175	156	164	161
London																
Short Haul	104	129	131	137	126	127	135	128	134	143	127	130	137	129	131	138
Long Haul	61	76	84	87	78	86	91	76	79	85	78	86	90	78	83	86
All International	165	205	215	224	204	213	226	204	213	228	205	216	227	207	214	224
Domestic	10	9	10	10	10	10	10	9	10	10	10	10	10	10	10	10
Total	175	214	225	234	214	223	236	213	223	238	215	226	237	217	224	234
Other Modelled Airports																
Short Haul	40	62	69	74	54	60	64	61	64	73	55	60	67	63	72	73
Long Haul	6	15	18	21	15	17	21	15	17	21	15	18	21	13	17	19
All International	46	77	87	95	69	77	85	76	81	94	70	78	88	76	89	92
Domestic	25	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Total	71	103	113	121	95	103	111	102	107	120	96	104	114	102	115	118
National																
Short Haul	105	129	131	137	126	127	135	128	134	143	127	130	137	129	132	138
Long Haul	61	76	84	87	78	86	91	76	79	85	78	86	90	78	83	86
All International	166	205	215	224	204	213	226	204	213	228	205	216	227	207	215	224
Domestic	26	26	27	27	27	27	27	26	27	27	27	27	27	27	27	27
Total	192	231	242	251	231	240	253	230	240	255	232	243	254	234	242	251

6.95 In the Heathrow Airport North West Runway option when carbon is capped, there are still significant gains to the national total of destinations ranging from 7 in 2050 in *global fragmentation* to 15 in *low-cost is king*. There is a similar pattern to the carbon-traded case, although with lower numbers of destinations. London, and Heathrow in particular, gain most destinations and destinations are lost at regional airports which are less able to offer daily frequencies than Heathrow if it expands.

Table 6.29: Option Heathrow Airport Extended Northern Runway, destinations served with daily scheduled services, carbon-traded

LHR ENR		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon-traded	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
LHR																
Short Haul	75	86	85	77	85	80	73	98	99	101	96	97	93	83	89	83
Long Haul	57	68	70	75	72	74	80	60	62	68	69	74	80	65	67	69
All International	132	154	155	152	157	154	153	158	161	169	165	171	173	148	156	152
Domestic	7	4	4	4	4	4	4	5	4	4	4	4	3	4	4	4
Total	139	158	159	156	161	158	157	163	165	173	169	175	176	152	160	156
London																
Short Haul	104	131	135	138	131	137	134	131	135	143	129	137	135	130	135	138
Long Haul	61	81	85	92	85	90	101	76	81	89	83	91	101	77	82	85
All International	165	212	220	230	216	227	235	207	216	232	212	228	236	207	217	223
Domestic	10	10	10	10	10	9	9	10	10	9	10	9	9	10	10	10
Total	175	222	230	240	226	236	244	217	226	241	222	237	245	217	227	233
Other Modelled Airports																
Short Haul	40	69	79	85	72	89	104	68	76	82	72	84	99	71	80	88
Long Haul	6	17	20	23	18	22	29	18	20	23	18	22	29	14	19	22
All International	46	86	99	108	90	111	133	86	96	105	90	106	128	85	99	110
Domestic	25	26	26	27	26	27	27	26	26	27	26	27	27	26	26	26
Total	71	112	125	135	116	138	160	112	122	132	116	133	155	111	125	136
National																
Short Haul	105	131	135	138	131	137	136	131	135	143	129	137	141	130	135	138
Long Haul	61	81	85	92	85	90	101	76	81	89	83	91	101	77	82	85
All International	166	212	220	230	216	227	237	207	216	232	212	228	242	207	217	223
Domestic	26	27	27	28	27	27	27	27	27	27	27	27	27	27	27	27
Total	192	239	247	258	243	254	264	234	243	259	239	255	269	234	244	250

6.96 When carbon is traded there are national gains in the number of destinations served ranging from 7 in 2050 in *global fragmentation* to 19 in *low-cost is king*. Heathrow makes significant gains of between 30 destinations (*global fragmentation*) and 62 destinations (*low-cost is king*). London overall makes significant gains (so routes are not lost at Gatwick, Stansted, Luton and City). Scenarios *relative decline of Europe* and *low-cost is king* see Heathrow gain significantly more short-haul than long-haul destinations.

Table 6.30: Option Heathrow Airport Extended Northern Runway, destinations served with daily scheduled services, carbon capped

LHR ENR		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon capped	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
LHR																
Short Haul	75	85	87	83	84	87	79	91	101	99	91	98	95	85	87	81
Long Haul	57	65	71	72	67	72	74	60	59	65	67	69	69	67	70	72
All International	132	150	158	155	151	159	153	151	160	164	158	167	164	152	157	153
Domestic	7	4	4	4	4	4	4	5	4	3	4	4	3	4	4	3
Total	139	154	162	159	155	163	157	156	164	167	162	171	167	156	161	156
London																
Short Haul	104	129	130	138	127	128	133	128	132	139	128	130	136	129	130	139
Long Haul	61	76	84	88	78	86	90	76	77	85	79	84	89	78	82	86
All International	165	205	214	226	205	214	223	204	209	224	207	214	225	207	212	225
Domestic	10	9	10	10	10	10	10	9	10	10	10	10	10	10	10	10
Total	175	214	224	236	215	224	233	213	219	234	217	224	235	217	222	235
Other Modelled Airports																
Short Haul	40	64	71	77	56	61	67	61	63	74	58	61	67	65	73	77
Long Haul	6	15	18	21	15	18	21	15	17	21	16	18	21	14	17	20
All International	46	79	89	98	71	79	88	76	80	95	74	79	88	79	90	97
Domestic	25	26	26	26	26	26	26	26	26	26	26	26	27	26	26	26
Total	71	105	115	124	97	105	114	102	106	121	100	105	115	105	116	123
National																
Short Haul	105	129	130	138	127	128	133	128	132	139	128	130	136	130	131	139
Long Haul	61	76	84	88	78	86	90	76	77	85	79	84	89	78	82	86
All International	166	205	214	226	205	214	223	204	209	224	207	214	225	208	213	225
Domestic	26	26	27	27	27	27	27	26	27	27	27	27	28	27	27	27
Total	192	231	241	253	232	241	250	230	236	251	234	241	253	235	240	252

6.97 When carbon is capped, there are still significant gains to the national total of destinations served ranging from 8 in 2050 in *global fragmentation* to 14 in *low-cost is king*. There is a similar pattern to the carbon-traded case, although with lower numbers of destinations. London, and Heathrow in particular, gain most destinations and destinations are lost at regional airports which are less able to offer daily frequencies than Heathrow.

Destinations served: all services

6.98 The analysis presented below in **Table 6.31** through to **Table 6.36** differs from the sequence of tables above by not applying any service frequency threshold. But, as these are modelled destinations, all routes must still pass a viability threshold. These figures also differ from those above by including charter routes, again subject to viability thresholds. As discussed earlier in paragraph 6.90, it should be noted that the routes totals within the separate tables are not additive.

Table 6.31: Option Gatwick Airport Second Runway, destinations served by all services, carbon-traded

LGW 2R		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon-traded	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
LGW																
Short Haul	158	181	192	210	189	200	205	137	139	155	145	139	134	138	147	158
Long Haul	49	47	44	46	56	68	68	58	62	62	114	112	112	41	42	44
All International	207	228	236	256	245	268	273	195	201	217	259	251	246	179	189	202
Domestic	9	8	8	8	8	8	8	7	7	7	10	9	8	8	8	8
Total	216	236	244	264	253	276	281	202	208	224	269	260	254	187	197	210
London																
Short Haul	215	227	229	233	228	233	230	226	229	233	227	227	226	225	228	234
Long Haul	107	123	129	131	127	132	129	121	129	131	130	133	135	120	128	130
All International	322	350	358	364	355	365	359	347	358	364	357	360	361	345	356	364
Domestic	10	9	10	10	9	9	9	10	9	9	10	10	9	9	10	10
Total	332	359	368	374	364	374	368	357	367	373	367	370	370	354	366	374
Other Modelled Airports																
Short Haul	179	223	228	227	222	228	237	223	226	232	228	232	240	222	227	228
Long Haul	42	66	83	98	75	97	114	59	67	74	61	73	100	77	91	102
All International	221	289	311	325	297	325	351	282	293	306	289	305	340	299	318	330
Domestic	28	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Total	249	318	340	354	326	354	380	311	322	335	318	334	369	328	347	359
National																
Short Haul	226	238	241	245	240	243	244	242	243	246	242	244	246	236	239	242
Long Haul	107	123	129	131	127	132	130	121	129	131	130	133	135	120	129	130
All International	333	361	370	376	367	375	374	363	372	377	372	377	381	356	368	372
Domestic	28	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Total	361	390	399	405	396	404	403	392	401	406	401	406	410	385	397	401

6.99 With Gatwick Airport Second Runway, under traded carbon, the overall number of destinations served from the airport in 2050 would rise with expansion, reaching between 210 and 280 depending on the forecast scenario. This compares to 200 or fewer in 2050 without expansion. In *global growth* and *low-cost is king* Gatwick gains large numbers of long-haul routes.

Table 6.32: Option Gatwick Airport Second Runway, destinations served by all services, carbon capped

LGW 2R		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon capped	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
LGW																
Short Haul	158	177	188	205	172	172	180	133	135	140	135	141	137	137	145	154
Long Haul	49	41	44	45	51	44	45	56	54	55	99	102	103	40	41	44
All International	207	218	232	250	223	216	225	189	189	195	234	243	240	177	186	198
Domestic	9	7	8	8	8	8	8	7	9	8	9	8	8	10	8	8
Total	216	225	240	258	231	224	233	196	198	203	243	251	248	187	194	206
London																
Short Haul	215	226	228	229	224	226	227	224	227	229	220	222	226	224	227	233
Long Haul	107	123	129	130	121	129	131	119	126	129	123	130	133	121	125	130
All International	322	349	357	359	345	355	358	343	353	358	343	352	359	345	352	363
Domestic	10	9	10	10	9	10	10	10	10	10	9	9	9	10	10	10
Total	332	358	367	369	354	365	368	353	363	368	352	361	368	355	362	373
Other Modelled Airports																
Short Haul	179	218	224	228	213	222	225	222	222	224	216	214	219	220	226	229
Long Haul	42	64	77	91	61	73	93	58	60	70	57	55	66	75	88	96
All International	221	282	301	319	274	295	318	280	282	294	273	269	285	295	314	325
Domestic	28	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Total	249	311	330	348	303	324	347	309	311	323	302	298	314	324	343	354
National																
Short Haul	226	238	239	241	237	238	239	240	243	243	238	240	243	235	239	241
Long Haul	107	123	129	130	121	129	131	119	126	129	123	130	133	121	127	130
All International	333	361	368	371	358	367	370	359	369	372	361	370	376	356	366	371
Domestic	28	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Total	361	390	397	400	387	396	399	388	398	401	390	399	405	385	395	400

6.100 In Gatwick Airport Second Runway with capped carbon the national gain in departures is smaller than under traded carbon and by 2050 in scenarios *global growth* and *global fragmentation* there is little gain in national destinations. This is because Gatwick and London airports gain more destinations as regional airports lose out compared to the 'do minimum' where they pick up additional traffic when the London system is constrained. The loss of destinations in the regions is noticeably higher in *low-cost is king* later in the period.

Table 6.33: Option Heathrow Airport North West Runway, destinations served by all services, carbon-traded

LHR NWR		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon-traded	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
LHR																
Short Haul	80	98	99	86	99	92	79	128	131	125	129	126	119	91	101	100
Long Haul	92	94	98	99	97	100	100	89	88	91	97	99	93	91	95	97
All International	172	192	197	185	196	192	179	217	219	216	226	225	212	182	196	197
Domestic	7	4	4	4	4	4	4	5	4	4	4	4	4	4	4	4
Total	179	196	201	189	200	196	183	222	223	220	230	229	216	186	200	201
London																
Short Haul	215	225	226	231	224	226	225	223	226	228	225	226	229	225	228	231
Long Haul	107	124	130	133	126	133	134	122	128	131	126	133	134	123	127	131
All International	322	349	356	364	350	359	359	345	354	359	351	359	363	348	355	362
Domestic	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Total	332	359	366	374	360	369	369	355	364	369	361	369	373	358	365	372
Other Modelled Airports																
Short Haul	179	222	228	225	221	224	237	220	223	229	221	225	239	221	228	226
Long Haul	42	68	81	92	76	96	102	58	63	74	76	97	101	74	85	94
All International	221	290	309	317	297	320	339	278	286	303	297	322	340	295	313	320
Domestic	28	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Total	249	319	338	346	326	349	368	307	315	332	326	351	369	324	342	349
National																
Short Haul	226	236	240	243	236	242	244	236	240	243	237	242	244	236	240	242
Long Haul	107	124	130	133	126	133	134	122	128	131	126	133	134	123	129	131
All International	333	360	370	376	362	375	378	358	368	374	363	375	378	359	369	373
Domestic	28	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Total	361	389	399	405	391	404	407	387	397	403	392	404	407	388	398	402

6.101 With Heathrow Airport North West Runway under traded carbon, there are modest gains in the number of destinations served. This is because as capacity is reached a similar pattern emerges to recent years at the airport, where there is a focus on more popular routes and destinations served decline.

Table 6.34: Option Heathrow Airport North West Runway, destinations served by all services, carbon capped

LHR NWR		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon capped	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
LHR																
Short Haul	80	96	102	96	96	101	96	126	135	155	118	129	126	97	101	97
Long Haul	92	92	97	98	95	97	99	89	88	89	95	97	96	92	97	98
All International	172	188	199	194	191	198	195	215	223	244	213	226	222	189	198	195
Domestic	7	4	4	4	4	4	4	5	4	4	4	4	4	4	4	4
Total	179	192	203	198	195	202	199	220	227	248	217	230	226	193	202	199
London																
Short Haul	215	223	222	226	220	221	221	222	222	227	220	222	223	224	221	227
Long Haul	107	123	126	130	126	126	132	122	127	130	126	127	131	123	126	130
All International	322	346	348	356	346	347	353	344	349	357	346	349	354	347	347	357
Domestic	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Total	332	356	358	366	356	357	363	354	359	367	356	359	364	357	357	367
Other Modelled Airports																
Short Haul	179	214	223	220	210	213	214	215	215	214	209	214	218	215	225	228
Long Haul	42	59	70	86	59	61	82	54	60	72	59	63	83	69	76	85
All International	221	273	293	306	269	274	296	269	275	286	268	277	301	284	301	313
Domestic	28	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Total	249	302	322	335	298	303	325	298	304	315	297	306	330	313	330	342
National																
Short Haul	226	236	236	238	234	236	235	235	235	238	234	235	236	236	235	240
Long Haul	107	123	126	130	126	126	132	122	127	130	126	127	131	123	126	131
All International	333	359	362	368	360	362	367	357	362	368	360	362	367	359	361	371
Domestic	28	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Total	361	388	391	397	389	391	396	386	391	397	389	391	396	388	390	400

6.102 With Heathrow Airport North West Runway under capped carbon, Heathrow gains destinations particularly in the *relative decline of Europe* and *low-cost is king* scenarios, due to a substantial diversification of the airport's short-haul route network. Across all but one scenarios the number of destinations served from Heathrow is higher in the carbon capped than carbon-traded forecasts. This reflects the fact that lower levels of demand at Heathrow in these scenarios do not drive the same level of concentration on the thickest routes.

Table 6.35: Option Heathrow Airport Extended Northern Runway, destinations served by all services, carbon-traded

LHR ENR		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon-traded	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
LHR																
Short Haul	80	98	95	81	98	85	77	128	129	126	124	124	120	91	99	88
Long Haul	92	94	97	98	97	100	93	89	88	91	96	98	93	91	95	96
All International	172	192	192	179	195	185	170	217	217	217	220	222	213	182	194	184
Domestic	7	4	4	4	4	4	4	5	4	4	4	4	4	4	4	4
Total	179	196	196	183	199	189	174	222	221	221	224	226	217	186	198	188
London																
Short Haul	215	225	226	230	225	225	223	224	228	227	226	226	227	225	229	232
Long Haul	107	124	129	133	126	133	134	122	128	131	126	133	134	123	127	131
All International	322	349	355	363	351	358	357	346	356	358	352	359	361	348	356	363
Domestic	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Total	332	359	365	373	361	368	367	356	366	368	362	369	371	358	366	373
Other Modelled Airports																
Short Haul	179	222	228	225	221	226	238	221	220	231	222	228	237	221	228	227
Long Haul	42	68	81	97	76	97	103	58	64	72	76	98	103	74	85	95
All International	221	290	309	322	297	323	341	279	284	303	298	326	340	295	313	322
Domestic	28	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Total	249	319	338	351	326	352	370	308	313	332	327	355	369	324	342	351
National																
Short Haul	226	236	240	243	237	242	245	236	241	243	239	242	244	236	241	243
Long Haul	107	124	129	133	126	133	134	122	128	131	126	133	134	123	129	131
All International	333	360	369	376	363	375	379	358	369	374	365	375	378	359	370	374
Domestic	28	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Total	361	389	398	405	392	404	408	387	398	403	394	404	407	388	399	403

6.103 With Heathrow Airport Extended Northern Runway under traded carbon, there are modest gains in the number of destinations served. This is because as the new capacity becomes full a similar pattern emerges to recent years at the airport, where there is a focus on serving more popular routes and the total destinations served declines.

Table 6.36: Option Heathrow Airport Extended Northern Runway, destinations served by all services, carbon capped

LHR ENR		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon capped	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
LHR																
Short Haul	80	96	97	92	93	96	87	126	129	127	122	127	123	97	100	86
Long Haul	92	92	97	97	95	97	97	89	88	89	94	96	91	92	97	98
All International	172	188	194	189	188	193	184	215	217	216	216	223	214	189	197	184
Domestic	7	4	4	4	4	4	4	5	4	4	4	4	3	4	4	4
Total	179	192	198	193	192	197	188	220	221	220	220	227	217	193	201	188
London																
Short Haul	215	224	222	228	220	220	221	222	222	226	221	223	225	225	222	230
Long Haul	107	123	126	130	126	127	131	122	128	130	126	129	131	123	126	130
All International	322	347	348	358	346	347	352	344	350	356	347	352	356	348	348	360
Domestic	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Total	332	357	358	368	356	357	362	354	360	366	357	362	366	358	358	370
Other Modelled Airports																
Short Haul	179	215	225	221	210	215	217	216	216	221	209	219	214	215	224	228
Long Haul	42	60	74	86	59	62	83	54	60	72	59	68	84	69	77	86
All International	221	275	299	307	269	277	300	270	276	293	268	287	298	284	301	314
Domestic	28	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Total	249	304	328	336	298	306	329	299	305	322	297	316	327	313	330	343
National																
Short Haul	226	236	236	242	234	235	235	235	235	238	234	237	239	237	236	242
Long Haul	107	123	126	130	126	127	131	122	128	130	126	129	131	123	126	131
All International	333	359	362	372	360	362	366	357	363	368	360	366	370	360	362	373
Domestic	28	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
Total	361	388	391	401	389	391	395	386	392	397	389	395	399	389	391	402

6.104 With Heathrow Extended Northern Runway under carbon capped Heathrow gains destinations. It is noticeable that in the 'assessment of need' and 'global growth' scenarios the number of destinations served from Heathrow in 2050 is higher in the carbon capped than in the carbon-traded scenarios. This reflects the fact that the lower levels of demand at Heathrow in these scenarios do not drive the same degree of concentration on the thickest routes.

Air transport movements (ATMs) and CO_2 emissions by option

6.105 The sequence of tables following show modelled air transport movements (ATMs).[63] ATMs are two way, comprising departing and arriving passenger air transport movements. If an airport has incurred a runway shadow cost then its input runway capacity is shown.[64] This is the runway usage data on which the capacity timelines shown earlier are based.

63 Tables exclude freight and some miscellaneous movements such as positional flights, diplomatic flights, domestic charters and domestic flights from modelled UK airports to non-modelled UK airports

64 In the model to reach an equilibrium solution at overloaded airports with shadow costs a tolerance of +/- 1.5% may be applied at the larger airports (with an absolute tolerance for smaller airports). In these tables and the timelines a runway shadow cost indicates the airport has reached capacity and the input capacity is reported.

6.106 The CO_2 emissions summary is UK departing CO_2 as measured in the emissions inventory.[65] In the carbon capped cases the target is for these emissions to be no higher than 37.5Mt CO_2 in 2050. Because fuel efficiency improves as new aircraft types enter the fleet during the period 2030-2050 at a faster rate than constrained demand can grow, the capped CO_2 forecasts prior to 2050 will often exceed the target.

6.107 All 2011 ATM data shown in the tables is from the base year validated model outputs.

Table 6.37: Gatwick Airport Second Runway ATM forecasts (thousands), carbon-traded

Carbon-traded		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
LGW 2R	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	480	480	480	473	478	472	480	480	480	474	480	479	471	480	480	478
Gatwick	247	341	422	559	390	560	559	336	412	547	481	560	557	270	349	452
Stansted	143	207	206	203	223	210	207	196	210	204	214	216	215	223	204	199
Luton	79	92	114	119	100	120	118	106	124	129	127	138	153	95	119	120
London City	57	114	116	119	118	120	120	117	119	120	120	115	115	100	120	120
London	1,006	1,234	1,338	1,472	1,309	1,482	1,484	1,236	1,344	1,475	1,421	1,507	1,510	1,169	1,272	1,370
Manchester	161	217	255	309	228	282	312	216	244	301	237	302	316	219	259	310
Birmingham	86	116	152	179	129	181	201	117	151	189	122	188	206	119	150	186
Glasgow	67	76	74	85	83	88	112	77	76	91	86	87	110	73	71	78
Edinburgh	96	135	153	174	136	159	160	136	155	159	138	164	165	129	144	169
Bristol	54	67	73	93	72	88	108	83	92	100	80	102	113	60	70	88
Newcastle	45	60	66	76	62	73	85	62	69	79	75	86	106	55	61	71
Belfast International	43	59	66	69	63	73	78	59	67	74	62	73	78	57	64	73
Liverpool	45	58	62	56	61	68	112	63	78	77	66	74	98	53	58	57
East Midlands	50	75	82	92	77	89	119	81	88	100	83	110	128	69	76	93
Other modelled UK	333	486	581	667	511	636	848	510	602	691	551	732	950	916	1,199	1,286
Non-London annual growth rate			1.5%	1.4%		2.0%	2.1%		1.5%	1.4%		2.5%	1.7%		2.1%	1.1%
UK Total	**1,985**	**2,583**	**2,902**	**3,273**	**2,730**	**3,218**	**3,620**	**2,639**	**2,966**	**3,338**	**2,920**	**3,424**	**3,780**	**2,920**	**3,424**	**3,780**
Paris CDG	420	521	595	690	562	690	690	515	583	675	557	690	690	500	573	655
Amsterdam	322	401	458	556	440	602	750	468	597	719	435	595	750	380	436	499
Frankfurt	403	524	638	700	615	700	696	460	498	590	605	700	700	441	509	622
Dubai	237	445	535	661	515	695	1,077	506	641	820	512	693	1,057	409	487	592
Foreign Hubs Total	**1,382**	**1,891**	**2,226**	**2,607**	**2,133**	**2,686**	**3,213**	**1,948**	**2,320**	**2,805**	**2,110**	**2,678**	**3,196**	**1,731**	**2,004**	**2,368**

65 See www.naei.org.uk/. In the NAEI, UK domestic aviation CO_2 emissions are reported in the UK total and international aviation emissions are reported as a memo item.

Table 6.38: Gatwick Airport Second Runway ATM forecasts (thousands), carbon capped																
Carbon capped		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
LGW 2R	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	480	480	480	466	480	480	473	480	480	480	480	480	480	480	480	480
Gatwick	247	319	380	476	303	336	412	294	339	412	364	529	560	264	330	420
Stansted	143	198	206	204	187	196	199	167	181	203	157	161	174	223	200	197
Luton	79	88	100	116	80	82	95	98	115	129	83	81	96	90	113	120
London City	57	102	116	120	90	120	120	120	120	120	120	120	120	100	120	120
London	1,006	1,187	1,282	1,382	1,140	1,215	1,299	1,159	1,235	1,344	1,205	1,371	1,430	1,158	1,244	1,337
Manchester	161	210	240	276	197	218	247	204	217	258	196	227	251	217	249	300
Birmingham	86	110	133	168	95	113	126	105	119	147	88	94	111	113	140	171
Glasgow	67	73	72	78	73	68	76	70	68	76	75	75	81	71	68	74
Edinburgh	96	131	145	165	119	131	154	126	141	164	116	127	149	127	141	163
Bristol	54	62	69	87	57	58	68	74	79	91	62	62	72	58	68	84
Newcastle	45	57	62	69	52	56	61	57	61	66	59	67	73	54	58	67
Belfast International	43	57	63	72	53	57	62	55	62	73	49	53	63	56	62	70
Liverpool	45	55	57	56	42	52	51	53	71	69	47	46	47	51	56	52
East Midlands	50	74	78	80	67	72	76	79	83	85	74	77	81	69	77	90
Other modelled UK	333	459	536	642	435	501	616	490	573	660	448	489	585	445	528	535
Non-London annual growth rate			1.2%	1.5%		1.1%	1.5%		1.2%	1.4%		0.8%	1.4%		1.4%	1.1%
UK Total	**1,985**	**2,474**	**2,737**	**3,075**	**2,330**	**2,541**	**2,835**	**2,471**	**2,710**	**3,032**	**2,419**	**2,689**	**2,944**	**2,419**	**2,689**	**2,944**
Paris CDG	420	503	563	630	487	548	624	476	521	591	468	517	580	499	571	653
Amsterdam	322	385	429	481	371	415	473	410	483	565	354	386	429	379	433	498
Frankfurt	403	494	587	700	492	611	700	392	406	467	457	553	655	436	497	602
Dubai	237	428	506	610	444	555	705	449	550	703	429	531	669	407	484	588
Foreign Hubs Total	**1,382**	**1,810**	**2,085**	**2,422**	**1,795**	**2,129**	**2,501**	**1,728**	**1,960**	**2,325**	**1,708**	**1,987**	**2,334**	**1,721**	**1,985**	**2,340**

6.108 In the Gatwick Airport Second Runway option with traded carbon Gatwick ATMs rise significantly above their current levels doubling to near its new full capacity of 560,000 between 2030 and 2040 in *global growth* and *low-cost is king*. The new runway is nearly fully utilised by 2050 in *assessment of need* and *relative decline of Europe*. Gatwick does not reach capacity in *global fragmentation*. Heathrow remains at capacity throughout and the other London airports are at full capacity by 2050. Regional airport ATMs vary from 1.8m ATMs by 2050 in *assessment of need* to 2.4m ATMs in *global fragmentation*.

6.109 With carbon capped the expanded Gatwick only uses all its new ATM capacity in *low-cost is king*. Heathrow remains at capacity throughout and London City operates at full capacity by 2050 in all scenarios. There is considerably less variation in ATMs (1.3m to 1.5m) at the regional airports with capping.

Table 6.39: Heathrow Airport North West Runway ATM forecasts (thousands), carbon-traded																
Carbon-traded		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
LHR NWR	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	482	684	740	740	723	740	738	719	740	740	740	740	740	625	716	740
Gatwick	247	269	276	280	277	280	267	262	277	280	271	280	259	270	273	280
Stansted	143	202	203	205	218	205	201	173	186	205	199	211	215	181	202	207
Luton	79	84	96	118	88	119	120	79	86	120	85	117	121	84	88	117
London City	57	85	120	120	92	120	120	86	120	120	95	120	120	96	120	120
London	1,008	1,324	1,435	1,463	1,398	1,463	1,445	1,320	1,409	1,465	1,391	1,469	1,455	1,256	1,399	1,464
Manchester	161	216	254	312	228	287	318	216	239	291	229	286	319	210	245	301
Birmingham	86	106	130	179	117	171	206	103	130	154	115	172	203	104	127	160
Glasgow	67	70	68	82	77	82	114	71	69	84	76	86	114	66	67	78
Edinburgh	96	138	164	191	145	158	161	135	163	190	145	166	159	138	160	184
Bristol	54	64	76	95	68	88	104	68	80	93	66	86	107	60	68	85
Newcastle	45	58	62	69	60	67	88	58	65	72	60	67	86	55	61	68
Belfast International	43	58	66	76	62	72	78	59	66	75	62	72	77	57	64	72
Liverpool	45	57	62	59	60	68	103	57	72	75	61	69	99	57	61	59
East Midlands	50	75	85	97	77	91	126	74	79	92	75	86	126	74	81	93
Other modelled UK	331	473	571	695	499	661	883	479	579	733	503	652	860	706	878	1,041
Non-London annual growth rate			1.6%	1.9%		2.3%	2.2%		1.6%	1.9%		2.3%	2.1%		1.7%	1.7%
UK Total	**1,985**	**2,640**	**2,973**	**3,318**	**2,791**	**3,211**	**3,626**	**2,639**	**2,951**	**3,323**	**2,784**	**3,211**	**3,605**	**2,784**	**3,211**	**3,605**
Paris CDG	420	513	587	686	552	690	690	508	578	673	555	690	690	493	561	649
Amsterdam	322	392	448	527	428	566	750	441	567	697	430	578	750	373	423	489
Frankfurt	403	473	570	700	565	700	700	437	485	586	573	700	700	419	466	569
Dubai	237	438	529	652	506	683	1,032	499	637	819	508	688	1,032	405	481	588
Foreign Hubs Total	**1,382**	**1,816**	**2,134**	**2,566**	**2,051**	**2,639**	**3,172**	**1,885**	**2,267**	**2,776**	**2,066**	**2,655**	**3,172**	**1,689**	**1,931**	**2,295**

Table 6.40: Heathrow Airport North West Runway ATM forecasts (thousands), carbon capped																
Carbon capped		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
LHR NWR	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	482	652	740	740	648	737	740	679	740	740	689	740	740	662	739	740
Gatwick	247	238	235	260	209	204	220	229	219	242	200	194	217	239	237	254
Stansted	143	169	181	195	166	163	172	155	151	159	153	138	155	171	187	199
Luton	79	71	67	76	63	55	69	70	74	86	63	70	82	71	63	74
London City	57	81	96	120	60	82	106	82	104	120	62	92	118	82	104	120
London	1,008	1,211	1,319	1,390	1,145	1,240	1,306	1,215	1,288	1,348	1,168	1,233	1,313	1,225	1,330	1,387
Manchester	161	202	219	250	185	198	232	198	210	246	188	202	236	201	218	255
Birmingham	86	90	91	113	75	76	93	88	87	110	76	79	104	92	106	123
Glasgow	67	67	61	67	63	59	65	68	65	76	63	61	67	60	58	64
Edinburgh	96	124	146	169	116	135	160	116	130	147	119	138	164	124	143	161
Bristol	54	56	58	70	49	51	58	60	64	74	51	50	56	54	55	64
Newcastle	45	53	53	59	48	48	53	53	56	62	49	49	55	50	52	56
Belfast International	43	53	57	65	49	52	60	53	58	72	50	54	62	52	55	61
Liverpool	45	43	53	48	39	42	35	51	62	56	40	44	39	44	53	43
East Midlands	50	70	74	77	64	67	70	69	74	80	64	67	70	70	70	73
Other modelled UK	331	422	493	582	405	443	536	435	511	616	408	464	540	302	303	417
Non-London annual growth rate			1.0%	1.4%		0.7%	1.5%		1.0%	1.6%		0.9%	1.4%		0.6%	1.7%
UK Total	**1,985**	**2,391**	**2,623**	**2,890**	**2,239**	**2,411**	**2,668**	**2,406**	**2,605**	**2,887**	**2,275**	**2,442**	**2,704**	**2,275**	**2,442**	**2,704**
Paris CDG	420	469	514	573	451	501	564	468	512	577	458	513	574	475	523	575
Amsterdam	322	354	385	427	339	372	413	399	476	576	345	382	423	360	395	434
Frankfurt	403	418	454	550	412	464	577	394	409	475	421	496	618	451	529	670
Dubai	237	400	467	563	417	517	653	459	570	724	421	527	662	414	487	576
Foreign Hubs Total	**1,382**	**1,642**	**1,821**	**2,112**	**1,620**	**1,854**	**2,206**	**1,720**	**1,968**	**2,352**	**1,646**	**1,918**	**2,277**	**1,700**	**1,934**	**2,256**

6.110 In the Heathrow Airport North West Runway option with traded carbon Heathrow is at full 3 runway capacity (around 740 thousand ATMs) before 2040 in all scenarios except under *global fragmentation* where it reaches capacity in 2041. The timelines of ATM capacity usage (**Figure 6.3**) show that Gatwick on its single runway is over 90% for the whole period and reaches full capacity (incurs shadow costs) before 2050 in all scenarios. The other London airports all reach capacity at some point by 2050 in each scenario. Regional airports have least ATMs by 2050 in *assessment of need* (1.9m) and most in *global growth* (2.2m) where there is still some London spill in evidence.

6.111 In the carbon capped case, Heathrow uses the full 740,000 ATM capacity of the three runways by 2040 in all scenarios. Elsewhere, London City is the only London airport to hit ATM capacity by 2050 (*relative decline of Europe* and *global fragmentation*). Total ATMs at the regional airports are in the relatively narrow range of 1.3m-1.5m as little runway demand is spilt out of the London airports.

Table 6.41: Heathrow Airport Extended Northern Runway ATM forecasts (thousands), carbon traded

Carbon-traded		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
LHR ENR	**2011**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**
Heathrow	482	685	700	700	700	700	700	699	700	700	688	700	700	625	694	700
Gatwick	247	269	280	277	278	280	266	263	280	280	280	280	265	270	275	280
Stansted	143	202	203	202	218	210	211	169	192	204	204	212	216	181	202	203
Luton	79	84	102	119	89	118	116	80	90	119	90	116	120	84	89	117
London City	57	85	120	120	94	120	118	87	120	120	102	120	120	95	120	120
London	1,008	1,325	1,406	1,419	1,379	1,428	1,412	1,299	1,381	1,423	1,365	1,428	1,421	1,255	1,380	1,420
Manchester	161	216	256	313	228	287	313	216	240	296	230	287	315	210	246	297
Birmingham	86	104	133	192	118	180	203	102	133	166	118	181	204	104	128	168
Glasgow	67	70	68	82	77	87	114	70	70	86	77	87	113	67	67	77
Edinburgh	96	138	162	190	145	161	157	138	162	192	144	164	159	138	161	186
Bristol	54	64	75	98	68	90	107	68	79	92	67	86	108	60	68	87
Newcastle	45	58	62	70	60	67	89	58	64	73	59	67	86	55	61	68
Belfast International	43	58	66	76	62	72	78	59	67	75	62	72	77	57	64	72
Liverpool	45	57	63	57	61	69	106	57	72	77	61	68	99	57	61	58
East Midlands	50	75	84	98	77	93	128	74	79	91	75	86	125	74	81	94
Other modelled UK	331	473	579	707	502	650	859	481	586	705	503	661	865	684	871	1,045
Non-London annual growth rate			1.6%	2.0%		2.3%	2.1%		1.6%	1.8%		2.3%	2.0%		1.8%	1.8%
UK Total	**1,985**	**2,638**	**2,953**	**3,302**	**2,777**	**3,185**	**3,565**	**2,622**	**2,933**	**3,275**	**2,762**	**3,186**	**3,572**	**2,762**	**3,186**	**3,572**
Paris CDG	420	513	588	690	553	690	690	510	580	674	559	690	690	493	562	653
Amsterdam	322	392	450	536	429	577	750	445	574	704	434	594	750	373	424	493
Frankfurt	403	473	584	700	568	700	700	439	489	587	586	700	700	419	468	580
Dubai	237	438	530	656	507	688	1,040	501	636	819	511	693	1,047	404	482	590
Foreign Hubs Total	**1,382**	**1,816**	**2,153**	**2,581**	**2,057**	**2,655**	**3,180**	**1,895**	**2,279**	**2,785**	**2,089**	**2,678**	**3,187**	**1,689**	**1,935**	**2,316**

Table 6.42: Heathrow Airport Extended Northern Runway ATM forecasts (thousands) and national CO_2 emissions, carbon capped

Carbon capped		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
LHR ENR	**2011**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**
Heathrow	482	654	700	700	650	700	700	681	700	700	694	700	700	664	700	700
Gatwick	247	241	245	272	214	212	234	231	227	265	210	221	256	244	248	273
Stansted	143	171	184	202	167	165	177	155	154	171	156	144	165	172	190	200
Luton	79	75	72	81	65	61	72	70	77	91	64	76	84	73	69	87
London City	57	82	108	120	62	92	120	83	116	120	64	103	120	82	111	120
London	1,008	1,223	1,308	1,375	1,157	1,229	1,304	1,219	1,274	1,347	1,188	1,244	1,325	1,235	1,317	1,380
Manchester	161	198	221	258	188	202	237	199	212	249	192	210	244	204	223	255
Birmingham	86	95	101	121	77	80	104	88	93	113	79	86	114	94	108	133
Glasgow	67	68	62	69	62	61	67	68	66	75	63	62	69	61	60	67
Edinburgh	96	124	148	169	118	137	163	117	131	148	121	142	166	126	145	163
Bristol	54	57	59	71	51	52	61	61	65	73	52	51	57	55	58	68
Newcastle	45	53	54	60	49	49	54	53	56	62	50	50	59	51	52	58
Belfast International	43	53	58	66	50	53	62	54	59	72	51	56	64	53	56	63
Liverpool	45	51	54	47	40	43	38	51	61	57	41	43	39	44	55	48
East Midlands	50	71	75	80	64	68	71	70	74	80	65	69	73	70	73	72
Other modelled UK	331	424	500	587	409	464	544	436	507	606	417	473	555	325	340	459
Non-London annual growth rate			1.1%	1.4%		0.9%	1.5%		1.0%	1.5%		1.0%	1.5%		0.8%	1.7%
UK Total	**1,985**	**2,418**	**2,641**	**2,904**	**2,265**	**2,437**	**2,705**	**2,415**	**2,597**	**2,883**	**2,318**	**2,486**	**2,766**	**2,318**	**2,486**	**2,766**
Paris CDG	420	474	523	582	457	511	572	470	516	581	467	525	588	478	529	586
Amsterdam	322	358	393	436	344	380	421	400	486	580	352	394	436	363	402	444
Frankfurt	403	423	470	582	420	485	611	395	415	478	432	531	657	454	547	691
Dubai	237	404	475	570	421	524	661	460	573	727	428	536	675	417	492	583
Foreign Hubs Total	**1,382**	**1,660**	**1,861**	**2,170**	**1,641**	**1,900**	**2,265**	**1,726**	**1,991**	**2,366**	**1,678**	**1,986**	**2,356**	**1,711**	**1,969**	**2,303**

6.112 In the Heathrow Airport Extended Northern Runway option with traded carbon, Heathrow is at full capacity (700 thousand ATMs) before 2040 in all scenarios. The timelines of ATM capacity usage **(Figure 6.5)** show that the single runway Gatwick reaches capacity in all scenarios between 2030 and 2040. All the other London airports reach capacity at some point by 2050 in each scenario. Regional airports in 2050 have least ATMs in *relative decline of Europe* (1.9m) and most in *global growth* (2.2m) where there is still London spill in evidence.

6.113 In the carbon capped case, Heathrow uses the full 700,000 ATM capacity of the Heathrow Airport Extended Northern Runway option by 2040 in all scenarios. London City with its short-haul network reaches ATM capacity by 2050 (*relative decline of Europe* and *global fragmentation*). The other London airports have some ATM capacity, although Stansted's terminal is full by 2050. Total ATMs at the regional airports are in the narrow range of 1.4m-1.5m as little runway demand is spilt out of the London airports.

6.114 The passenger and seat-kilometres outputs in the sequence of tables below are two-way and arguably provide a more precise driver of the emissions forecasts than simple numbers of ATMs. Passenger-kilometres, seats and seat-kilometres are presented both in total for each capacity option, carbon-traded and carbon capped. The base forecasts of these outputs (as presented in **Table 5.13** and **Table 5.14** in the previous chapter) are then subtracted to show the net change attributable to each capacity option. All these forecasts are national, not airport specific totals.

Table 6.43: Gatwick Airport Second Runway passenger-km, seat and seat-km statistics, carbon-traded

LGW 2R	Option															
Carbon-traded		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
millions	Seat-Kms															
Domestic	23,453	28,250	32,484	38,724	30,137	36,189	40,009	28,005	31,395	36,548	34,905	41,497	44,770	25,888	29,418	34,223
Western Europe	280,811	404,517	474,249	542,708	426,249	527,759	610,945	418,330	488,347	558,007	450,738	551,312	626,496	399,290	472,382	544,967
OECD	221,743	270,549	290,331	322,621	290,788	331,637	363,749	239,672	243,730	278,140	298,838	332,528	379,118	252,459	258,210	276,166
NIC	259,206	382,639	472,270	595,679	433,612	583,863	753,964	408,644	527,796	705,889	451,347	602,545	788,717	359,891	438,051	547,643
LDC	25,823	42,051	50,478	61,324	50,629	70,185	91,012	41,269	48,821	61,624	51,589	70,872	91,558	38,111	43,919	51,216
All Long Haul	**506,772**	**695,239**	**813,078**	**979,624**	**775,029**	**985,684**	**1,208,725**	**689,586**	**820,347**	**1,045,652**	**801,774**	**1,005,944**	**1,259,393**	**650,462**	**740,180**	**875,026**
Total	**811,035**	**1,128,005**	**1,319,811**	**1,561,056**	**1,231,415**	**1,549,631**	**1,859,678**	**1,135,921**	**1,340,089**	**1,640,207**	**1,287,416**	**1,598,753**	**1,930,659**	**1,075,639**	**1,241,980**	**1,454,216**
millions	Passenger-Kms															
Domestic	15,638	19,867	22,460	26,759	21,209	25,417	28,372	19,784	22,126	25,743	24,583	28,935	31,575	18,206	20,161	23,293
Western Europe	222,975	334,699	393,713	448,317	352,626	437,398	504,350	341,200	399,221	455,856	366,486	447,931	511,118	331,004	393,104	453,667
OECD	174,661	231,588	248,231	275,743	248,969	283,788	302,796	205,467	209,177	238,660	258,319	288,345	329,171	216,232	221,044	236,387
NIC	187,338	292,315	360,528	454,244	331,209	444,764	574,948	310,144	399,399	532,677	341,982	451,769	596,531	274,821	333,211	416,093
LDC	17,983	32,489	39,120	47,818	39,204	54,531	71,538	31,732	37,496	47,373	40,472	55,089	71,672	29,480	34,116	39,957
All Long Haul	**379,982**	**556,392**	**647,880**	**777,805**	**619,383**	**783,084**	**949,283**	**547,344**	**646,073**	**818,710**	**640,773**	**795,203**	**997,375**	**520,532**	**588,371**	**692,437**
Total	**618,595**	**910,957**	**1,064,053**	**1,252,881**	**993,218**	**1,245,898**	**1,482,006**	**908,327**	**1,067,420**	**1,300,309**	**1,031,842**	**1,272,069**	**1,540,068**	**869,743**	**1,001,636**	**1,169,397**
millions	Seats															
Domestic	55	66	75	89	70	84	93	65	72	84	83	99	104	60	67	78
Western Europe	204	286	331	375	301	367	418	298	349	393	317	381	431	280	327	371
OECD	32	39	42	46	42	48	53	35	36	41	43	48	55	36	37	39
NIC	37	53	65	82	60	81	105	58	76	101	62	83	109	49	60	75
LDC	6	10	12	15	12	17	23	10	12	15	13	18	23	9	11	13
All Long Haul	**75**	**102**	**119**	**144**	**115**	**147**	**181**	**103**	**123**	**157**	**118**	**149**	**186**	**95**	**108**	**127**
Total	**333**	**454**	**525**	**607**	**486**	**597**	**692**	**466**	**545**	**634**	**517**	**629**	**721**	**435**	**502**	**576**

	Option-Base															
Carbon-traded		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
millions	Seat-Kms															
Domestic	0	761	2,299	3,564	1,569	3,307	803	937	1,504	1,147	6,338	8,615	5,430	-128	645	922
Western Europe	0	1,971	5,767	13,842	5,207	12,065	41,713	20,645	30,942	41,829	29,695	35,619	53,506	1,204	3,892	9,568
OECD	0	3,451	11,354	17,581	9,253	23,346	36,864	-4,247	5,215	7,060	17,302	24,237	50,336	2,267	5,278	11,573
NIC	0	3,251	7,950	13,373	7,649	18,422	24,744	1,745	6,432	11,149	25,384	37,104	57,611	2,734	5,467	10,209
LDC	0	449	1,482	3,058	1,144	2,908	8,319	370	2,024	3,659	2,104	3,595	8,506	175	778	1,941
All Long Haul	**0**	**7,151**	**20,785**	**34,013**	**18,046**	**44,676**	**69,927**	**-2,132**	**13,671**	**21,867**	**44,790**	**64,936**	**116,453**	**5,177**	**11,523**	**23,724**
Total	**0**	**9,883**	**28,851**	**51,401**	**24,822**	**60,048**	**112,444**	**19,450**	**46,117**	**64,843**	**80,824**	**109,169**	**175,390**	**6,253**	**16,060**	**34,214**
millions	Passenger-Kms															
Domestic	0	494	1,111	1,870	964	2,127	813	882	1,254	1,080	4,338	5,646	3,975	309	567	663
Western Europe	0	1,483	5,573	11,988	3,924	13,078	31,223	11,694	18,861	28,197	17,784	23,610	35,430	848	2,894	8,240
OECD	0	3,044	9,733	15,003	8,062	20,202	34,444	-2,982	5,770	7,622	17,412	24,759	60,228	1,950	4,505	9,885
NIC	0	2,183	6,945	11,392	5,998	14,773	18,342	876	5,913	8,569	16,770	21,778	39,873	1,892	3,458	7,668
LDC	0	270	879	1,800	708	1,620	5,549	282	1,367	2,378	1,976	2,177	5,439	113	458	1,138
All Long Haul	**0**	**5,498**	**17,556**	**28,195**	**14,769**	**36,595**	**58,334**	**-1,824**	**13,050**	**18,569**	**36,158**	**48,714**	**105,540**	**3,956**	**8,421**	**18,690**
Total	**0**	**7,475**	**24,241**	**42,053**	**19,657**	**51,800**	**90,370**	**10,751**	**33,165**	**47,846**	**58,280**	**77,970**	**144,944**	**5,113**	**11,882**	**27,593**
millions	Seats															
Domestic	0	2	5	7	4	8	2	2	4	2	16	23	13	0	2	2
Western Europe	0	1	4	10	4	10	27	15	22	29	19	24	38	1	3	7
OECD	0	1	2	3	2	4	5	-1	1	1	3	4	7	0	1	2
NIC	0	0	1	1	1	3	3	0	1	2	3	4	7	0	1	1
LDC	0	0	0	1	0	1	2	0	1	1	1	1	2	0	0	0
All Long Haul	**0**	**1**	**3**	**5**	**3**	**7**	**10**	**-0**	**2**	**4**	**6**	**9**	**16**	**1**	**2**	**3**
Total	**0**	**4**	**12**	**22**	**10**	**25**	**39**	**17**	**27**	**35**	**42**	**57**	**67**	**2**	**6**	**13**

6.115 Nationally in the Gatwick Airport Second Runway option with traded carbon, seat-kilometres supplied to and from the UK increase between 6 and 80 billion in 2030 and 34 and 175 billion in 2050.The biggest increment is in *low-cost is king* in both 2030 and 2050 with the smallest in *global fragmentation* in both years. The long-haul proportion of incremental flight seat-kilometres in 2050 varies between 34% in *relative decline of Europe* and 74% in *global fragmentation*.

Table 6.44: Gatwick Airport Second Runway passenger-km, seat and seat-km statistics, carbon capped

LGW 2R		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon capped	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
millions	Seat-Kms															
Domestic	23,453	27,091	30,781	35,889	25,603	29,054	34,283	26,328	29,035	33,219	28,172	35,842	39,743	25,045	27,889	32,245
Western Europe	280,811	383,915	436,867	488,554	345,181	377,449	410,730	384,325	426,016	473,493	351,578	378,582	405,921	390,930	457,202	519,940
OECD	221,743	263,887	279,881	304,519	262,760	276,722	303,954	225,120	223,288	254,636	257,473	279,379	307,640	248,772	254,392	273,028
NIC	259,206	368,453	445,783	553,584	377,650	470,475	614,470	383,179	481,215	632,757	377,704	483,179	623,629	353,480	425,668	529,456
LDC	25,823	39,886	46,406	54,523	40,944	48,940	60,618	37,016	42,228	51,947	39,720	48,570	58,738	37,190	42,302	48,807
All Long Haul	**506,772**	**672,227**	**772,070**	**912,626**	**681,354**	**796,136**	**979,042**	**645,315**	**746,731**	**939,340**	**674,897**	**811,128**	**990,006**	**639,441**	**722,361**	**851,291**
Total	**811,035**	**1,083,233**	**1,239,718**	**1,437,069**	**1,052,138**	**1,202,639**	**1,424,055**	**1,055,968**	**1,201,783**	**1,446,051**	**1,054,647**	**1,225,553**	**1,435,670**	**1,055,416**	**1,207,453**	**1,403,476**
millions	Passenger-Kms															
Domestic	15,638	19,064	21,333	24,776	18,109	20,113	23,653	18,442	20,197	22,951	19,891	25,120	27,996	17,587	19,099	21,942
Western Europe	222,975	317,796	362,450	405,388	285,468	311,592	338,092	312,591	347,583	386,614	284,248	306,568	329,416	324,136	379,875	433,307
OECD	174,661	225,809	239,292	260,194	224,942	236,530	259,665	192,784	190,430	216,999	221,665	240,297	264,459	213,066	217,756	233,608
NIC	187,338	281,441	340,213	422,145	287,814	358,345	467,279	290,539	364,377	479,169	285,602	360,361	463,863	269,922	324,281	402,702
LDC	17,983	30,744	35,778	42,205	31,366	37,455	46,449	28,261	32,276	39,671	30,416	36,500	44,431	28,750	32,801	37,974
All Long Haul	**379,982**	**537,993**	**615,283**	**724,543**	**544,122**	**632,330**	**773,393**	**511,584**	**587,082**	**735,839**	**537,683**	**637,159**	**772,753**	**511,738**	**574,838**	**674,283**
Total	**618,595**	**874,854**	**999,066**	**1,154,707**	**847,699**	**964,035**	**1,135,138**	**842,617**	**954,862**	**1,145,405**	**841,822**	**968,846**	**1,130,165**	**853,461**	**973,811**	**1,129,532**
millions	Seats															
Domestic	55	63	71	82	60	67	79	61	68	76	67	87	95	58	64	73
Western Europe	204	272	308	341	248	271	293	275	307	338	253	272	291	274	317	356
OECD	32	38	40	44	38	40	44	33	33	37	37	40	45	36	36	39
NIC	37	51	62	76	52	65	85	54	69	90	52	67	86	49	58	73
LDC	6	10	11	14	10	12	15	9	10	13	10	12	14	9	10	12
All Long Haul	**75**	**99**	**113**	**134**	**100**	**117**	**144**	**96**	**112**	**140**	**99**	**119**	**145**	**93**	**105**	**124**
Total	**333**	**433**	**492**	**557**	**408**	**455**	**515**	**433**	**487**	**554**	**419**	**478**	**530**	**426**	**486**	**553**

	Difference from 'do minimum'															
LGW 2R		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon capped	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
millions	Seat-Kms															
Domestic	0	311	1,586	2,458	-92	184	1,240	250	1,000	736	2,472	6,910	7,157	-682	-504	-541
Western Europe	0	-2,187	-2,147	-523	-6,467	-8,371	-6,705	16,483	19,095	26,921	-172	-7,607	-11,716	-4,084	-7,130	-9,042
OECD	0	1,553	7,308	9,211	867	1,955	5,173	-6,541	-699	1,489	-4,465	4,401	10,016	603	1,920	8,147
NIC	0	-146	2,093	2,638	-1,048	-4,667	-3,807	-1,306	631	-3,877	-1,066	8,025	6,416	-930	-3,759	-3,660
LDC	0	17	559	978	-488	-790	-558	-349	262	383	-1,724	-1,236	-2,331	-391	-437	33
All Long Haul	**0**	**1,423**	**9,960**	**12,826**	**-669**	**-3,502**	**807**	**-8,196**	**194**	**-2,006**	**-7,256**	**11,190**	**14,101**	**-718**	**-2,276**	**4,520**
Total	**0**	**-453**	**9,398**	**14,762**	**-7,228**	**-11,688**	**-4,657**	**8,537**	**20,289**	**25,651**	**-4,956**	**10,494**	**9,542**	**-5,485**	**-9,910**	**-5,062**
millions	Passenger-Kms															
Domestic	0	149	789	1,203	-24	-1	562	263	926	542	1,754	4,945	5,147	-127	-214	-318
Western Europe	0	-1,714	-1,220	622	-5,136	-7,523	-6,889	7,905	9,085	15,280	-6,441	-12,662	-15,379	-3,555	-6,727	-7,306
OECD	0	1,341	6,268	7,800	876	1,688	4,362	-5,195	-539	1,268	-2,440	5,296	10,192	516	1,619	6,866
NIC	0	-308	1,930	3,594	-1,129	-3,504	-1,782	-1,378	925	-753	-3,397	-1,415	-4,733	-861	-3,079	-2,414
LDC	0	-61	198	234	-465	-768	-974	-274	106	73	-1,424	-1,771	-2,934	-343	-507	-378
All Long Haul	**0**	**972**	**8,396**	**11,629**	**-718**	**-2,584**	**1,605**	**-6,847**	**492**	**588**	**-7,261**	**2,110**	**2,525**	**-688**	**-1,968**	**4,074**
Total	**0**	**-592**	**7,965**	**13,454**	**-5,878**	**-10,108**	**-4,722**	**1,320**	**10,504**	**16,411**	**-11,948**	**-5,607**	**-7,708**	**-4,370**	**-8,908**	**-3,551**
millions	Seats															
Domestic	0	0	4	5	0	1	3	1	3	2	7	20	20	-1	-1	-1
Western Europe	0	-1	-1	1	-4	-5	-3	11	12	18	1	-4	-5	-2	-4	-5
OECD	0	0	1	1	0	0	1	-1	0	0	0	1	2	0	0	1
NIC	0	0	0	0	0	-1	-1	0	0	-1	0	1	0	0	-1	-1
LDC	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	0	0
All Long Haul	**0**	**0**	**1**	**1**	**0**	**-1**	**0**	**-1**	**0**	**0**	**-1**	**1**	**2**	**0**	**0**	**1**
Total	**0**	**-1**	**4**	**8**	**-4**	**-5**	**-1**	**11**	**15**	**19**	**7**	**17**	**16**	**-4**	**-5**	**-6**

6.116 In the Gatwick Airport Second Runway option with capped carbon, the incremental seat-kilometres supplied to and from the UK change little, as carbon emissions are closely correlated with seat-kilometres. There are gains in the long haul seat-kilometres in 2050 ranging from under a billion in *global growth* to 14 billion in *low-cost is king*. This effect can be seen most strongly in the *low-cost is king* scenario, in which domestic and long-haul connectivity expand significantly, but are balanced by a lower level of growth in the short-haul market. The key exception is the *relative decline of Europe* scenario, in which the UK's attractiveness as a long-haul destination is reduced, enabling significantly higher growth in short-haul.

Table 6.45: Heathrow Airport North West Runway passenger-km, seat and seat-km statistics, carbon-traded

LHR NWR		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon-traded	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
millions	Seat-Kms															
Domestic	23,453	28,983	33,126	38,137	30,561	35,171	40,724	29,010	31,579	36,712	30,348	34,670	40,033	26,643	29,555	34,059
Western Europe	280,811	416,857	489,962	547,146	440,402	533,607	608,050	412,024	478,055	534,279	438,526	531,779	608,052	407,032	486,855	556,323
OECD	221,743	312,130	349,124	366,123	341,917	375,323	415,418	283,103	283,286	304,648	334,673	363,839	408,869	275,370	298,720	322,327
NIC	259,206	405,419	499,672	611,062	459,131	596,076	780,748	423,853	536,523	705,230	453,715	590,055	779,749	372,436	458,041	565,988
LDC	25,823	47,904	57,980	64,668	57,515	74,453	94,678	44,629	50,258	61,796	56,950	73,035	90,474	41,415	49,517	56,319
All Long Haul	**506,772**	**765,453**	**906,777**	**1,041,853**	**858,563**	**1,045,851**	**1,290,844**	**751,585**	**870,067**	**1,071,674**	**845,339**	**1,026,928**	**1,279,091**	**689,221**	**806,278**	**944,634**
Total	**811,035**	**1,211,294**	**1,429,864**	**1,627,136**	**1,329,526**	**1,614,630**	**1,939,618**	**1,192,620**	**1,379,701**	**1,642,665**	**1,314,213**	**1,593,377**	**1,927,176**	**1,122,896**	**1,322,688**	**1,535,015**
millions	Passenger-Kms															
Domestic	15,638	20,486	22,807	26,190	21,617	24,426	28,366	20,258	21,620	25,088	21,426	24,465	28,362	18,441	20,227	23,261
Western Europe	222,975	343,497	404,501	453,671	362,720	440,892	502,665	338,608	393,574	442,542	360,475	438,756	501,999	336,430	402,783	461,186
OECD	174,661	267,234	298,787	313,183	292,733	321,069	355,304	242,067	241,861	259,834	286,517	311,206	349,687	235,897	255,806	275,961
NIC	187,338	309,514	380,649	464,304	350,910	453,954	594,297	322,041	406,378	533,932	346,788	449,662	593,225	284,483	349,405	430,707
LDC	17,983	35,752	43,119	48,990	42,966	56,501	72,677	33,734	38,440	47,455	42,587	55,874	71,274	31,327	37,046	42,371
All Long Haul	**379,982**	**612,500**	**722,554**	**826,477**	**686,610**	**831,523**	**1,022,278**	**597,842**	**686,679**	**841,221**	**675,893**	**816,742**	**1,014,187**	**551,707**	**642,258**	**749,040**
Total	**618,595**	**976,484**	**1,149,862**	**1,306,338**	**1,070,948**	**1,296,841**	**1,553,309**	**956,709**	**1,101,873**	**1,308,851**	**1,057,794**	**1,279,964**	**1,544,548**	**906,579**	**1,065,267**	**1,233,487**
millions	Seats															
Domestic	55	68	76	86	71	80	94	69	72	83	70	79	93	62	68	77
Western Europe	204	295	343	379	311	371	418	293	340	378	309	369	418	285	337	382
OECD	32	44	50	52	49	53	59	41	41	44	48	52	58	39	43	46
NIC	37	56	69	85	63	82	108	60	76	100	63	82	108	51	63	78
LDC	6	12	14	16	14	19	24	11	12	15	14	18	22	10	12	14
All Long Haul	**75**	**112**	**133**	**153**	**126**	**154**	**191**	**112**	**130**	**159**	**124**	**152**	**189**	**101**	**118**	**137**
Total	**333**	**475**	**552**	**618**	**508**	**606**	**704**	**473**	**542**	**620**	**504**	**600**	**700**	**448**	**523**	**596**

	Difference from 'do minimum'															
LHR NWR		**Assessment of need**			**Global growth**			**Relative decline of Europe**			**Low-cost is king**			**Global fragmentation**		
Carbon-traded	**2011**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**
millions	**Seat-Kms**															
Domestic	0	1,495	2,940	2,959	1,994	2,289	1,519	1,943	1,688	1,311	1,781	1,788	693	627	782	758
Western Europe	0	14,311	21,480	18,280	19,360	17,914	38,819	14,339	20,650	18,101	17,483	16,085	35,062	8,946	18,365	20,924
OECD	0	45,032	70,147	61,083	60,382	67,032	88,534	39,183	44,771	33,568	53,138	55,548	80,087	25,178	45,788	57,734
NIC	0	26,031	35,352	28,756	33,168	30,635	51,527	16,954	15,159	10,490	27,752	24,614	48,643	15,279	25,457	28,554
LDC	0	6,302	8,984	6,403	8,030	7,176	11,985	3,730	3,461	3,831	7,465	5,759	7,421	3,479	6,376	7,044
All Long Haul	**0**	**77,365**	**114,484**	**96,241**	**101,579**	**104,843**	**152,046**	**59,867**	**63,392**	**47,890**	**88,355**	**85,920**	**136,151**	**43,936**	**77,621**	**93,332**
Total	**0**	**93,171**	**138,904**	**117,481**	**122,934**	**125,046**	**192,384**	**76,149**	**85,729**	**67,301**	**107,620**	**103,793**	**171,907**	**53,509**	**96,768**	**115,014**
millions	**Passenger-Kms**															
Domestic	0	1,114	1,458	1,300	1,372	1,137	806	1,356	748	426	1,181	1,176	761	543	634	631
Western Europe	0	10,281	16,361	17,342	14,018	16,572	29,538	9,103	13,214	14,883	11,773	14,436	26,311	6,275	12,572	15,760
OECD	0	38,690	60,288	52,443	51,826	57,483	86,952	33,618	38,454	28,795	45,610	47,620	80,744	21,616	39,267	49,458
NIC	0	19,383	27,066	21,452	25,699	23,963	37,690	12,773	12,892	9,825	21,577	19,671	36,567	11,555	19,653	22,282
LDC	0	3,533	4,877	2,973	4,470	3,589	6,688	2,284	2,310	2,460	4,091	2,962	5,041	1,960	3,388	3,552
All Long Haul	**0**	**61,607**	**92,231**	**76,867**	**81,995**	**85,034**	**131,329**	**48,674**	**53,656**	**41,080**	**71,278**	**70,253**	**122,351**	**35,131**	**62,307**	**75,293**
Total	**0**	**73,001**	**110,050**	**95,510**	**97,386**	**102,743**	**161,674**	**59,133**	**67,617**	**56,388**	**84,232**	**85,865**	**149,424**	**41,949**	**75,514**	**91,683**
millions	**Seats**															
Domestic	0	4	6	5	5	5	3	6	3	1	4	4	2	2	3	2
Western Europe	0	10	16	14	14	14	27	9	13	14	12	13	26	7	14	17
OECD	0	6	9	8	8	9	11	5	6	5	7	7	10	3	6	8
NIC	0	3	5	4	4	4	6	2	2	1	3	3	6	2	3	4
LDC	0	2	2	2	2	2	3	1	1	1	2	2	2	1	2	2
All Long Haul	**0**	**11**	**16**	**14**	**14**	**15**	**21**	**8**	**8**	**7**	**12**	**12**	**18**	**6**	**11**	**13**
Total	**0**	**25**	**39**	**33**	**33**	**34**	**51**	**24**	**25**	**22**	**28**	**28**	**45**	**15**	**28**	**33**

6.117 Nationally in the carbon-traded case, with the Heathrow Airport North West Runway option the total number of seat-kilometres supplied to and from UK ranges from 54 to 123 billion in 2030 rising to 67 to 192 billion in 2050. In both cases the highest increment to seat-kilometres provided is in *global growth*, the lowest increment to seat capacity is in *global fragmentation* in 2030 but *relative decline of Europe* has the lowest by 2050. In all demand scenarios the majority of the seat-kilometres added long-haul.

Table 6.46: Heathrow Airport North West Runway passenger-km, seat and seat-km statistics, carbon capped

LHR NWR		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon capped	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
millions	Seat-Kms															
Domestic	23,453	26,562	29,930	33,756	25,118	27,572	32,002	26,689	28,503	32,308	25,441	27,815	32,185	23,498	24,461	27,202
Western Europe	280,811	366,405	407,310	442,729	326,892	351,369	371,860	363,031	398,291	431,066	333,315	355,350	379,340	377,766	427,880	467,266
OECD	221,743	285,872	318,399	348,073	283,209	320,338	346,818	260,856	263,559	276,978	285,821	311,574	337,601	293,729	325,458	344,847
NIC	259,206	368,904	443,360	535,889	376,636	473,033	603,161	388,412	481,316	620,046	380,346	469,493	603,111	366,088	437,413	518,146
LDC	25,823	41,798	48,980	54,955	42,564	52,111	60,642	39,138	41,386	50,392	43,329	51,222	58,659	41,660	48,211	53,400
All Long Haul	506,772	696,574	810,739	938,917	702,409	845,482	1,010,621	688,405	786,261	947,416	709,496	832,289	999,371	701,478	811,082	916,392
Total	811,035	1,089,541	1,247,979	1,415,402	1,054,419	1,224,423	1,414,483	1,078,126	1,213,055	1,410,790	1,068,253	1,215,454	1,410,895	1,102,741	1,263,423	1,410,861
millions	Passenger-Kms															
Domestic	15,638	18,557	20,713	23,182	17,645	19,103	22,010	18,647	19,735	22,148	17,876	19,205	21,984	16,287	16,754	18,509
Western Europe	222,975	302,099	335,390	364,445	268,822	288,285	305,324	298,997	327,136	355,284	273,495	291,149	310,992	310,982	352,501	386,191
OECD	174,661	244,708	272,443	297,746	242,413	274,045	296,574	223,032	225,067	236,186	244,651	266,540	288,689	251,674	278,779	295,325
NIC	187,338	280,860	337,007	407,110	286,320	358,841	456,111	294,797	364,387	468,653	289,196	356,350	457,388	279,674	333,640	394,717
LDC	17,983	31,097	35,909	40,639	31,473	37,895	44,483	29,319	31,140	38,291	32,057	37,679	43,984	30,754	35,026	38,791
All Long Haul	379,982	556,665	645,359	745,495	560,206	670,782	797,168	547,148	620,594	743,130	565,905	660,568	790,061	562,102	647,445	728,833
Total	618,595	877,320	1,001,462	1,133,122	846,674	978,170	1,124,502	864,792	967,465	1,120,563	857,275	970,922	1,123,038	889,371	1,016,700	1,133,534
millions	Seats															
Domestic	55	62	69	77	59	64	73	64	66	75	60	64	73	55	56	62
Western Europe	204	261	290	314	236	255	268	261	289	311	240	256	273	267	302	327
OECD	32	41	45	50	41	46	49	38	38	40	41	45	48	42	46	49
NIC	37	51	61	74	52	65	84	55	69	88	53	65	84	50	60	71
LDC	6	10	12	14	10	13	15	10	10	12	11	13	14	10	12	13
All Long Haul	75	102	119	137	103	124	148	102	117	141	104	122	146	102	118	133
Total	333	425	478	528	398	442	489	426	472	527	404	442	493	424	476	522

	Difference from 'do minimum'															
LHR NWR		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon capped	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
millions	Seat-Kms															
Domestic	0	-217	735	325	-576	-1,297	-1,041	611	467	-175	-259	-1,117	-401	-2,229	-3,932	-5,583
Western Europe	0	-19,698	-31,704	-46,349	-24,757	-34,451	-45,575	-4,810	-8,629	-15,506	-18,434	-30,839	-38,296	-17,249	-36,452	-61,715
OECD	0	23,538	45,826	52,764	21,316	45,572	48,038	29,195	39,572	23,831	23,883	36,596	39,976	45,560	72,986	79,967
NIC	0	304	-330	-15,056	-2,062	-2,108	-15,116	3,927	732	-16,587	1,575	-5,661	-14,102	11,679	7,986	-14,970
LDC	0	1,928	3,132	1,410	1,132	2,381	-535	1,773	-580	-1,173	1,885	1,415	-2,409	4,080	5,472	4,625
All Long Haul	0	25,770	48,628	39,118	20,386	45,844	32,387	34,894	39,724	6,071	27,343	32,351	23,465	61,319	86,444	69,622
Total	0	5,855	17,658	-6,906	-4,947	10,096	-14,229	30,694	31,562	-9,610	8,650	395	-15,232	41,840	46,060	2,323
millions	Passenger-Kms															
Domestic	0	-359	169	-391	-488	-1,011	-1,081	468	464	-261	-261	-970	-865	-1,426	-2,558	-3,751
Western Europe	0	-17,411	-28,280	-40,321	-21,782	-30,830	-39,658	-5,689	-11,362	-16,050	-17,195	-28,081	-33,804	-16,709	-34,101	-54,422
OECD	0	20,240	39,419	45,352	18,347	39,204	41,271	25,052	34,098	20,455	20,546	31,538	34,423	39,124	62,642	68,583
NIC	0	-888	-1,275	-11,440	-2,623	-3,008	-12,950	2,879	936	-11,269	198	-5,426	-11,208	8,891	6,279	-10,398
LDC	0	293	329	-1,331	-358	-327	-2,941	785	-1,030	-1,307	217	-593	-3,381	1,661	1,718	439
All Long Haul	0	19,644	38,473	32,580	15,367	35,868	25,381	28,716	34,004	7,879	20,961	25,519	19,834	49,676	70,639	58,624
Total	0	1,874	10,362	-8,131	-6,903	4,027	-15,358	23,495	23,106	-8,431	3,505	-3,532	-14,835	31,540	33,980	451
millions	Seats															
Domestic	0	-0	2	-0	-1	-3	-3	3	2	1	0	-2	-2	-4	-8	-12
Western Europe	0	-12	-18	-27	-16	-22	-28	-3	-6	-9	-12	-20	-23	-9	-19	-35
OECD	0	3	6	7	3	6	6	4	5	3	3	5	5	6	10	11
NIC	0	-0	-0	-3	-0	-0	-2	0	-0	-3	0	-1	-2	1	1	-2
LDC	0	1	1	0	0	1	-0	0	-0	-0	1	0	-1	1	1	1
All Long Haul	0	4	7	5	3	6	4	5	5	0	4	4	3	9	12	10
Total	0	-9	-10	-22	-14	-18	-27	4	1	-8	-8	-18	-22	-5	-15	-37

6.118 Nationally the changes in the total number of seat-kilometres supplied are minimal in the carbon capped case for the Heathrow Airport North West Runway option as carbon emissions are closely correlated with seat-kilometres. But there are gains in the long-haul seat-kilometres ranging between 6 billion in *relative decline of Europe* to 70 billion in *global fragmentation* in 2050.

Table 6.47: Heathrow Airport Extended Northern Runway passenger-km, seat and seat-km statistics, carbon-traded

LHR ENR		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon-traded	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
millions	Seat-Kms															
Domestic	23,453	28,974	32,781	37,866	30,248	34,348	40,142	28,526	31,406	36,539	30,086	34,218	39,933	26,613	29,135	33,901
Western Europe	280,811	416,860	485,800	543,040	438,967	529,561	602,762	409,274	473,758	531,239	433,761	527,426	605,077	407,044	485,805	551,341
OECD	221,743	312,170	339,490	352,377	338,746	364,219	405,415	277,297	275,203	298,774	321,829	351,591	394,893	275,431	296,836	311,409
NIC	259,206	405,433	493,170	604,348	456,730	589,697	777,631	420,953	532,732	702,834	445,487	583,968	776,245	372,437	456,415	559,595
LDC	25,823	47,918	56,402	62,678	57,143	73,153	89,531	44,004	49,648	61,286	55,418	71,640	89,970	41,497	49,249	54,347
All Long Haul	**506,772**	**765,521**	**889,062**	**1,019,403**	**852,620**	**1,027,068**	**1,272,577**	**742,254**	**857,583**	**1,062,893**	**822,734**	**1,007,200**	**1,261,108**	**689,365**	**802,500**	**925,350**
Total	**811,035**	**1,211,356**	**1,407,643**	**1,600,308**	**1,321,836**	**1,590,977**	**1,915,481**	**1,180,054**	**1,362,747**	**1,630,671**	**1,286,582**	**1,568,844**	**1,906,119**	**1,123,023**	**1,317,440**	**1,510,592**
millions	Passenger-Kms															
Domestic	15,638	20,483	22,542	25,983	21,376	24,187	28,273	19,819	21,488	24,919	21,217	24,234	28,226	18,444	19,898	23,168
Western Europe	222,975	343,494	401,803	450,631	361,754	437,814	498,533	336,629	390,997	440,433	357,372	435,628	498,887	336,437	402,084	457,722
OECD	174,661	267,268	290,534	301,347	290,015	311,576	346,777	237,094	234,920	254,797	275,493	300,727	337,724	235,950	254,195	266,612
NIC	187,338	309,525	375,897	459,061	349,048	448,865	591,879	319,717	403,561	531,689	340,483	444,910	590,506	284,483	348,155	425,452
LDC	17,983	35,759	42,241	48,224	42,740	55,828	70,697	33,321	38,033	47,109	41,718	55,165	71,026	31,368	36,886	41,423
All Long Haul	**379,982**	**612,552**	**708,673**	**808,633**	**681,803**	**816,269**	**1,009,353**	**590,132**	**676,514**	**833,596**	**657,694**	**800,803**	**999,255**	**551,801**	**639,236**	**733,486**
Total	**618,595**	**976,529**	**1,133,018**	**1,285,247**	**1,064,933**	**1,278,270**	**1,536,160**	**946,580**	**1,088,998**	**1,298,948**	**1,036,282**	**1,260,664**	**1,526,368**	**906,682**	**1,061,217**	**1,214,376**
millions	Seats															
Domestic	55	68	75	86	70	79	93	67	72	83	69	79	93	62	66	77
Western Europe	204	295	340	374	310	368	415	291	337	375	306	366	416	285	337	377
OECD	32	44	48	50	48	52	58	40	40	43	46	50	56	39	42	44
NIC	37	56	68	84	63	82	108	59	76	100	61	81	108	51	62	77
LDC	6	12	14	16	14	18	22	11	12	15	14	18	22	10	12	14
All Long Haul	**75**	**112**	**130**	**149**	**125**	**152**	**188**	**110**	**128**	**158**	**121**	**149**	**186**	**101**	**117**	**135**
Total	**333**	**475**	**545**	**610**	**505**	**599**	**696**	**468**	**537**	**616**	**496**	**593**	**695**	**448**	**520**	**589**

	Difference from 'do minimum'															
LHR ENR		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon-traded	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
millions	Seat-Kms															
Domestic	0	1,485	2,596	2,688	1,681	1,466	937	1,458	1,515	1,138	1,519	1,336	593	597	362	600
Western Europe	0	14,314	17,318	14,173	17,925	13,867	33,531	11,588	16,353	15,061	12,719	11,732	32,088	8,957	17,315	15,942
OECD	0	45,072	60,513	47,337	57,211	55,928	78,530	33,378	36,688	27,694	40,294	43,300	66,111	25,239	43,904	46,816
NIC	0	26,046	28,850	22,042	30,767	24,256	48,411	14,054	11,368	8,094	19,524	18,527	45,139	15,280	23,831	22,161
LDC	0	6,316	7,406	4,413	7,658	5,876	6,838	3,105	2,852	3,321	5,933	4,364	6,918	3,561	6,108	5,072
All Long Haul	**0**	**77,434**	**96,769**	**73,792**	**95,636**	**86,060**	**133,779**	**50,536**	**50,908**	**39,108**	**65,751**	**66,192**	**118,168**	**44,081**	**73,843**	**74,048**
Total	**0**	**93,233**	**116,683**	**90,653**	**115,243**	**101,393**	**168,247**	**63,583**	**68,776**	**55,307**	**79,989**	**79,260**	**150,850**	**53,636**	**91,520**	**90,590**
millions	Passenger-Kms															
Domestic	0	1,111	1,193	1,094	1,131	898	714	916	616	257	972	945	625	547	304	537
Western Europe	0	10,277	13,663	14,302	13,052	13,493	25,406	7,123	10,637	12,774	8,669	11,307	23,199	6,282	11,873	12,296
OECD	0	38,725	52,036	40,607	49,108	47,990	78,425	28,644	31,513	23,758	34,586	37,141	68,780	21,668	37,655	40,109
NIC	0	19,394	22,315	16,209	23,836	18,873	35,273	10,448	10,075	7,582	15,271	14,919	33,847	11,555	18,402	17,026
LDC	0	3,540	3,999	2,207	4,245	2,916	4,707	1,872	1,903	2,114	3,222	2,254	4,792	2,001	3,228	2,604
All Long Haul	**0**	**61,658**	**78,349**	**59,023**	**77,189**	**69,780**	**118,404**	**40,964**	**43,491**	**33,454**	**53,079**	**54,314**	**107,419**	**35,224**	**59,285**	**59,739**
Total	**0**	**73,046**	**93,206**	**74,419**	**91,371**	**84,171**	**144,524**	**49,004**	**54,743**	**46,485**	**62,721**	**66,566**	**131,243**	**42,053**	**71,463**	**72,572**
millions	Seats															
Domestic	0	4	5	4	3	3	2	4	3	1	3	3	1	2	1	1
Western Europe	0	10	13	10	13	11	24	7	10	11	9	9	23	7	13	13
OECD	0	6	8	6	8	8	10	4	5	4	5	6	8	3	6	7
NIC	0	3	4	3	4	3	6	2	1	1	2	2	6	2	3	3
LDC	0	2	2	1	2	2	2	1	1	1	2	1	2	1	2	1
All Long Haul	**0**	**11**	**14**	**10**	**13**	**12**	**17**	**7**	**7**	**5**	**9**	**9**	**16**	**6**	**11**	**11**
Total	**0**	**25**	**32**	**24**	**30**	**27**	**43**	**18**	**20**	**18**	**21**	**21**	**40**	**15**	**25**	**25**

6.119 In the Heathrow Airport Extended Northern Runway option with traded carbon, seat-kilometres supplied to and from the UK vary between 54 and 115 billion in 2030 and 55 and 168 billion in 2050. The smallest increments in seat-kilometres are in *global fragmentation* in 2030 and *relative decline of Europe* in 2050. The largest increment in seat-kilometres is in *global growth* in both 2030 and 2050. In all demand scenarios the majority of the seat-kilometres added are long-haul.

Table 6.48: Heathrow Airport Extended Northern Runway passenger-km, seat and seat-km statistics, carbon capped

LHR ENR		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon capped	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
millions	Seat-Kms															
Domestic	23,453	26,833	29,631	33,805	25,407	27,878	32,146	26,794	28,065	31,883	25,889	28,376	32,965	23,897	25,071	27,861
Western Europe	280,811	371,689	412,875	449,157	331,776	355,856	378,474	364,906	398,224	433,594	341,888	364,048	391,303	382,611	433,900	473,793
OECD	221,743	288,466	316,453	342,070	285,963	316,700	340,644	261,707	256,688	278,187	289,918	307,451	329,292	295,091	320,599	335,888
NIC	259,206	372,449	444,491	537,930	380,102	472,482	603,206	389,753	479,969	623,059	386,012	472,512	608,007	369,080	437,645	519,631
LDC	25,823	42,358	48,957	54,353	43,259	51,853	59,682	39,330	41,127	50,794	43,826	51,058	57,905	42,097	47,884	52,057
All Long Haul	**506,772**	**703,273**	**809,901**	**934,352**	**709,324**	**841,035**	**1,003,532**	**690,791**	**777,784**	**952,041**	**719,756**	**831,022**	**995,204**	**706,269**	**806,127**	**907,577**
Total	**811,035**	**1,101,795**	**1,252,407**	**1,417,315**	**1,066,507**	**1,224,769**	**1,414,152**	**1,082,491**	**1,204,073**	**1,417,518**	**1,087,532**	**1,223,445**	**1,419,472**	**1,112,778**	**1,265,099**	**1,409,230**
millions	Passenger-Kms															
Domestic	15,638	18,771	20,415	23,174	17,855	19,273	21,985	18,721	19,362	21,821	18,202	19,504	22,435	16,577	17,124	18,911
Western Europe	222,975	306,331	340,304	370,798	273,139	292,493	310,944	300,555	327,674	358,016	280,616	298,982	321,134	315,057	357,739	392,844
OECD	174,661	246,933	270,760	292,592	244,776	270,936	291,305	223,760	219,148	237,227	248,167	263,048	281,538	252,842	274,632	287,646
NIC	187,338	283,624	337,955	408,751	289,002	358,632	457,386	295,821	363,210	470,875	293,609	358,688	461,432	281,975	333,821	395,782
LDC	17,983	31,542	36,104	40,641	31,998	37,987	44,426	29,469	31,003	38,613	32,650	37,976	44,078	31,107	35,049	38,401
All Long Haul	**379,982**	**562,098**	**644,820**	**741,985**	**565,776**	**667,555**	**793,117**	**549,051**	**613,361**	**746,716**	**574,426**	**659,712**	**787,048**	**565,924**	**643,502**	**721,829**
Total	**618,595**	**887,201**	**1,005,538**	**1,135,957**	**856,770**	**979,321**	**1,126,046**	**868,328**	**960,397**	**1,126,552**	**873,244**	**978,198**	**1,130,617**	**897,558**	**1,018,366**	**1,133,585**
millions	Seats															
Domestic	55	63	68	77	60	64	73	64	64	73	61	65	75	56	57	64
Western Europe	204	265	294	317	239	257	273	262	289	313	246	262	280	271	305	330
OECD	32	41	45	49	41	45	49	38	38	40	41	44	47	42	45	48
NIC	37	51	61	74	52	65	84	55	68	88	53	65	84	50	60	71
LDC	6	10	12	13	11	13	15	10	10	12	11	13	14	10	12	13
All Long Haul	**75**	**103**	**119**	**136**	**104**	**123**	**147**	**102**	**116**	**141**	**106**	**122**	**145**	**103**	**117**	**132**
Total	**333**	**430**	**480**	**531**	**403**	**445**	**493**	**428**	**469**	**527**	**412**	**449**	**500**	**429**	**480**	**525**

	Difference from 'do minimum'															
LHR ENR		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
Carbon capped	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
millions	Seat-Kms															
Domestic	0	53	436	374	-288	-992	-898	716	30	-600	188	-556	379	-1,830	-3,322	-4,925
Western Europe	0	-14,413	-26,139	-39,920	-19,873	-29,963	-38,960	-2,936	-8,697	-12,978	-9,862	-22,141	-26,333	-12,403	-30,432	-55,189
OECD	0	26,132	43,880	46,761	24,071	41,933	41,863	30,046	32,701	25,040	27,980	32,473	31,668	46,922	68,127	71,008
NIC	0	3,849	800	-13,016	1,404	-2,659	-15,071	5,268	-616	-13,574	7,242	-2,642	-9,206	14,671	8,217	-13,485
LDC	0	2,489	3,109	808	1,827	2,123	-1,495	1,965	-839	-770	2,382	1,251	-3,163	4,517	5,145	3,283
All Long Haul	**0**	**32,469**	**47,790**	**34,553**	**27,302**	**41,397**	**25,297**	**37,280**	**31,246**	**10,696**	**37,603**	**31,083**	**19,298**	**66,110**	**81,490**	**60,806**
Total	**0**	**18,110**	**22,087**	**-4,993**	**7,141**	**10,442**	**-14,560**	**35,059**	**22,580**	**-2,882**	**27,929**	**8,386**	**-6,656**	**51,877**	**47,735**	**692**
millions	Passenger-Kms															
Domestic	0	-144	-129	-399	-278	-841	-1,106	543	91	-588	65	-670	-415	-1,137	-2,188	-3,349
Western Europe	0	-13,179	-23,367	-33,968	-17,465	-26,622	-34,037	-4,131	-10,823	-13,318	-10,074	-20,248	-23,661	-12,634	-28,862	-47,769
OECD	0	22,465	37,737	40,198	20,710	36,094	36,003	25,780	28,179	21,496	24,061	28,046	27,271	40,292	58,495	60,904
NIC	0	1,875	-327	-9,799	60	-3,217	-11,675	3,904	-242	-9,047	4,611	-3,088	-7,163	11,192	6,461	-9,333
LDC	0	737	524	-1,329	167	-236	-2,998	935	-1,167	-984	809	-296	-3,287	2,014	1,741	49
All Long Haul	**0**	**25,078**	**37,933**	**29,071**	**20,937**	**32,641**	**21,330**	**30,619**	**26,771**	**11,465**	**29,482**	**24,663**	**16,820**	**53,498**	**66,696**	**51,620**
Total	**0**	**11,754**	**14,438**	**-5,296**	**3,193**	**5,178**	**-13,814**	**27,030**	**16,038**	**-2,442**	**19,473**	**3,744**	**-7,256**	**39,727**	**35,646**	**502**
millions	Seats															
Domestic	0	0	1	0	-0	-2	-3	3	0	-1	1	-1	0	-3	-7	-11
Western Europe	0	-9	-15	-23	-13	-19	-24	-2	-6	-7	-6	-15	-16	-6	-15	-31
OECD	0	3	6	6	3	6	6	4	4	4	4	4	4	6	9	10
NIC	0	0	-0	-2	0	-0	-2	0	-0	-2	1	-0	-1	2	1	-2
LDC	0	1	1	0	1	1	-0	0	-0	-0	1	0	-1	1	1	1
All Long Haul	**0**	**4**	**7**	**4**	**4**	**6**	**3**	**5**	**4**	**1**	**5**	**4**	**2**	**9**	**11**	**8**
Total	**0**	**-4**	**-8**	**-19**	**-9**	**-15**	**-23**	**6**	**-2**	**-8**	**0**	**-12**	**-14**	**-0**	**-11**	**-33**

6.120 In the Heathrow Airport Extended Northern Runway option with capped carbon, the increment in seat-kilometres supplied to and from the UK lies within the range +/- 1% by 2050. This is the effect of carbon capping levelling out this metric across all the options and demand scenarios. Nevertheless there are significant gains in the number of long-haul flight seat-kilometre: these increase from an additional 11 billion in *relative decline of Europe* to an additional 51 billion seat-kilometres in *global fragmentation*.

Passengers per ATM

6.121 The baseline passengers per passenger ATM (p/patm) for the five demand scenarios in the three capacity options are shown below in **Table 6.49** to **Table 6.51**. Note that this is not quite the same as the total terminal passengers in **Table 6.1** through to **Table 6.6** divided by the ATMs in **Table 6.37** through to **Table 6.42** because the ATM tables also include freight aircraft.

Table 6.49: Gatwick Airport Second Runway, passengers per passenger ATM (p/patm)																
Carbon-traded		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
LGW 2R	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	146	177	189	205	182	198	191	174	183	201	172	183	207	174	182	196
Gatwick	137	146	147	147	148	153	172	145	150	151	150	160	172	149	151	151
Stansted	133	168	178	179	166	177	180	163	177	181	165	171	173	165	183	187
Luton	132	149	154	155	148	156	154	145	145	142	137	134	118	148	154	154
London City	54	62	62	63	63	62	69	64	67	67	66	68	73	62	55	55
Manchester	126	153	162	167	156	167	178	157	166	172	151	162	176	150	158	159
Birmingham	97	98	99	104	102	108	132	104	109	109	107	113	142	102	105	110
Glasgow	100	108	121	126	111	127	131	114	129	135	111	128	138	107	119	126
Edinburgh	94	110	114	116	111	115	130	113	116	131	114	118	127	109	115	116
UK Average	**113**	**125**	**130**	**133**	**127**	**133**	**137**	**124**	**130**	**135**	**125**	**129**	**135**	**125**	**128**	**131**
Paris CDG	137	160	165	170	164	170	178	160	166	173	163	170	178	157	162	166
Amsterdam	129	147	151	156	150	158	165	152	159	164	150	158	164	145	148	152
Frankfurt	132	152	157	162	155	160	165	152	156	161	155	160	164	150	153	157
Dubai	192	225	231	240	228	239	241	225	235	243	228	239	241	224	229	238

Carbon capped		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
LGW 2R	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	146	177	185	200	176	188	205	171	176	195	168	174	186	173	181	192
Gatwick	137	143	147	146	145	145	145	144	146	147	144	147	153	147	151	151
Stansted	133	168	178	184	166	184	187	168	185	184	163	176	179	166	183	187
Luton	132	149	153	157	148	150	152	142	142	142	141	142	145	150	154	154
London City	54	61	62	60	59	55	58	61	61	62	60	60	61	61	54	53
Manchester	126	153	160	165	149	159	164	154	164	169	146	145	157	149	158	156
Birmingham	97	96	97	97	97	89	86	100	101	99	98	94	82	102	104	108
Glasgow	100	106	117	125	106	114	122	114	125	129	103	109	112	106	118	125
Edinburgh	94	109	112	114	107	113	112	114	117	116	108	112	113	109	116	115
UK Total	**113**	**125**	**128**	**130**	**125**	**128**	**130**	**123**	**126**	**129**	**121**	**124**	**127**	**125**	**128**	**130**
Paris CDG	137	159	164	169	160	167	175	158	164	172	159	166	174	157	161	166
Amsterdam	129	146	150	155	147	152	160	149	155	161	147	151	159	145	148	152
Frankfurt	132	152	155	161	153	158	165	150	156	162	152	157	164	150	153	156
Dubai	192	225	230	238	225	233	241	224	231	240	225	231	241	224	229	238

6.122 The characteristics of aircraft change less at Gatwick in future scenarios where the growth forecasts are relatively low and not all the added capacity is used, particularly *global fragmentation*. Adding a second runway at Gatwick with traded carbon results in lower aircraft loadings compared to the baseline in most years. Heathrow loadings remain high. The added capacity at Gatwick tends to allow back in smaller short-haul aircraft with lower passenger loads. There is a similar pattern in the higher demand scenarios, *global growth and low-cost is king*, up until 2040, but in the 2040s capacity becomes exhausted at the expanded Gatwick and the smaller aircraft on predominantly short-haul routes are forced out and aircraft loads increase quite rapidly. The lower level of demand in the carbon

capped case results in less pressure on the expanded Gatwick in all the demand scenarios and lower aircraft loadings than in the baseline.

Table 6.50: Heathrow Airport North West Runway, passengers per passenger ATM (p/patm)

Carbon-traded		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
LGW 2R	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	146	171	178	185	174	186	201	166	173	182	173	184	201	166	170	177
Gatwick	137	147	158	167	152	165	170	151	164	172	149	164	174	146	157	164
Stansted	133	167	181	181	167	182	182	165	180	181	166	175	173	169	183	180
Luton	132	149	153	157	150	156	155	148	150	155	150	156	154	150	153	156
London City	54	59	61	62	59	53	59	63	62	62	60	59	63	58	59	59
Manchester	126	153	161	166	156	166	176	151	164	171	155	166	176	151	159	163
Birmingham	97	99	101	106	103	111	139	104	105	112	101	108	133	98	101	107
Glasgow	100	106	119	129	106	120	128	113	128	138	106	118	129	106	115	124
Edinburgh	94	112	112	109	112	123	131	110	109	106	112	116	131	108	111	109
UK Average	**113**	**128**	**133**	**134**	**130**	**135**	**139**	**127**	**131**	**134**	**129**	**134**	**139**	**125**	**130**	**132**
Paris CDG	137	159	164	170	163	170	177	160	166	173	163	170	178	156	161	166
Amsterdam	129	146	150	155	149	157	164	149	157	164	149	157	164	144	147	151
Frankfurt	132	151	154	160	153	160	164	151	156	161	154	160	164	149	152	155
Dubai	192	226	232	240	228	239	242	225	235	243	228	239	242	224	229	238

Carbon capped		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
LGW 2R	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	146	168	171	180	169	177	185	164	168	174	167	175	184	167	174	178
Gatwick	137	146	153	156	146	153	157	151	162	167	145	153	157	144	152	157
Stansted	133	168	183	185	166	180	184	167	178	183	165	177	181	168	182	186
Luton	132	151	148	148	148	148	145	151	150	153	149	150	147	149	151	149
London City	54	55	54	57	54	51	53	53	50	50	55	52	53	56	57	59
Manchester	126	148	157	161	146	151	156	149	162	166	146	152	157	147	156	159
Birmingham	97	100	94	86	97	95	89	102	94	89	98	87	84	96	96	96
Glasgow	100	103	107	115	99	104	110	107	114	119	100	106	114	102	105	112
Edinburgh	94	110	110	109	108	108	105	115	119	120	108	105	104	107	109	107
UK Total	**113**	**127**	**130**	**130**	**127**	**131**	**131**	**126**	**129**	**129**	**126**	**129**	**130**	**126**	**131**	**131**
Paris CDG	137	156	161	167	159	165	174	158	163	172	159	165	174	155	160	165
Amsterdam	129	144	147	152	146	151	158	147	154	161	146	151	158	143	146	150
Frankfurt	132	149	153	157	151	156	162	150	155	162	151	157	162	149	152	158
Dubai	192	224	227	235	225	231	241	224	232	240	225	231	241	224	228	235

6.123 Under carbon trading, expanding the Heathrow capacity by adding a North West Runway sees lower aircraft loadings in all the demand scenarios as lower congestion costs result in fewer smaller aircraft on shorter routes being forced to use less convenient airports. Whereas in the baseline there are a number of demand scenarios where average aircraft loads exceed 200 passengers during the 2040s, loadings over 200 only occur in 2050 with the higher demand levels in the *global growth* and *low-cost is king* demand scenarios.

When carbon is capped there is a significant drop in aircraft loadings at Heathrow, this is a result of capping combined with lower congestion premia making short-haul flying significantly more attractive e. This is most evident in the *relative decline of Europe scenario* where loadings per aircraft drop from 197 to 174 passengers.

Table 6.51: Heathrow Airport Extended Northern Runway, passengers per passenger ATM (p/patm)

Carbon-traded		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
LHR ENR	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	146	170	179	186	176	188	201	167	173	184	174	185	202	166	173	178
Gatwick	137	147	157	167	151	167	171	151	163	172	148	164	171	146	157	164
Stansted	133	167	181	182	167	175	174	165	181	182	166	176	173	169	183	181
Luton	132	149	154	155	150	157	157	149	151	155	150	158	153	150	153	157
London City	54	59	61	62	60	59	65	63	63	61	61	59	65	58	59	60
Manchester	126	153	161	166	156	167	178	152	164	170	155	167	178	151	159	164
Birmingham	97	100	102	106	103	112	141	103	107	114	102	109	134	98	101	108
Glasgow	100	106	121	131	107	117	128	114	128	138	107	118	129	106	115	124
Edinburgh	94	112	112	108	112	119	133	107	109	103	112	117	131	108	111	109
UK Average	**113**	**128**	**132**	**133**	**130**	**135**	**140**	**127**	**131**	**135**	**128**	**134**	**139**	**125**	**130**	**132**
Paris CDG	137	159	165	170	163	170	178	160	166	173	163	170	178	156	161	166
Amsterdam	129	146	150	155	149	157	164	150	158	164	150	158	165	144	147	151
Frankfurt	132	151	154	161	153	160	164	151	156	161	154	160	165	149	153	155
Dubai	192	226	232	240	228	239	242	225	236	243	228	239	241	224	229	238

Carbon capped		Assessment of need			Global growth			Relative decline of Europe			Low-cost is king			Global fragmentation		
LHR ENR	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
Heathrow	146	168	175	182	169	177	186	164	171	179	168	176	185	168	174	180
Gatwick	137	146	153	159	146	154	158	151	162	165	145	151	153	144	152	159
Stansted	133	169	183	185	166	181	185	167	178	183	165	178	183	168	182	184
Luton	132	149	148	148	149	148	146	151	151	153	147	149	149	149	151	151
London City	54	55	56	59	55	51	54	53	52	52	55	53	54	56	57	58
Manchester	126	151	158	161	146	151	157	149	162	166	147	153	159	148	156	161
Birmingham	97	98	92	90	98	95	85	102	95	89	99	90	83	97	97	98
Glasgow	100	103	108	118	100	106	113	108	115	120	100	107	115	102	106	113
Edinburgh	94	111	110	108	108	106	104	115	118	119	108	105	104	108	108	106
UK Total	**113**	**127**	**130**	**131**	**127**	**130**	**130**	**126**	**129**	**130**	**126**	**129**	**129**	**126**	**130**	**131**
Paris CDG	137	157	162	168	159	165	174	158	164	172	159	166	174	156	160	166
Amsterdam	129	144	148	152	146	151	158	148	155	162	146	151	159	144	146	151
Frankfurt	132	150	154	157	151	157	162	150	156	162	152	157	163	150	152	158
Dubai	192	224	228	236	225	231	241	224	232	240	225	231	241	225	228	236

6.124 Under carbon trading, expanding the Heathrow capacity by extending the northern runway sees lower aircraft loadings in all the demand scenarios as lower congestion costs result in fewer smaller aircraft on shorter routes being forced to use less convenient airports. Whereas in the baseline there are a number of demand scenarios where average

aircraft loads exceed 200 passengers during the 2040s, loadings over 200 only occur in 2050 with the higher demand levels in the *global growth* and *low-cost is king* demand scenarios. When carbon is capped there is a significant drop in aircraft loadings at Heathrow, this is a result of capping combined with lower congestion premia making short-haul flying significantly more attractive. This is most evident in the *low-cost is king* scenario which seems some low cost airlines gaining a foothold at Heathrow where loadings per aircraft drop from 205 to 185 passengers.

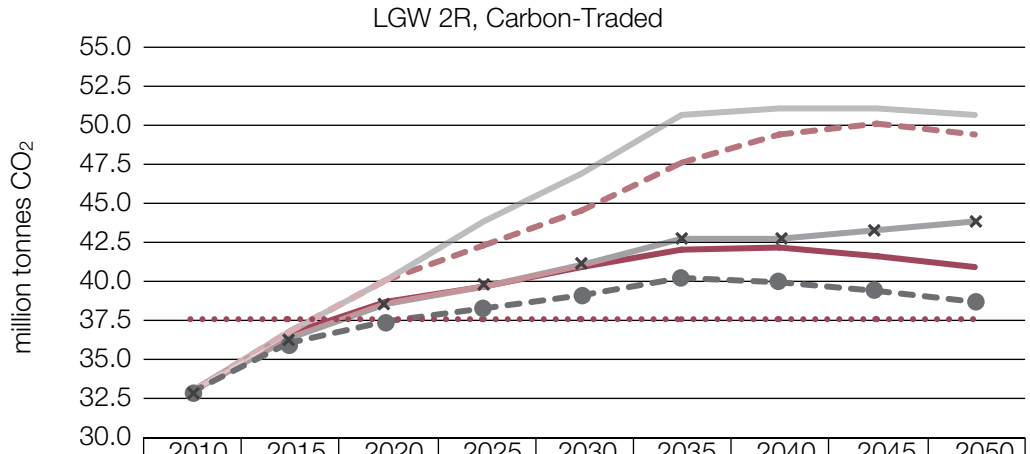
CO_2 emissions by option

6.125 **Chapter 4** describes the Commission's approach to modelling the carbon-traded and carbon capped emissions cases. That chapter also reports the CO_2 emissions for the baseline of no new runway capacity for each demand scenario. These figures show the emissions for each runway capacity development option over the full modelled period.

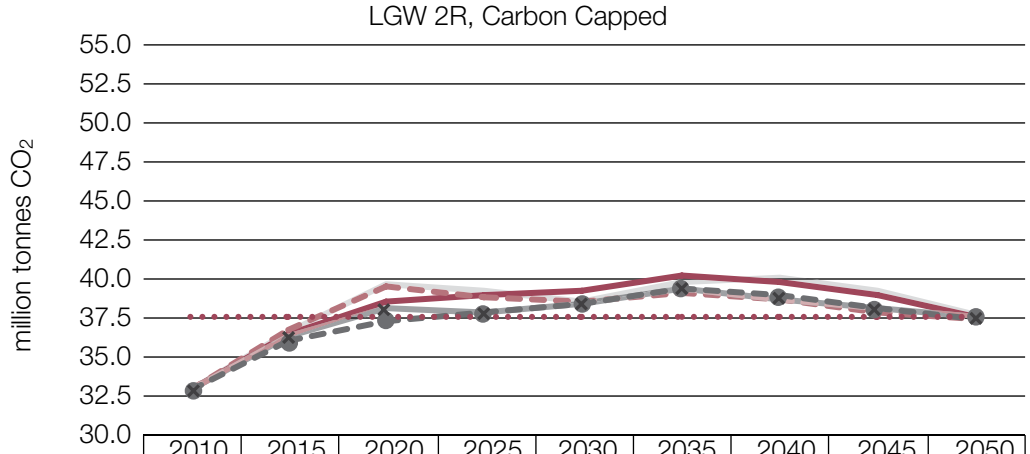
6.126 With the Gatwick Airport Second Runway option **Figure 6.7** shows that without capping, national emissions are highest at 51MtCO_2 in 2050 in *low-cost is king* and with 49MtCO_2 in *global growth*. In the other demand scenarios national emissions range between 39MtCO_2e and 44MtCO_2e when capacity is added at Gatwick.

6.127 If these emissions were not accounted for as part of a liberal global carbon market (as envisaged in this forecasting approach) and needed to be accommodated within any UK specific target this would see aviation emissions account for a larger share of the total and require commensurate reductions elsewhere in the economy.

Figure 6.7: Gatwick Airport Second Runway option national UK departing flight CO_2 emissions



	2010	2015	2020	2025	2030	2035	2040	2045	2050
Assessment of need	32.8	36.5	38.6	39.6	40.8	41.9	42.1	41.5	40.8
Global growth	32.8	36.7	40.0	42.2	44.4	47.5	49.2	49.9	49.4
Relative decline of Europe	32.8	36.3	38.5	39.6	41.0	42.7	42.7	43.2	43.7
Low-cost in king	32.8	36.7	40.0	43.8	46.8	50.6	51.0	51.0	50.6
Global fragmentation	32.8	36.0	37.3	38.2	39.0	40.1	39.9	39.3	38.7
Target	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5



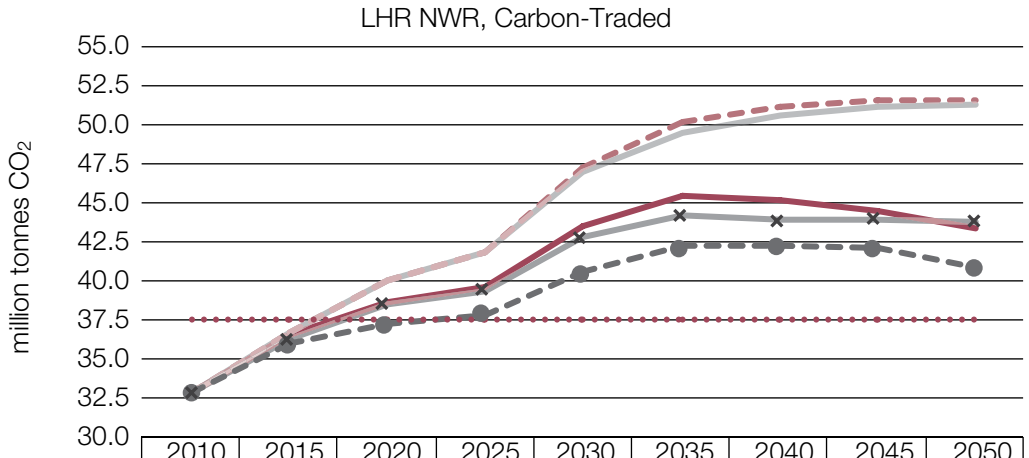
	2010	2015	2020	2025	2030	2035	2040	2045	2050
Assessment of need	32.8	36.4	38.5	38.9	39.2	40.2	39.7	39.0	37.5
Global growth	32.8	36.6	39.5	38.8	38.4	39.0	38.6	37.8	37.4
Relative decline of Europe	32.8	36.3	38.1	37.8	38.3	39.3	38.6	38.1	37.4
Low-cost in king	32.8	36.5	39.6	39.1	38.5	39.8	40.0	39.2	37.6
Global fragmentation	32.8	36.0	37.3	37.8	38.3	39.3	38.9	38.0	37.4
Target	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5

6.128 The Gatwick Airport Second Runway capped carbon price for 2050 is highest at £1198/tonne CO_2e in *low-cost is king*, a 40% increase over the cost of carbon capping in the base case in this scenario. All the scenario CO_2e capping prices for this capacity option are shown in **Appendix 5**.

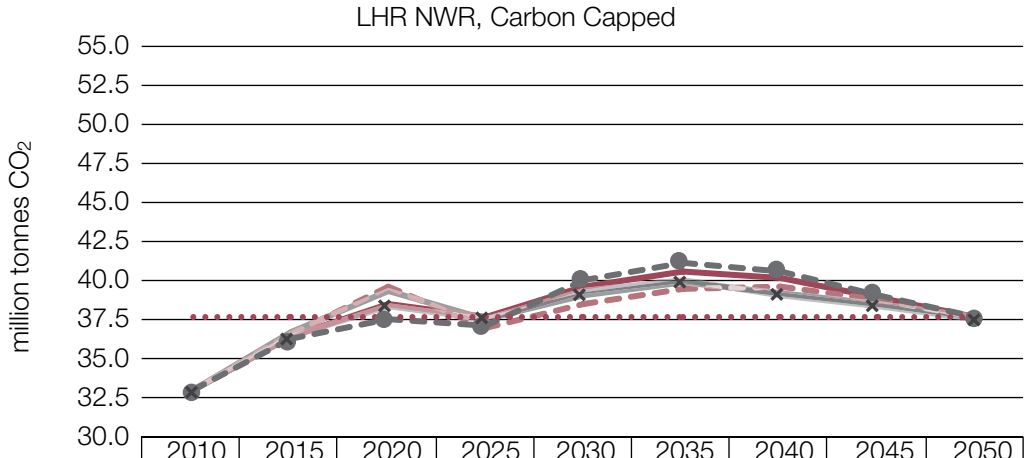
6.129 **Figure 6.8** shows that without capping, in the Heathrow Airport North West Runway option national emissions are highest at 52MtCO_2e in 2050 in *global growth*, with *low-cost is king* close to that level. In the other demand scenarios national emissions range between 41MtCO_2e and 44MtCO_2e when a northwest runway is added at Heathrow.

6.130 If these emissions were not accounted for as part of a liberal global carbon market (as envisaged in this forecasting approach) and needed to be accommodated within any UK specific target this would see aviation emissions account for a larger share of the total and require commensurate reductions elsewhere in the economy.

Figure 6.8: Heathrow Airport North West Runway option national UK departing flight CO_2 emissions



	2010	2015	2020	2025	2030	2035	2040	2045	2050
Assessment of need	32.8	36.5	38.6	39.5	43.4	45.5	45.2	44.5	43.3
Global growth	32.8	36.7	40.0	41.8	47.3	50.1	51.2	51.6	51.5
Relative decline of Europe	32.8	36.3	38.5	39.3	42.7	44.2	43.8	43.9	43.8
Low-cost in king	32.8	36.7	40.0	41.8	46.9	49.4	50.6	51.1	51.2
Global fragmentation	32.8	36.0	37.3	37.8	40.6	42.3	42.3	42.1	40.8
Target	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5



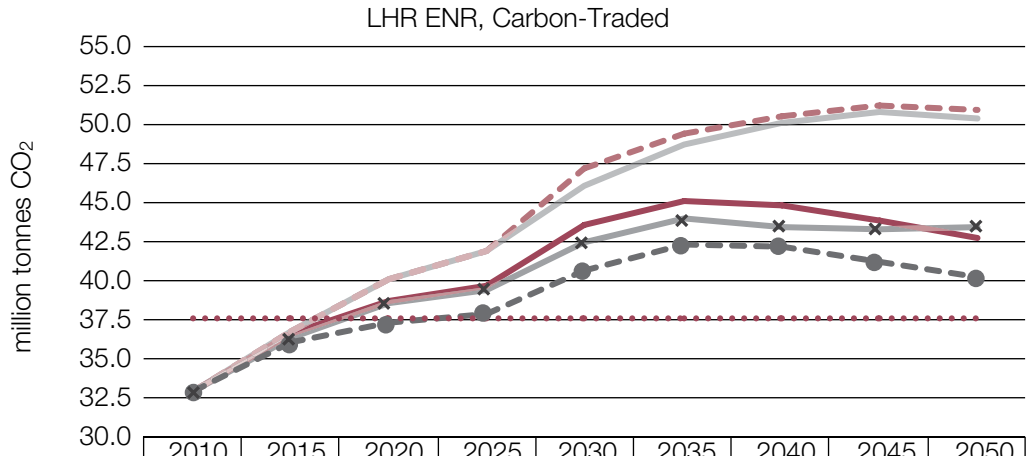
	2010	2015	2020	2025	2030	2035	2040	2045	2050
Assessment of need	32.8	36.3	38.4	37.6	39.4	40.4	40.0	38.7	37.5
Global growth	32.8	36.4	39.4	36.9	38.4	39.4	39.5	38.7	37.5
Relative decline of Europe	32.8	36.3	38.2	37.3	39.1	39.8	38.9	38.2	37.4
Low-cost in king	32.8	36.5	39.2	37.4	38.8	39.8	39.0	38.4	37.5
Global fragmentation	32.8	36.1	37.4	37.0	39.8	41.0	40.4	38.9	37.5
Target	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5

6.131 The Heathrow Airport North West Runway capped carbon price for 2050 is highest at £1316/tonne CO_2e in *global growth*, but the biggest increase occurs in *global fragmentation* when the cost of carbon needs to rise by a factor of 3.6 from £236 to £857/tCO_2e. All the scenario CO_2e capping prices for this capacity option are shown in **Appendix 5.**

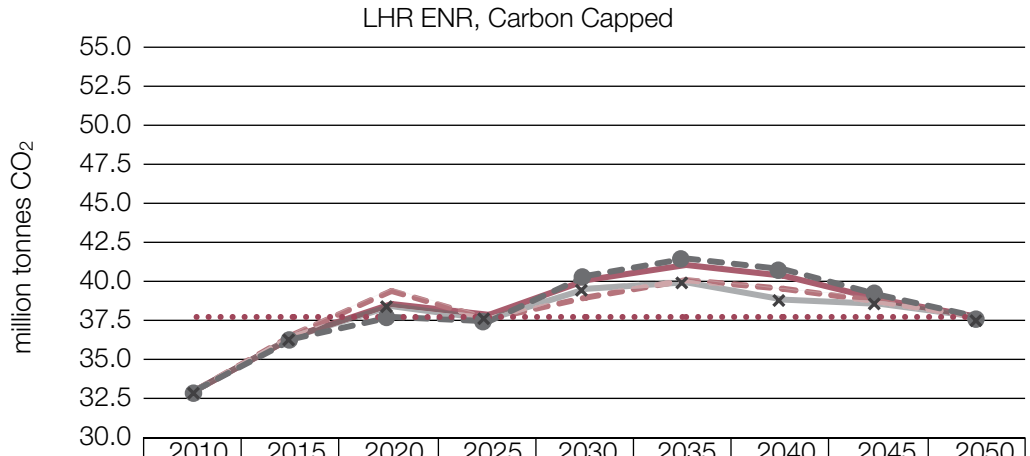
6.132 In the Heathrow Airport Extended Northern Runway option without capping national emissions are highest at 51MtCO_2e in 2050 in *global growth* but with *low-cost is king* close to that level. In the other demand scenarios national emissions range between 40MtCO_2e and 43MtCO_2e when the northern runway is extended at Heathrow (**Figure 6.9**).

6.133 If these emissions were not accounted for as part of a liberal global carbon market (as envisaged in this forecasting approach) and needed to be accommodated within any UK specific target this would see aviation emissions account for a larger share of the total and require commensurate reductions elsewhere in the economy.

Figure 6.9: Heathrow Airport Extended Northern Runway option national UK departing flight CO_2 emissions



	2010	2015	2020	2025	2030	2035	2040	2045	2050
Assessment of need	32.8	36.5	38.6	39.5	43.4	45.0	44.7	43.8	42.6
Global growth	32.8	36.7	40.0	41.8	47.0	49.4	50.4	51.1	50.9
Relative decline of Europe	32.8	36.3	38.5	39.3	42.4	43.9	43.4	43.2	43.4
Low-cost in king	32.8	36.7	40.0	41.8	46.0	48.6	49.9	50.6	50.2
Global fragmentation	32.8	36.0	37.3	37.8	40.6	42.3	42.1	41.2	40.2
Target	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5



	2010	2015	2020	2025	2030	2035	2040	2045	2050
Assessment of need	32.8	36.3	38.4	37.7	39.8	40.9	40.1	38.7	37.5
Global growth	32.8	36.5	39.2	37.3	38.7	39.9	39.3	38.5	37.5
Relative decline of Europe	32.8	36.3	38.2	37.4	39.2	39.8	38.7	38.3	37.5
Low-cost in king	32.8	36.5	39.3	37.5	39.4	40.0	39.3	38.7	37.5
Global fragmentation	32.8	36.1	37.5	37.2	40.1	41.2	40.5	38.9	37.5
Target	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5

6.134 For the Heathrow Airport Extended Northern Runway option, the capped carbon price for 2050 is highest at £1236/tonne CO_2e in *global growth*, but the biggest increase occurs in *global fragmentation* when the cost of carbon needs to rise by a factor of 3.2 from £236 to £758/tCO_2e. All the scenario CO_2e capping prices for this capacity option are shown in **Appendix 5.**

Catchment areas

6.135 **Chapter 2** describes how the passenger to airport allocation model represents how passengers in each district choose between available airports primarily on the basis of their costs of getting to each airport (future surface access costs) and the availability of air services to the desired destination at each airport (frequency costs). This methodology captures the complex overlapping of airport catchments. In practice different passengers in particular districts choose different airports for the same journey depending on personal preferences. This allocation methodology also captures the dynamics of catchments varying district by district as airports become full or gain extra capacity. For the baseline case of no additional runway capacity, **Chapter 5** contains maps which show the modelled catchments of 8 airports in 2030. **Appendix 4** shows catchment area maps for 2030 for Gatwick and Heathrow for capacity development options.

7. Sensitivity Tests

7.1 This chapter sets out the Commission's work on sensitivities to test the impact on the *assessment of need* demand scenario forecasts if:

1. There were no international-to-international transfer passengers (I to Is).
2. There was no carbon price applied to fares.
3. Additional runway capacity was phased in for the Heathrow Airport North West Runway option.
4. Heathrow Airport North West Runway surface access assumptions were applied in the Heathrow Airport Extended Northern Runway option.
5. Lower capacity assumptions were assumed in the Heathrow Airport Extended Northern Runway option.
6. The high DECC carbon prices were applied.

7.2 The modelling assumptions underpinning results of these model runs and how they compare with the *assessment of need* results are described below.

No international-to-international transfer passengers

7.3 This sensitivity test measures the impact of international-to-international transfer passengers under the *assessment of need* demand scenario in terms of both total passenger throughput and connectivity in terms of destinations served by airport and region. It is assumed that there are no international-international interliners at any of the modelled airports. All other assumptions were identical to those in the *assessment of need* scenario. The runs were made for all airport development options under both the carbon capped and traded cases.

Total passengers

7.4 Removing international-to-international transfer passengers makes a significant difference to demand. In the base year of 2011 some 24 million terminal passengers are removed from the total UK demand and 94 million from the total hub demand. By 2050 in the carbon-traded case demand at the hubs is reduced by over 150 million terminal passengers and by just over 115 million in the carbon capped case.

7.5 In the baseline removing the international-to-international transfer passengers means that Heathrow is not full until 2030 in the carbon-traded case and 2032 in the carbon capped case. Once Heathrow is full the shadow costs remain lower throughout the modelled

period. This reduction in shadow cost effect is predictably less evident at Gatwick (which has fewer of these transfers) where the 2050 baseline shadow costs are only slightly lower in the carbon-traded case and very similar in the carbon capped case.

7.6 This sensitivity test has been run for all the development options in both the carbon-traded and carbon cases. **Table 7.1** shows that after 2030 the Heathrow and Gatwick throughputs are quite similar to the baseline no runways case.

Table 7.1: Base no I to I passengers sensitivity test

Base	Carbon-traded								Carbon capped							
Assessment of need	Base				Base No I to I				Base				Base No I to I			
mppa	2011	2030	2040	2050	2011	2030	2040	2050	2011	2030	2040	2050	2011	2030	2040	2050
Heathrow	70	85	90	95	51	78	84	91	70	85	89	94	51	76	84	90
Gatwick	34	42	46	47	34	44	47	50	34	41	44	47	34	43	46	47
Stansted	18	35	35	35	17	29	35	35	18	34	35	35	17	28	34	35
Luton	10	14	18	18	10	13	18	18	10	14	18	18	10	12	17	18
London City	3	8	7	7	3	6	7	7	3	7	7	7	3	5	7	7
London	135	184	196	203	115	169	191	201	135	180	193	201	115	164	188	197
Other modelled UK	83	129	163	207	83	127	157	204	83	123	148	185	83	121	142	181
UK Total	**218**	**314**	**360**	**411**	**198**	**295**	**348**	**405**	**218**	**303**	**341**	**386**	**198**	**284**	**330**	**378**

7.7 **Table 7.2** shows that in the Gatwick Airport Second Runway option under the carbon-traded case total Gatwick throughput declines by 4 to 6 million passengers and by 3 to 5 million in the carbon capped case in the 2030-2050 period. The decline in passengers at Heathrow varies between 4 and 9 million passengers but reduces in the later years. Under the carbon-traded case Gatwick has some capacity remaining in 2050 and Heathrow becomes full a year later in 2031.

Table 7.2: Gatwick Airport Second Runway option no I to I passengers sensitivity test

LGW 2R	Carbon-traded								Carbon capped							
Assessment of need	LGW 2R				LGW 2R No I to I				LGW 2R				LGW 2R No I to I			
mppa	2011	2030	2040	2050	2011	2030	2040	2050	2011	2030	2040	2050	2011	2030	2040	2050
Heathrow	70	85	91	96	51	78	85	93	70	85	89	93	51	76	83	91
Gatwick	34	50	62	82	34	46	56	76	34	46	56	69	34	43	51	64
Stansted	18	33	35	35	17	28	34	35	18	31	35	35	17	27	32	35
Luton	10	13	17	18	10	13	17	18	10	13	15	18	10	12	15	18
London City	3	7	7	8	3	5	7	7	3	6	7	8	3	5	7	7
London	135	188	213	238	115	170	199	229	135	182	202	223	115	163	188	215
Other modelled UK	83	128	156	188	83	126	152	186	83	121	142	168	83	119	139	165
UK Total	**218**	**316**	**368**	**426**	**198**	**296**	**351**	**415**	**218**	**303**	**344**	**391**	**198**	**282**	**326**	**379**

7.8 **Table 7.3** and **Table 7.4** show significant reductions in the number of passengers at Heathrow when new runway capacity is added. With carbon trading the 2050 forecast for the Heathrow Airport North West Runway option reduces by 14 million passengers and by 32 million with carbon capping. For the Heathrow Airport Extended Northern Runway option the equivalent reductions are 10 million and 24 million. The reductions are greater earlier in the period when there is less excess of demand over capacity. In the Heathrow Airport North West Runway option with carbon trading, there are no Heathrow shadow costs once the new runway capacity is added and only in 2049 with the Heathrow Airport Extended Northern Runway option. With carbon capping, Heathrow retains some capacity throughout the model period, i.e. its shadow costs are cleared.

Table 7.3: Heathrow Airport North West Runway option no I to I passengers sensitivity test

LHR NWR	Carbon-traded								Carbon capped							
Assessment of need	LHR NWR				LHR NWR No I to I				LHR NWR				LHR NWR No I to I			
mppa	2011	2030	2040	2050	2011	2030	2040	2050	2011	2030	2040	2050	2011	2030	2040	2050
Heathrow	70	116	134	138	51	79	98	124	70	109	128	135	51	73	86	103
Gatwick	34	39	43	47	34	43	46	49	34	35	36	41	34	39	42	45
Stansted	18	32	35	35	17	29	35	35	18	27	31	34	17	26	30	34
Luton	10	12	14	18	10	13	16	18	10	10	10	11	10	11	12	12
London City	3	5	8	8	3	5	7	6	3	4	5	7	3	4	5	6
London	135	205	234	245	115	169	201	233	135	186	210	228	115	153	175	200
Other modelled UK	83	126	153	190	83	126	151	183	83	110	123	141	83	110	122	140
UK Total	**218**	**331**	**387**	**435**	**198**	**296**	**353**	**415**	**218**	**296**	**332**	**369**	**198**	**263**	**297**	**340**

Table 7.4: Heathrow Airport Extended Northern Runway option no I to I passengers sensitivity test

LHR ENR	Carbon-traded								Carbon capped							
Assessment of need	LHR ENR				LHR ENR No I to I				LHR ENR				LHR ENR No I to I			
mppa	2011	2030	2040	2050	2011	2030	2040	2050	2011	2030	2040	2050	2011	2030	2040	2050
Heathrow	70	116	127	131	51	79	98	121	70	110	124	129	51	73	86	105
Gatwick	34	39	44	46	34	43	46	49	34	35	37	43	34	40	43	46
Stansted	18	32	35	35	17	29	35	35	18	27	32	35	17	26	31	34
Luton	10	12	15	18	10	13	16	18	10	11	10	12	10	11	12	12
London City	3	5	7	8	3	5	7	7	3	4	6	7	3	4	6	7
London	135	205	229	238	115	169	201	230	135	187	209	226	115	155	177	203
Other modelled UK	83	126	154	193	83	126	151	184	83	112	126	146	83	112	124	143
UK Total	**218**	**331**	**383**	**430**	**198**	**296**	**353**	**414**	**218**	**299**	**335**	**372**	**198**	**267**	**302**	**347**

Destinations served, daily services

7.9 The analysis presented in **Table 7.5** to **Table 7.8** summarises the number of separate route destinations served without any extra runway capacity for Gatwick, Heathrow, all five London airports, non-London airports and all UK airports. A threshold of at least one daily

service throughout the year is applied. This is defined in the analysis as being at least 365 daily scheduled departures a year, or 730 annual passenger ATMs (arriving and departing) air transport movements. The daily threshold applied is relatively stringent. The tables include only scheduled services (both 'full-service' and LCC), and therefore exclude charter.

7.10 It is important to understand that this destinations served by area analysis is not additive. For example if a destination is served at Gatwick it will be counted once at Gatwick, once in the London total and once in the national total, three times in all.

Table 7.5: Baseline, destinations served with daily scheduled services

Base	No I to I test							difference from 'do minimum'					
Assessment of need		carbon-traded			carbon capped			carbon-traded			carbon capped		
	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
LGW													
Short Haul	57	63	60	54	62	60	56	-4	-3	-7	-7	-2	-4
Long Haul	14	20	22	24	19	22	23	4	4	4	3	4	4
All International	71	83	82	78	81	82	79	0	1	-3	-4	2	0
Domestic	8	7	6	6	7	6	6	0	-2	-2	0	-2	-2
Total	79	90	88	84	88	88	85	0	-1	-5	-4	0	-2
LHR													
Short Haul	63	75	64	56	74	68	57	7	2	1	7	7	3
Long Haul	41	49	54	58	49	53	58	-9	-7	-5	-9	-8	-5
All International	104	124	118	114	123	121	115	-2	-5	-4	-2	-1	-2
Domestic	7	6	5	5	6	5	5	2	2	2	2	2	2
Total	111	130	123	119	129	126	120	0	-3	-2	0	1	0
London													
Short Haul	103	132	134	134	131	132	133	4	7	5	3	7	3
Long Haul	48	69	76	82	68	75	81	-5	-3	-1	-6	-4	-1
All International	151	201	210	216	199	207	214	-1	4	4	-3	3	2
Domestic	10	9	10	9	9	10	9	0	1	0	0	1	0
Total	161	210	220	225	208	217	223	-1	5	4	-3	4	2
Other Modelled Airports													
Short Haul	41	71	82	96	69	77	88	-2	-1	-3	-2	-2	2
Long Haul	5	18	21	25	18	20	24	1	0	-1	1	0	1
All International	46	89	103	121	87	97	112	-1	-1	-4	-1	-2	3
Domestic	25	26	26	27	26	26	27	0	0	0	0	0	0
Total	71	115	129	148	113	123	139	-1	-1	-4	-1	-2	3
National													
Short Haul	104	132	134	139	131	132	134	3	6	4	2	6	2
Long Haul	48	69	76	82	68	75	81	-5	-3	-1	-6	-4	-1
All International	152	201	210	221	199	207	215	-2	3	3	-4	2	1
Domestic	26	26	27	27	26	27	27	0	1	0	0	1	0
Total	178	227	237	248	225	234	242	-2	4	3	-4	3	1

Table 7.6: Gatwick Airport Second Runway, destinations served with daily scheduled services													
LGW 2R	No I to I test							difference from 'do minimum'					
Assessment of need		carbon-traded			carbon capped			carbon-traded			carbon capped		
	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
LGW													
Short Haul	57	64	73	95	62	62	82	-11	-15	-18	-12	-20	-12
Long Haul	14	20	22	25	19	22	23	0	4	4	3	4	3
All International	71	84	95	120	81	84	105	-11	-11	-14	-9	-16	-9
Domestic	8	7	6	6	7	6	6	0	-2	-2	0	-2	-2
Total	79	91	101	126	88	90	111	-11	-13	-16	-9	-18	-11
London													
Short Haul	103	131	134	139	130	130	137	4	2	-4	5	-1	0
Long Haul	48	69	76	83	68	75	81	-6	-5	-5	-7	-6	-4
All International	151	200	210	222	198	205	218	-2	-3	-9	-2	-7	-4
Domestic	10	9	10	10	9	10	10	0	0	0	0	0	0
Total	161	209	220	232	207	215	228	-2	-3	-9	-2	-7	-4
Other Modelled Airports													
Short Haul	41	70	77	81	68	75	80	-1	-2	0	-3	-1	0
Long Haul	5	18	20	24	18	20	23	1	-1	-1	1	1	1
All International	46	88	97	105	86	95	103	0	-3	-1	-2	0	1
Domestic	25	26	26	27	26	26	27	0	0	0	0	0	0
Total	71	114	123	132	112	121	130	0	-3	-1	-2	0	1
National													
Short Haul	104	131	134	139	131	130	138	3	1	-4	5	-2	1
Long Haul	48	69	76	83	68	75	81	-6	-5	-5	-7	-6	-4
All International	152	200	210	222	199	205	219	-3	-4	-9	-2	-8	-3
Domestic	26	26	27	28	26	27	28	0	0	0	0	0	0
Total	178	226	237	250	225	232	247	-3	-4	-9	-2	-8	-3

Table 7.7: Heathrow Airport North West Runway, destinations served with daily scheduled services

LHR NWR	No I to I test							difference from 'do minimum'					
Assessment of need		carbon-traded			carbon capped			carbon-traded			carbon capped		
	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
LHR													
Short Haul	63	75	78	88	72	76	78	-11	-9	7	-13	-13	-8
Long Haul	41	49	54	59	47	50	58	-19	-19	-16	-18	-21	-15
All International	104	124	132	147	119	126	136	-30	-28	-9	-31	-34	-23
Domestic	7	6	6	5	6	5	5	2	2	1	2	1	1
Total	111	130	138	152	125	131	141	-28	-26	-8	-29	-33	-22
London													
Short Haul	103	131	137	140	128	132	138	0	2	3	-1	1	1
Long Haul	48	69	76	84	66	71	80	-12	-11	-8	-10	-13	-7
All International	151	200	213	224	194	203	218	-12	-9	-5	-11	-12	-6
Domestic	10	9	10	10	9	10	10	-1	0	0	0	0	0
Total	161	209	223	234	203	213	228	-13	-9	-5	-11	-12	-6
Other Modelled Airports													
Short Haul	41	70	79	83	64	69	71	1	-1	-2	2	0	-3
Long Haul	5	18	20	24	16	18	21	1	0	1	1	0	0
All International	46	88	99	107	80	87	92	2	-1	-1	3	0	-3
Domestic	25	26	26	27	26	26	26	0	0	0	0	0	0
Total	71	114	125	134	106	113	118	2	-1	-1	3	0	-3
National													
Short Haul	104	131	137	140	128	132	138	0	2	3	-1	1	1
Long Haul	48	69	76	84	66	71	80	-12	-11	-8	-10	-13	-7
All International	152	200	213	224	194	203	218	-12	-9	-5	-11	-12	-6
Domestic	26	26	27	28	26	27	27	-1	0	0	0	0	0
Total	178	226	240	252	220	230	245	-13	-9	-5	-11	-12	-6

Table 7.8: Heathrow Airport Extended Northern Runway, destinations served with daily scheduled services

LHR ENR	No I to I test							difference from 'do minimum'					
Assessment of need		carbon-traded			carbon capped			carbon-traded			carbon capped		
	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
LHR													
Short Haul	63	75	78	85	72	76	79	-11	-7	8	-13	-11	-4
Long Haul	41	49	54	59	47	51	58	-19	-16	-16	-18	-20	-14
All International	104	124	132	144	119	127	137	-30	-23	-8	-31	-31	-18
Domestic	7	6	6	5	6	5	5	2	2	1	2	1	1
Total	111	130	138	149	125	132	142	-28	-21	-7	-29	-30	-17
London													
Short Haul	103	131	136	139	128	132	138	0	1	1	-1	2	0
Long Haul	48	69	76	84	66	72	80	-12	-9	-8	-10	-12	-8
All International	151	200	212	223	194	204	218	-12	-8	-7	-11	-10	-8
Domestic	10	9	10	10	9	10	10	-1	0	0	0	0	0
Total	161	209	222	233	203	214	228	-13	-8	-7	-11	-10	-8
Other Modelled Airports													
Short Haul	41	70	79	83	65	68	76	1	0	-2	1	-3	-1
Long Haul	5	18	20	24	15	18	21	1	0	1	0	0	0
All International	46	88	99	107	80	86	97	2	0	-1	1	-3	-1
Domestic	25	26	26	27	26	26	26	0	0	0	0	0	0
Total	71	114	125	134	106	112	123	2	0	-1	1	-3	-1
National													
Short Haul	104	131	136	139	128	132	138	0	1	1	-1	2	0
Long Haul	48	69	76	84	66	72	80	-12	-9	-8	-10	-12	-8
All International	152	200	212	223	194	204	218	-12	-8	-7	-11	-10	-8
Domestic	26	26	27	28	26	27	27	-1	0	0	0	0	0
Total	178	226	239	251	220	231	245	-13	-8	-7	-11	-10	-8

Destinations served, all services

7.11 The analysis presented below in **Table 7.9** and **Table 7.12** differs from the figures above by not applying any service frequency threshold. But, as these are modelled destinations, all routes must pass a viability threshold. These tables also differ from **Table 7.5** to **Table 7.8** above by including charter routes, again subject to viability thresholds. As explained above and in paragraphs 5.27-5.28 this destinations served by area analysis is not additive.

Table 7.9: Baseline, destinations served all services													
Base	No I to I test							difference from 'do minimum'					
Assessment of need		carbon-traded			carbon capped			carbon-traded			carbon capped		
	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
LGW													
Short Haul	153	163	150	141	161	152	133	1	-16	-10	-1	-5	-14
Long Haul	49	45	47	48	45	45	48	4	6	6	4	3	6
All International	202	208	197	189	206	197	181	5	-10	-4	3	-2	-8
Domestic	8	7	7	7	7	7	7	-1	-1	-1	-1	-1	-1
Total	210	215	204	196	213	204	188	4	-11	-5	2	-3	-9
LHR													
Short Haul	67	83	70	61	81	74	61	11	2	0	9	8	2
Long Haul	65	74	80	82	71	78	82	-11	-9	-7	-14	-11	-7
All International	132	157	150	143	152	152	143	0	-7	-7	-5	-3	-5
Domestic	7	6	5	5	6	5	5	2	2	2	2	2	2
Total	139	163	155	148	158	157	148	2	-5	-5	-3	-1	-3
London													
Short Haul	216	224	226	227	222	228	224	-3	1	2	-4	3	2
Long Haul	98	118	126	129	115	122	129	-5	-2	0	-8	-5	0
All International	314	342	352	356	337	350	353	-8	-1	2	-12	-2	2
Domestic	10	10	10	10	10	10	10	1	0	0	1	0	0
Total	324	352	362	366	347	360	363	-7	-1	2	-11	-2	2
Other Modelled Airports													
Short Haul	179	223	228	230	220	225	231	-1	-2	-3	-1	-3	1
Long Haul	46	70	86	100	65	80	95	0	-1	1	0	-2	1
All International	225	293	314	330	285	305	326	-1	-3	-2	-1	-5	2
Domestic	28	29	29	29	29	29	29	0	0	0	0	0	0
Total	253	322	343	359	314	334	355	-1	-3	-2	-1	-5	2
National													
Short Haul	225	235	239	242	234	239	241	-4	-2	-1	-4	-1	0
Long Haul	98	118	127	130	115	122	130	-5	-2	0	-8	-5	0
All International	323	353	366	372	349	361	371	-9	-4	-1	-12	-6	0
Domestic	28	29	29	29	29	29	29	0	0	0	0	0	0
Total	351	382	395	401	378	390	400	-9	-4	-1	-12	-6	0

Table 7.10: Gatwick Airport Second Runway, destinations served all services													
LGW 2R	No I to I test							difference from 'do minimum'					
Assessment of need		carbon-traded			carbon capped			carbon-traded			carbon capped		
	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
LGW													
Short Haul	153	172	173	207	161	169	184	-9	-19	-3	-16	-19	-21
Long Haul	49	45	48	49	45	45	49	-2	4	3	4	1	4
All International	202	217	221	256	206	214	233	-11	-15	0	-12	-18	-17
Domestic	8	7	7	7	7	7	7	-1	-1	-1	0	-1	-1
Total	210	224	228	263	213	221	240	-12	-16	-1	-12	-19	-18
London													
Short Haul	216	224	228	233	222	226	229	-3	-1	0	-4	-2	0
Long Haul	98	118	127	130	115	122	130	-5	-2	-1	-8	-7	0
All International	314	342	355	363	337	348	359	-8	-3	-1	-12	-9	0
Domestic	10	10	10	10	10	10	10	1	0	0	1	0	0
Total	324	352	365	373	347	358	369	-7	-3	-1	-11	-9	0
Other Modelled Airports													
Short Haul	179	222	226	224	219	224	229	-1	-2	-3	1	0	1
Long Haul	46	69	82	97	65	79	93	3	-1	-1	1	2	2
All International	225	291	308	321	284	303	322	2	-3	-4	2	2	3
Domestic	28	29	29	29	29	29	29	0	0	0	0	0	0
Total	253	320	337	350	313	332	351	2	-3	-4	2	2	3
National													
Short Haul	225	235	239	244	234	237	241	-3	-2	-1	-4	-2	0
Long Haul	98	118	127	130	115	122	130	-5	-2	-1	-8	-7	0
All International	323	353	366	374	349	359	371	-8	-4	-2	-12	-9	0
Domestic	28	29	29	29	29	29	29	0	0	0	0	0	0
Total	351	382	395	403	378	388	400	-8	-4	-2	-12	-9	0

Table 7.11: Heathrow Airport North West Runway, destinations served all services													
LHR NWR	No I to I test							difference from 'do minimum'					
Assessment of need		carbon-traded			carbon capped			carbon-traded			carbon capped		
	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
LHR													
Short Haul	67	84	87	101	81	84	90	-14	-12	15	-15	-18	-6
Long Haul	65	74	80	82	70	77	82	-20	-18	-17	-22	-20	-16
All International	132	158	167	183	151	161	172	-34	-30	-2	-37	-38	-22
Domestic	7	6	6	5	6	5	5	2	2	1	2	1	1
Total	139	164	173	188	157	166	177	-32	-28	-1	-35	-37	-21
London													
Short Haul	216	223	226	231	222	222	225	-2	0	0	-1	0	-1
Long Haul	98	118	127	129	114	121	129	-6	-3	-4	-9	-5	-1
All International	314	341	353	360	336	343	354	-8	-3	-4	-10	-5	-2
Domestic	10	10	10	10	10	10	10	0	0	0	0	0	0
Total	324	351	363	370	346	353	364	-8	-3	-4	-10	-5	-2
Other Modelled Airports													
Short Haul	179	223	226	228	214	222	227	1	-2	3	0	-1	7
Long Haul	46	70	82	93	60	74	87	2	1	1	1	4	1
All International	225	293	308	321	274	296	314	3	-1	4	1	3	8
Domestic	28	29	29	29	29	29	29	0	0	0	0	0	0
Total	253	322	337	350	303	325	343	3	-1	4	1	3	8
National													
Short Haul	225	234	237	240	234	234	235	-2	-3	-3	-2	-2	-3
Long Haul	98	118	127	130	114	121	129	-6	-3	-3	-9	-5	-1
All International	323	352	364	370	348	355	364	-8	-6	-6	-11	-7	-4
Domestic	28	29	29	29	29	29	29	0	0	0	0	0	0
Total	351	381	393	399	377	384	393	-8	-6	-6	-11	-7	-4

Table 7.12: Heathrow Airport Extended Northern Runway, destinations served all services													
LHR ENR	No I to I test							difference from 'do minimum'					
Assessment of need		carbon-traded			carbon capped			carbon-traded			carbon capped		
	2011	2030	2040	2050	2030	2040	2050	2030	2040	2050	2030	2040	2050
LHR													
Short Haul	67	84	87	97	81	84	90	-14	-8	16	-15	-13	-2
Long Haul	65	74	80	82	70	77	82	-20	-17	-16	-22	-20	-15
All International	132	158	167	179	151	161	172	-34	-25	0	-37	-33	-17
Domestic	7	6	6	5	6	5	5	2	2	1	2	1	1
Total	139	164	173	184	157	166	177	-32	-23	1	-35	-32	-16
London													
Short Haul	216	223	226	230	222	222	226	-2	0	0	-2	0	-2
Long Haul	98	118	127	129	114	121	129	-6	-2	-4	-9	-5	-1
All International	314	341	353	359	336	343	355	-8	-2	-4	-11	-5	-3
Domestic	10	10	10	10	10	10	10	0	0	0	0	0	0
Total	324	351	363	369	346	353	365	-8	-2	-4	-11	-5	-3
Other Modelled Airports													
Short Haul	179	223	226	231	215	224	228	1	-2	6	0	-1	7
Long Haul	46	69	81	93	62	75	88	1	0	-4	2	1	2
All International	225	292	307	324	277	299	316	2	-2	2	2	0	9
Domestic	28	29	29	29	29	29	29	0	0	0	0	0	0
Total	253	321	336	353	306	328	345	2	-2	2	2	0	9
National													
Short Haul	225	234	237	242	234	234	237	-2	-3	-1	-2	-2	-5
Long Haul	98	118	127	130	114	121	129	-6	-2	-3	-9	-5	-1
All International	323	352	364	372	348	355	366	-8	-5	-4	-11	-7	-6
Domestic	28	29	29	29	29	29	29	0	0	0	0	0	0
Total	351	381	393	401	377	384	395	-8	-5	-4	-11	-7	-6

No carbon price in fares

7.12 This sensitivity test measures the impact of carbon prices on all the airport capacity development options under the *assessment of need* scenario. It is assumed that there is no carbon price and that all countries are free to meet demand. All other assumptions are identical to those in the *assessment of need* scenario.

Table 7.13: Base, no carbon price in fares sensitivity test, passenger numbers and CO_2 emissions

Base							
Assessment of need		**Base, carbon-traded**			**Base, No carbon price**		
mppa	**2011**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**
Heathrow	70	85	90	95	85	93	99
Gatwick	34	42	46	47	43	46	49
Stansted	18	35	35	35	35	35	35
Luton	10	14	18	18	17	18	18
London City	3	8	7	7	7	7	8
London	135	184	196	203	188	199	209
Other modelled UK	83	129	163	207	141	194	243
UK Total	**218**	**314**	**360**	**411**	**329**	**393**	**452**

		Base, traded carbon			**Base, No carbon price**		
UK	**2011**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**
Mt CO_2e	34.4	40.4	41.1	39.9	42.0	44.5	44.1
Aircraft kms (millions)	3270.9	4288.7	4826.3	5529.3	4492.5	5246.0	6058.7

7.13 No carbon cost in fares predictably stimulates further demand over and above that in the baseline of no new runway capacity in the *assessment of need* forecast. **Table 7.13** shows that results in an increase in national demand rising from 15 million in 2030 of 41 million passengers by 2050. Of the extra passengers in 2050, only 6 million are at London airports, reflecting the capacity constraints in the London airports present in the base option of no new runway capacity. This additional demand results in 4.2Mt more CO_2 emissions in 2050 compared to the main carbon-traded case.

Table 7.14: Gatwick Airport Second Runway, no carbon price in fares sensitivity test, passenger numbers and CO_2 emissions							
	LGW 2R						
Assessment of need		LGW 2R, carbon-traded			LGW 2R, No carbon price		
mppa	2011	2030	2040	2050	2030	2040	2050
Heathrow	70	85	91	96	85	92	99
Gatwick	34	50	62	82	54	78	90
Stansted	18	33	35	35	35	35	35
Luton	10	13	17	18	15	18	18
London City	3	7	7	8	8	7	8
London	135	188	213	238	196	231	250
Other modelled UK	83	128	156	188	138	176	226
UK Total	**218**	**316**	**368**	**426**	**334**	**407**	**477**

		LGW 2R, traded carbon			LGW 2R, No carbon price		
UK	2011	2030	2040	2050	2030	2040	2050
Mt CO_2e	34.4	40.8	42.1	40.8	42.7	46.4	46.4
Aircraft kms (millions)	3270.9	4325.5	4916.1	5694.2	4545.3	5425.0	6357.3

7.14 **Table 7.14** shows that in the Gatwick Airport Second Runway option nationally there are 18 million additional passengers in 2030 rising to 49 million additional passengers by 2050 as a result of the zero carbon price. Of the extra passengers in 2050, 8 million use Gatwick, with most of the others using regional airports. This additional demand results in 5.6MtCO_2 higher emissions in 2050 compared to the carbon-traded case and 2.3Mt more CO_2 emissions compared to the baseline of no new runway capacity under this test.

Table 7.15: Heathrow Airport North West Runway, no carbon price in fares sensitivity test, passenger numbers and CO_2 emissions							
	LHR NWR						
Assessment of need		**LHR NWR, carbon-traded**			**LHR NWR, No carbon price**		
mppa	**2011**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**
Heathrow	70	116	134	138	120	134	141
Gatwick	34	39	43	47	41	47	49
Stansted	18	32	35	35	35	35	35
Luton	10	12	14	18	13	18	18
London City	3	5	8	8	5	7	8
London	135	205	234	245	214	241	252
Other modelled UK	83	126	153	190	135	176	230
UK Total	**218**	**331**	**387**	**435**	**350**	**417**	**481**

		LHR NWR, traded carbon			LHR NWR, No carbon price		
UK	**2011**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**
Mt CO_2e	34.4	43.4	45.2	43.3	45.6	48.6	47.5
Aircraft kms (millions)	3270.9	4527.1	5173.8	5799.9	4760.2	5563.7	6402.9

7.15 **Table 7.15** shows that in the Heathrow Airport North West Runway option, the zero carbon price stimulates an additional 10 million passengers in 2030 rising to 46 million more passengers by 2050. Of these new passengers in 2050, only 3 million use Heathrow where shadow costs have returned because Heathrow is using all its runway capacity. This additional demand results in 4.2Mt more CO_2 emissions in 2050 compared to the carbon-traded case and 3.4Mt more CO_2 emissions compared to the baseline of no new runway capacity under this test.

Table 7.16: Heathrow Airport Extended Northern Runway, no carbon price in fares sensitivity test, passenger numbers and CO_2 emissions							
	LHR ENR						
Assessment of need		LHR ENR, carbon-traded			LHR ENR, No carbon price		
mppa	2011	2030	2040	2050	2030	2040	2050
Heathrow	70	116	127	131	120	127	133
Gatwick	34	39	44	46	41	47	50
Stansted	18	32	35	35	35	35	35
Luton	10	12	15	18	13	18	18
London City	3	5	7	8	5	7	7
London	135	205	229	238	215	234	243
Other modelled UK	83	126	154	193	135	178	232
UK Total	**218**	**331**	**383**	**430**	**350**	**412**	**475**

		LHR ENR, traded carbon			LHR ENR, No carbon price		
UK	2011	2030	2040	2050	2030	2040	2050
Mt CO_2e	34.4	43.4	44.7	42.6	45.6	47.8	46.8
Aircraft kms (millions)	3270.9	4525.7	5124.8	5751.3	4759.5	5487.3	6311.0

7.16 **Table 7.16** shows that in the Heathrow Airport Extended Northern Runway option, there are 19 million additional passengers in 2030 rising to 45 million additional passengers by 2050 as a result of the zero carbon price. Of these extra passengers in 2050, only 2 million use Heathrow where shadow costs have returned. This additional demand results in 4.2Mt more CO_2 emissions in 2050 compared to the carbon-traded case and 2.7Mt more CO_2 emissions compared to the baseline of no new runway capacity under this test.

Phased in capacity at Heathrow Airport Northwest Runway

7.17 This sensitivity test explores the impact of new capacity at Heathrow opening gradually as opposed to all the capacity being available in the opening year. The phased release of new capacity may be necessary in order for the airport to operate within any environmental limits set as a condition for growth. It may also drive commercial gains for the airport operator, maintaining high demand for slots. Heathrow Airport Limited modelled a staged release of new capacity in its submission to the Airports Commission.

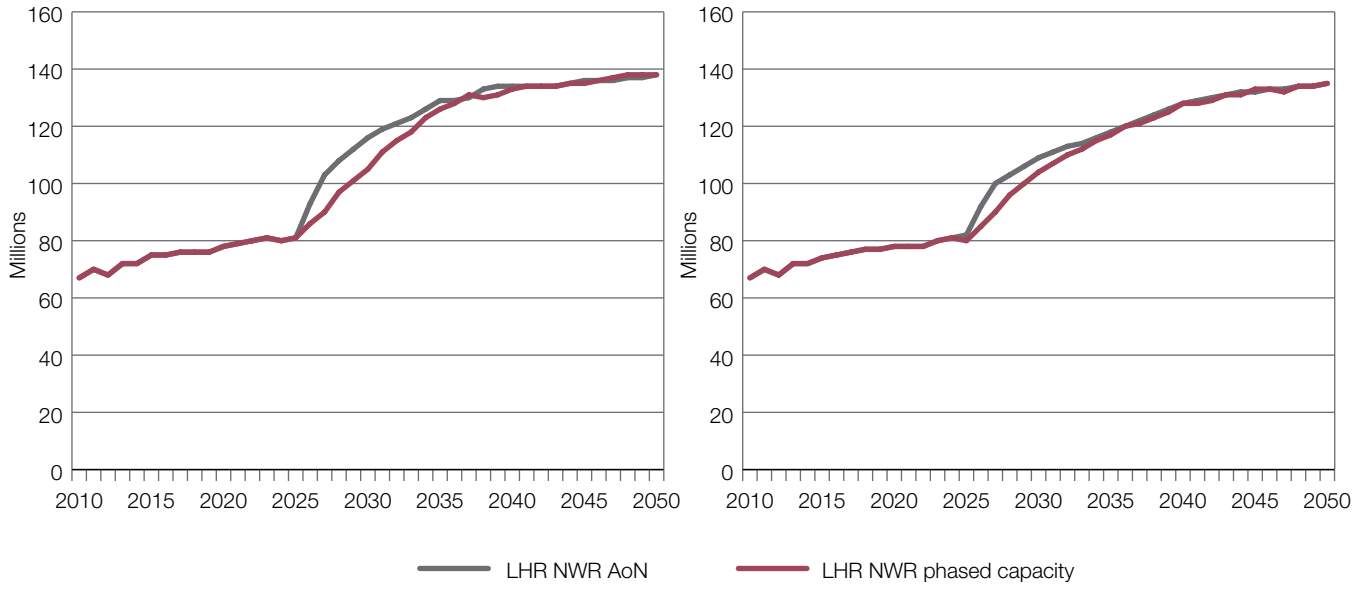
7.18 This sensitivity test was only run for the Heathrow Airport North West Runway option under the *assessment of need* demand scenario in the carbon-traded and carbon capped cases. It is assumed that the 260,000 extra ATM runway capacity is phased in over 10 years on a linear basis i.e. 26,000 capacity is added every year between 2026 and 2035.

Table 7.17: Heathrow Airport North West Runway option phased in capacity sensitivity test														
LHR NWR		**Carbon-traded**							**Carbon capped**					
Assessment of need		**Option LHR NWR**			**capacity test**				**LHR NWR**			**capacity test**		
mppa	**2011**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**	**2011**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**
Heathrow	70	116	134	138	105	133	138	70	109	128	135	104	128	135
Gatwick	34	39	43	47	41	44	47	34	35	36	41	37	36	40
Stansted	18	32	35	35	33	35	35	18	27	31	34	27	31	34
Luton	10	12	14	18	13	15	18	10	10	10	11	11	10	11
London City	3	5	8	8	6	7	8	3	4	5	7	5	5	7
London	135	205	234	245	198	235	245	135	186	210	228	184	210	228
Other modelled UK	83	126	153	190	127	152	190	83	110	123	141	111	123	142
UK Total	**218**	**331**	**387**	**435**	**325**	**387**	**436**	**218**	**296**	**332**	**369**	**294**	**333**	**369**
Paris CDG	58	81	96	117	82	96	116	58	73	83	96	74	83	96
Amsterdam	41	57	67	82	58	67	81	41	51	57	65	51	57	65
Frankfurt	53	71	88	113	75	88	114	53	62	70	86	64	70	86
Dubai	45	99	123	157	99	122	156	45	90	106	132	90	106	133
Foreign Hubs Total	**198**	**309**	**374**	**468**	**314**	**374**	**468**	**198**	**277**	**315**	**379**	**279**	**316**	**380**

7.19 **Table 7.17** shows that with carbon trading the effect is to reduce Heathrow throughput from 116 to 105 million passengers in 2030 but that the change becomes negligible by 2040. In 2030 there are 1 million more passengers at the regional airports and 5 million more at the foreign hubs. Again these differences have disappeared by 2040.

7.20 The impacts are lower in the carbon capped case. Heathrow throughput is only 5 million passengers lower in 2030 with 1 million more passengers at the regional airports and 2 million more at the foreign hubs. By 2040 the results are almost identical.

Figure 7.1: Heathrow Airport North West Runway option changes in passengers with phased in new capacity



7.21 **Figure 7.1** shows the difference between the carbon-traded and capped passenger demand profiles over the modelled period. The capped levels are slightly lower but the results return to the level of the main option results quicker than in the traded case. This is because demand at Heathrow is lower and model equilibrium is reached sooner.

Surface access at Heathrow Hub

7.22 This sensitivity test measures the impact of having the "on-site" surface access solution, similar to that proposed by HAL, applied to the Heathrow Airport Extended Northern Runway airfield design in the carbon-traded case. This test was made to allow the Commission to assess either Heathrow airfield scheme with either the "on-site" or hub station transport solutions. All other assumptions are identical to those in the *assessment of need* demand scenario.

Table 7.18: Heathrow Airport Extended Northern Runway option, with Heathrow Airport North West Runway surface access sensitivity test, million terminal passengers

LHR ENR		Carbon-traded							Carbon capped					
Assessment of need		LHR ENR			surface access test				LHR ENR			surface access test		
mppa	2011	2030	2040	2050	2030	2040	2050	2011	2030	2040	2050	2030	2040	2050
Heathrow	70	116	127	131	116	127	131	70	110	124	129	110	124	128
Gatwick	34	39	44	46	39	44	47	34	35	37	43	35	37	44
Stansted	18	32	35	35	32	35	35	18	27	32	35	27	32	35
Luton	10	12	15	18	12	15	18	10	11	10	12	11	10	12
London City	3	5	7	8	5	7	8	3	4	6	7	4	6	7
London	135	205	229	238	205	229	239	135	187	209	226	187	209	226
Other modelled UK	83	126	154	193	126	154	192	83	112	126	146	112	126	146
UK Total	**218**	**331**	**383**	**430**	**331**	**383**	**431**	**218**	**299**	**335**	**372**	**299**	**335**	**372**

7.23 **Table 7.18** shows that using the on-site surface access assumptions with the Heathrow Airport Extended Northern Runway airfield capacity makes very little difference to the Heathrow Airport Extended Northern Runway option forecast passenger levels. This is because the on-site and hub station surface access inputs result in very similar modelled passenger surface access costs to Heathrow, on average across transport modes and origin points. The differences in the highway network are essentially local to the immediate Heathrow access roads to accommodate the different runway configuration and, although significant in engineering terms, in a strategic model of Heathrow surface access cost from all UK districts the effect of using an on-site or hub option on overall surface access costs is not materially different.

Lower capacity at Heathrow Airport Extended Northern Runway

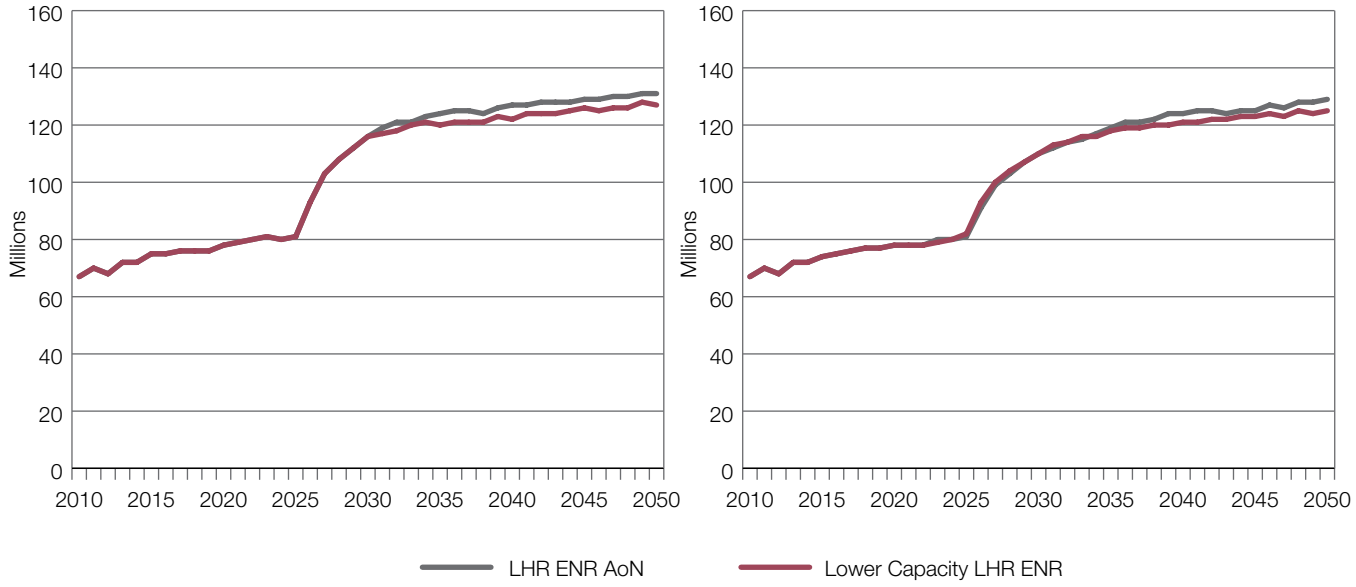
7.24 This sensitivity test examines the impact of having a lower additional runway capacity under the Heathrow Airport Extended Northern Runway option. It is assumed that the northern runway extension results in 200,000 rather than 220,000 additional ATMs at Heathrow. This test has been run under the *Assessment of need* demand scenario for both carbon cases. This test was made because of some uncertainty on the exact capacity of the proposed runway extension and taxiway network, given the innovative and untested nature of its proposed form of operation.

Table 7.19: Heathrow Airport Extended Northern Runway option, lower runway capacity sensitivity test, million terminal passengers

LHR ENR		Carbon-traded							Carbon capped					
Assessment of need		LHR ENR			Lower capacity test				LHR ENR			Lower capacity test		
mppa	2011	2030	2040	2050	2030	2040	2050	2011	2030	2040	2050	2030	2040	2050
Heathrow	70	116	127	131	116	122	127	70	110	124	129	110	121	125
Gatwick	34	39	44	46	39	43	47	34	35	37	43	36	39	44
Stansted	18	32	35	35	32	35	35	18	27	32	35	27	32	35
Luton	10	12	15	18	12	16	18	10	11	10	12	11	11	14
London City	3	5	7	8	5	7	8	3	4	6	7	4	6	7
London	135	205	229	238	205	225	235	135	187	209	226	189	209	224
Other modelled UK	83	126	154	193	126	155	193	83	112	126	146	113	128	149
UK Total	**218**	**331**	**383**	**430**	**331**	**379**	**429**	**218**	**299**	**335**	**372**	**302**	**337**	**373**
Foreign Hubs Total	**198**	**309**	**377**	**472**	**309**	**380**	**473**	**198**	**280**	**323**	**390**	**282**	**328**	**398**

7.25 **Table 7.19** shows the lower capacity reduces passenger demand in both the carbon-traded and carbon capped cases by the reduction in capacity, as expected. Most of this reduction occurs at Heathrow (4 million passengers in 2050), as it cannot accommodate as many passengers. With carbon trading, the national total drops by only 1 million passengers as the other 3 million passengers use the other London airports. In the carbon capped case there is an overall reduction in the use of London airports and 3 million more passengers at the regional airports by 2050.

Figure 7.2: Heathrow Airport Extended Northern Runway option, lower runway capacity sensitivity test, passenger demand graphs



7.26 **Figure 7.2** shows the profile of passenger demand over time at Heathrow with the 700,000 and 680,000 ATM capacities for both carbon cases. The demand levels are identical until the airport fills up in the lower capacity test, at which point demand remains lower than in the main option throughout the modelled period. Capacity fills up slightly slower in the carbon capped case.

High DECC carbon prices

7.27 This sensitivity shows the impact of assuming higher carbon prices, based on the DECC high appraisal carbon price values.[66] This test has been run under the *assessment of need* demand scenario and is only relevant for the carbon-traded case. Forecasts have been made for the base of no new runway capacity and the three runway capacity options.

66 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/360323/20141001_Supporting_Tables_for_DECC-HMT_Supplementary_Appraisal_Guidance.xlsx

Table 7.20: Base, high DECC carbon price in fares sensitivity test, passenger numbers and CO_2 emissions							
Base		**Carbon-traded**					
Assessment of need		**Base**			**carbon price test**		
mppa	**2011**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**
Heathrow	70	85	90	95	86	89	94
Gatwick	34	42	46	47	42	45	47
Stansted	18	35	35	35	34	35	35
Luton	10	14	18	18	14	18	18
London City	3	8	7	7	8	7	7
London	135	184	196	203	183	194	202
Other modelled UK	83	129	163	207	126	155	193
UK Total	**218**	**314**	**360**	**411**	**309**	**349**	**395**

		Base			**carbon price test**		
UK	**2011**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**
Mt CO_2e	34.4	40.4	41.1	39.9	39.9	40.2	38.4
Aircraft kms (millions)	3270.9	4288.7	4826.3	5529.3	4231.1	4695.6	5317.1

7.28 **Table 7.20** shows the baseline of no new runway capacity, including higher carbon costs in fares reduces emissions below the level of the main *assessment of need* baseline run, but not to the level of the capped case. With no additional runway capacity the carbon emissions are 0.9Mt of CO_2 short of the 2050 target for capping. There is a decrease in national demand of 5 million in 2030 and 16 million passengers by 2050. Of the 2050 decrease, only 1 million is at London airports, reflecting the capacity constraints at the London airports in the base option of no new runway capacity.

Table 7.21: Gatwick Airport Second Runway, high DECC carbon price in fares sensitivity test, passenger numbers and CO_2 emissions

LGW R2	Carbon-traded						
Assessment of need		LGW R2			carbon price test		
mppa	2011	2030	2040	2050	2030	2040	2050
Heathrow	70	85	91	96	85	90	94
Gatwick	34	50	62	82	46	58	74
Stansted	18	33	35	35	33	35	35
Luton	10	13	17	18	13	17	18
London City	3	7	7	8	8	7	8
London	135	188	213	238	185	207	229
Other modelled UK	83	128	156	188	125	149	178
UK Total	**218**	**316**	**368**	**426**	**310**	**356**	**407**

		LGW R2			carbon price test		
UK	2011	2030	2040	2050	2030	2040	2050
Mt CO_2e	34.4	40.8	42.1	40.8	39.9	40.9	39.2
Aircraft kms (millions)	3270.9	4325.5	4916.1	5694.2	4239.3	4765.3	5478.7

7.29 **Table 7.21** shows that in the Gatwick Airport Second Runway option including higher carbon costs in fares reduces emissions below the levels in the equivalent main carbon-traded case by 1.6MtCO_2 in 2050 to 1.7Mt over the 2050 capping target. There is a decrease in national demand of 6 million in 2030 and 19 million passengers by 2050. Of the 2050 decrease, almost half, 9 million, is at London airports and Gatwick itself loses 8 million passengers.

Table 7.22: Heathrow Airport North West Runway, high DECC carbon price in fares sensitivity test, passenger numbers and CO_2 emissions							
LHR NWR	Carbon-traded						
Assessment of need		LHR NWR			carbon price test		
mppa	2011	2030	2040	2050	2030	2040	2050
Heathrow	70	116	134	138	114	133	137
Gatwick	34	39	43	47	39	43	47
Stansted	18	32	35	35	31	35	35
Luton	10	12	14	18	12	13	18
London City	3	5	8	8	5	7	7
London	135	205	234	245	202	231	244
Other modelled UK	83	126	153	190	123	145	177
UK Total	**218**	**331**	**387**	**435**	**325**	**377**	**420**

		LHR NWR			carbon price test		
UK	2011	2030	2040	2050	2030	2040	2050
Mt CO_2e	34.4	43.4	45.2	43.3	42.7	44.3	42.0
Aircraft kms (millions)	3270.9	4527.1	5173.8	5799.9	4443.3	5044.3	5603.3

7.30 **Table 7.22** shows that in the Heathrow Airport North West Runway option including higher carbon costs in fares reduces emissions below the levels in the equivalent main carbon-traded case by 1.3MtCO_2 in 2050 to 4.5Mt over the 2050 capping target. There is a decrease in national demand of 6 million in 2030 and 15 million passengers by 2050. Of the 2050 decrease, only 1 million is at London airports where the Heathrow throughput is 1 million lower.

Table 7.23: Heathrow Airport Extended Northern Runway, high DECC carbon price in fares sensitivity test, passenger numbers and CO_2 emissions							
LHR ENR	Carbon-traded						
Assessment of need		LHR ENR			carbon price test		
mppa	2011	2030	2040	2050	2030	2040	2050
Heathrow	70	116	127	131	114	126	131
Gatwick	34	39	44	46	39	43	46
Stansted	18	32	35	35	31	35	35
Luton	10	12	15	18	12	14	18
London City	3	5	7	8	5	7	7
London	135	205	229	238	202	226	237
Other modelled UK	83	126	154	193	123	146	179
UK Total	**218**	**331**	**383**	**430**	**325**	**372**	**416**

		LHR ENR			carbon price test		
UK	2011	2030	2040	2050	2030	2040	2050
Mt CO_2e	34.4	43.4	44.7	42.6	42.7	43.9	41.1
Aircraft kms (millions)	3270.9	4525.7	5124.8	5751.3	4443.3	5006.7	5555.9

7.31 **Table 7.23** shows that in the Heathrow Airport Extended Northern Runway option including higher carbon costs in fares reduces emissions below the levels in the equivalent main carbon-traded case by 1.5MtCO_2 in 2050 to 3.6Mt over the 2050 capping target. There is a decrease in national demand of 6 million in 2030 and 14 million passengers by 2050. All the 2050 decrease in national throughput occurs at regional airports and the Heathrow throughput is unchanged.

Appendix 1

Additional model validation detail

Figure A1.1: Scatter plot of actual and fitted passenger numbers by routes, 2011, international and domestic with over 10,000 passengers a year

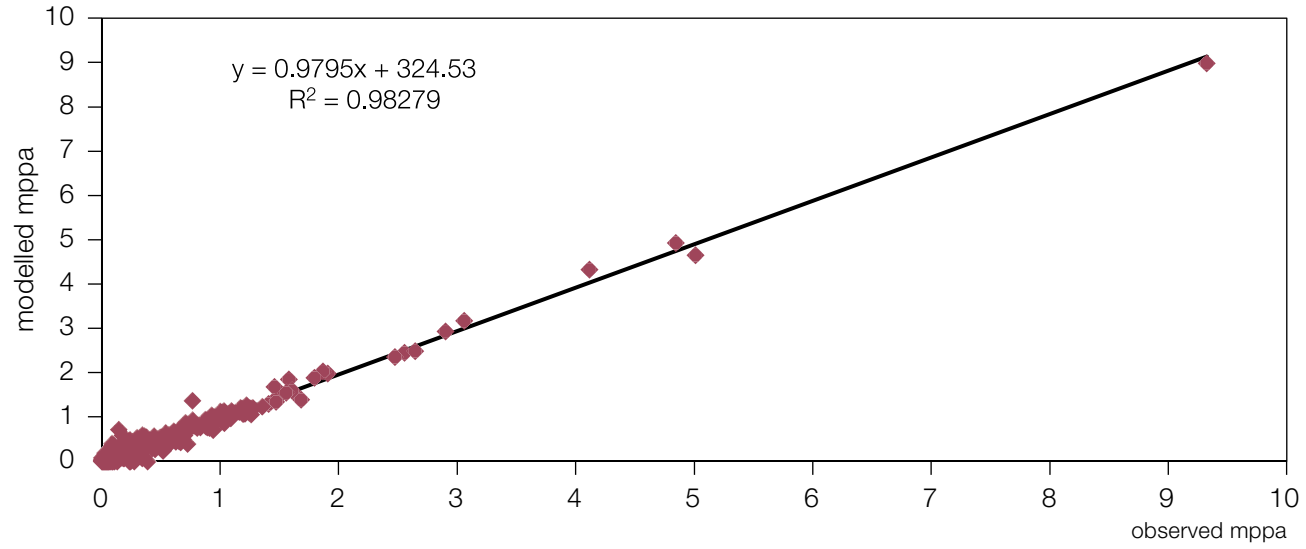


Figure A1.2: Scatter plot of actual and fitted ATMs by route, 2011, international and domestic with over 500 ATMs a year

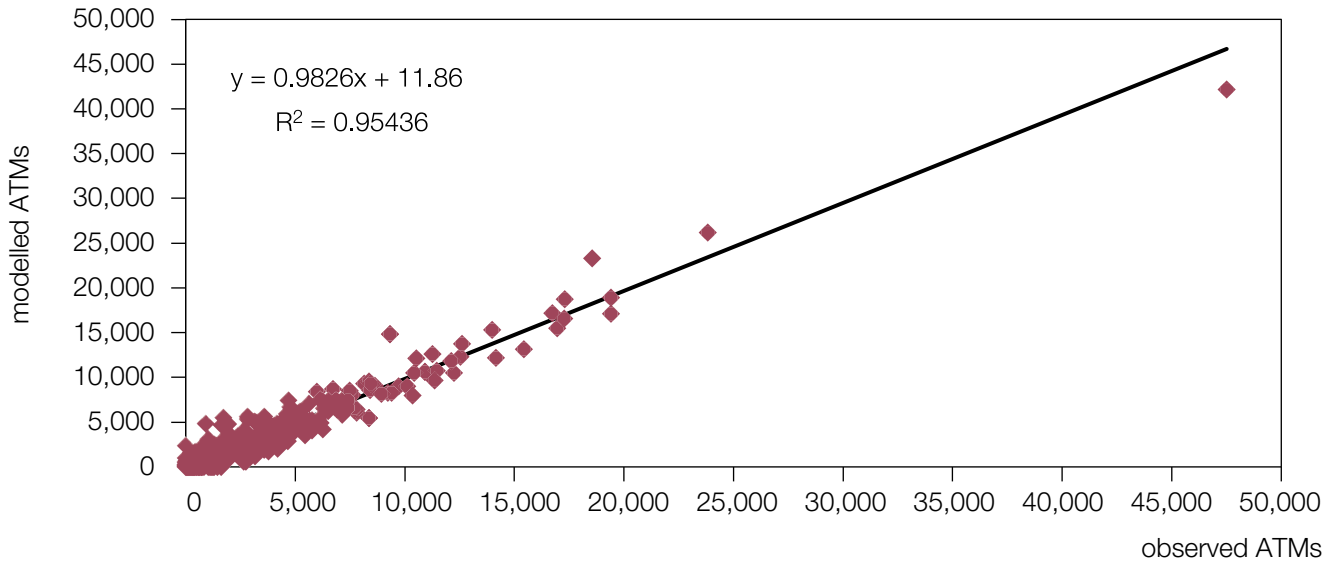
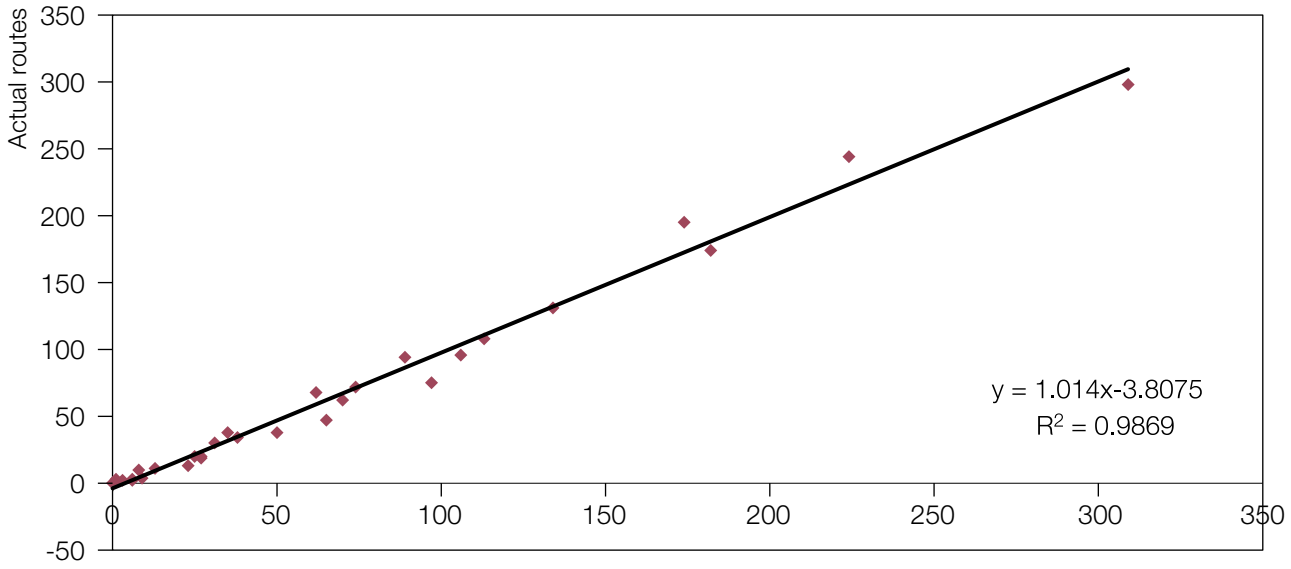


Figure A1.3: Scatter plot of actual and fitted international route numbers by airport, 2011



Appendix 2

Baseline and option road and rail schemes

Table A2.1: List of baseline rail schemes in NAAM2	
Baseline	**Year of introduction in NAAM2 / NAPAM**
Western Rail Access to Heathrow: provides better access to Heathrow for those travelling from the West with a new direct service from Reading	2020
Crossrail: 4 trains per hour (tph) serve Heathrow.	2020
Thameslink Programme: improving access to Gatwick	2020
Great Western, East Midlands and East Coast routes: significant journey time and frequency improvements.	2020
Northern Hub: significant improvements in frequency in the North of England	2020
London Underground: series of relatively small changes, including 15tph to Heathrow on the Piccadilly line.	2020
HS2 Phase One: a new high speed railway from London to West Midlands. This also has cascade effects on the rest of the rail network which is reflected in NAAM2.	2026
HS2 Phase Two: extension of the new high speed railway to Manchester and Leeds. No spur to Heathrow is assumed. This has further cascade effects on the rest of the rail network which is reflected in NAAM2.	2033

Table A2.2: List of baseline highway schemes included in NAAM2		
Road Name	**Scheme**	**Highways Agency Status**
M1	Junction 6a-10 Widening	Completed
M1	Junction 28-31 HSRU	Planned (complete year 2015)
M1	Junctions 10-13 HSRU	Complete year 2014
M1	Junctions 25-28 Widening	Current
M1	Junctions 24-25 HSRU	Current
M4	Junction 19-20 HSRU	Planned Complete year 2014
M5	Junction 15-17 HSRU	Planned Complete year 2014
M6	Junction 11a-19 Widening	Planned
M6	Junction 4-5 HSRU	Planned
M6	Junction 8-10a HSRU	Completed
M6	Junction 5-8 HSRU	Planned Complete year 2014
M6	Carlisle to Guards Mill Extension	Completed
M20	Junction 3-5 HSRU	Candidate (development, subject to VfM)
M25	Junction 16-23 Widening	Completed
M25	Junction 27-30 Widening	Completed
M25	Junction 1b-3 Widening	Current
M25	Junction 23-27 HSRU	Planned Complete year 2014
M25	Junction 5-7 HSRU	Planned Complete year 2014
M42	Junctions 3a-7 HSRU	Current
M62	Junction 25-30 HSRU	Completed in 2013
M74	M74 Completion	Current
M80	M80 Stepps to Haggs	Current
A1	Dishforth to Barton Improvement Scheme	Current
A5 – M1	Dunstable Northern Bypass	Planned (complete year 2016/17)
A11	Improvements (dualling)	Complete year 2014
A14	Ellington to Fen Ditton	Planned
A14	Kettering Bypass Widening	Planned
A21	Tonbridge to Penbury	Current
A23	Handcross to Warninglid	Planned Complete year 2014
A30	Temple to Higher Carblake Improvement	Planned (complete year 2016/17)
A46	Newark to Widmerpool Improvement	Current
A421	Bedford to M1 Junction 13	Complete
A453	Widening (M1 Junction 24 to A52 Nottingham)	Planned (complete year 2015)
A595	Parton to Lillyhall Improvement	Completed
M1	Junction 32-35a HSRU	2015/16
M1	Junction 39-42 HSRU	Planned (Complete year 2015)
A160/A180	Improvements	Planned (complete in 2016/17)
A21	Dualing	Planned
M60, M62	M60 Jn8 – M62 Jn20	Planned (Complete year 2014)
M6	Junction 10a-13	Planned (Complete year 2015)
M8, M73 and M4	New motorway and junction improvements	Complete in 2017
A487	Caernarfon to Bontnewydd	Planned (start in 2014)
A465	Dualling of the A465 Heads of the Valleys road	Complete year 2015
A477	from St Clears to Red Roses	Complete year 2014
A3	A3 Hindhead	Completed in 2011
A556	A556 Knutsford to Bowden	Complete year 2016/17
M3	M3 J2-4a	Planned (complete in 2015/16)

Table A2.3: List of option rail schemes in NAAM2
Gatwick Airport Ltd (LGW 2R)
The baseline (described above) with the following changes
Brighton Main Line: Addition of 1tph Brighton to Victoria service Addition of 1tph Bognor Regis to Victoria service
London Bridge (Thameslink): Addition of 1tph Brighton to Bedford service Addition of 1tph Horsham to Cambridge service
North Downs Line: Addition of 1tph Gatwick to Reading service Addition of 1tph Gatwick to Oxford via Reading service
Heathrow Airport Ltd (LHR NWR)
The baseline (described above) with the following changes
Revised Western Rail Access to Heathrow: a total of 4 trains per hour (as in baseline), with 2 trains per hour extended to Oxford
Heathrow Southern Access: new four trains per hour direct service to Waterloo from Heathrow, stopping at Clapham Junction, Richmond, Twickenham, Feltham and Staines
Crossrail: Increased frequency from 4tph to 6tph
Heathrow Hub Ltd (LHR ENR)
The baseline (described above) with the following changes
New Hub station between Iver and West Drayton: It is assumed to be equivalent to a 15 minute walk connection to and from T123 All mainline Great Western services stop at the new Hub station All Crossrail services stop at the new Hub station
Western Rail Access: removed, as it is assumed to be no longer required following the new Hub station. Heathrow Express revert back to their baseline pattern, terminating at Heathrow.
Crossrail: Increased frequency to 6tph, serving T5 instead of T4.
Heathrow Southern Access: new four trains per hour direct service to Waterloo from Heathrow, stopping at Clapham Junction, Richmond, Twickenham, Feltham and Staines.

Appendix 3

Assessment of need range forecasts

Table A3.1: Baseline, Low-high range, terminal passengers (mppa), carbon-traded									
Carbon-traded	**Central**			**Low**			**High**		
Base	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**
Heathrow	85	90	95	83	87	92	87	95	0
Gatwick	42	46	47	39	43	44	44	47	0
Stansted	35	35	35	26	32	35	35	35	0
Luton	14	18	18	9	11	17	18	18	0
London City	8	7	7	6	7	7	7	8	0
London	184	196	203	162	180	194	192	203	0
London annual growth rate		0.6%	0.4%		1.0%	0.8%		0.6%	
Manchester	33	42	53	28	34	43	37	49	0
Birmingham	12	17	24	9	12	16	19	26	0
Glasgow	8	9	11	6	7	9	10	11	0
Edinburgh	14	16	20	12	14	17	16	19	0
Bristol	7	10	12	6	8	10	10	12	0
Newcastle	6	7	8	5	5	6	7	8	0
Belfast International	6	8	8	5	6	7	7	8	0
Liverpool	8	9	8	6	7	6	9	11	0
East Midlands	7	10	14	5	6	8	8	13	0
Other modelled UK	27	36	49	21	24	32	35	50	0
Non-London annual growth rate		2.8%	3.3%		1.5%	2.6%		3.7%	
UK Total	**314**	**360**	**411**	**267**	**305**	**348**	**349**	**411**	**0**
UK annual growth rate		1.4%	1.3%		1.3%	1.3%		1.6%	
Paris CDG	83	99	119	81	96	113	85	103	0
Amsterdam	59	70	90	57	67	78	61	75	0
Frankfurt	81	103	114	70	87	112	91	112	0
Dubai	100	124	160	95	118	150	106	132	0
Foreign Hubs Total	**323**	**395**	**483**	**303**	**368**	**454**	**343**	**423**	**0**
Foreign hub annual growth rate		2.0%	2.0%		2.0%	2.1%		2.1%	

Table A3.2: Gatwick Airport Second Runway, *assessment of need* low-high range, terminal passengers (mppa), carbon-traded									
Carbon-traded	**Central**			**Low**			**High**		
LGW 2R	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**
Heathrow	85	91	96	82	87	94	87	93	0
Gatwick	50	62	82	39	47	58	61	86	0
Stansted	33	35	35	26	30	34	35	35	0
Luton	13	17	18	9	11	12	17	18	0
London City	7	7	8	6	7	7	8	8	0
London	188	213	238	162	183	205	207	240	0
London annual growth rate		1.2%	1.1%		1.2%	1.2%		1.5%	
Manchester	33	41	51	28	34	42	37	47	0
Birmingham	11	15	18	9	12	14	17	24	0
Glasgow	8	9	11	6	7	8	10	12	0
Edinburgh	14	17	19	12	14	17	16	19	0
Bristol	7	9	11	6	7	9	9	11	0
Newcastle	6	7	8	5	6	7	7	8	0
Belfast International	6	8	8	5	6	7	7	9	0
Liverpool	8	9	8	6	7	7	9	11	0
East Midlands	7	9	10	5	6	8	7	10	0
Other modelled UK	27	33	42	21	24	31	32	39	0
Non-London annual growth rate		2.2%	2.4%		1.5%	2.4%		2.1%	
UK Total	**316**	**368**	**426**	**267**	**307**	**354**	**357**	**430**	**0**
UK annual growth rate		1.5%	1.5%		1.4%	1.5%		1.9%	
Paris CDG	83	98	118	81	96	113	85	101	0
Amsterdam	59	69	87	57	67	79	61	72	0
Frankfurt	80	100	114	70	87	110	89	112	0
Dubai	100	124	159	95	118	149	105	131	0
Foreign Hubs Total	**322**	**391**	**478**	**303**	**367**	**451**	**339**	**415**	**0**
Foreign hub annual growth rate		2.0%	2.0%		1.9%	2.1%		2.0%	

Table A3.3: Heathrow Airport North West Runway, *assessment of need* low-high range, terminal passengers (mppa), carbon-traded									
Carbon-traded	**Central**			**Low**			**High**		
LHR NWR	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**
Heathrow	116	134	138	104	123	133	127	136	0
Gatwick	39	43	47	34	37	43	43	47	0
Stansted	32	35	35	26	31	34	35	35	0
Luton	12	14	18	8	8	10	15	18	0
London City	5	8	8	4	4	6	6	8	0
London	205	234	245	175	203	226	227	243	0
London annual growth rate		1.3%	0.5%		1.5%	1.1%		0.7%	
Manchester	33	41	52	28	34	42	36	48	0
Birmingham	10	13	19	9	10	12	15	24	0
Glasgow	7	8	11	6	6	7	9	10	0
Edinburgh	15	18	20	12	15	18	16	20	0
Bristol	7	9	11	6	7	9	9	12	0
Newcastle	6	7	8	5	5	6	7	8	0
Belfast International	6	8	9	5	6	7	7	9	0
Liverpool	8	9	9	6	7	7	9	11	0
East Midlands	7	9	11	5	6	8	7	10	0
Other modelled UK	26	32	40	20	23	30	31	41	0
Non-London annual growth rate		2.0%	2.4%		1.4%	2.5%		2.8%	
UK Total	**331**	**387**	**435**	**279**	**325**	**372**	**375**	**436**	**0**
UK annual growth rate		1.6%	1.2%		1.5%	1.4%		1.5%	
Paris CDG	81	96	117	79	94	111	83	100	0
Amsterdam	57	67	82	55	65	77	58	71	0
Frankfurt	71	88	113	65	78	99	78	106	0
Dubai	99	123	157	94	116	148	103	130	0
Foreign Hubs Total	**309**	**374**	**468**	**294**	**352**	**436**	**322**	**406**	**0**
Foreign hub annual growth rate		1.9%	2.3%		1.8%	2.1%		2.3%	

Table A3.4: Heathrow Airport Extended Northern Runway, *assessment of need* low-high range, terminal passengers (mppa), carbon-traded									
Carbon-traded	**Central**			**Low**			**High**		
LHR ENR	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**	**2030**	**2040**	**2050**
Heathrow	116	127	131	104	120	126	125	130	0
Gatwick	39	44	46	34	38	44	43	46	0
Stansted	32	35	35	26	31	34	35	35	0
Luton	12	15	18	8	8	10	15	18	0
London City	5	7	8	4	4	7	7	7	0
London	205	229	238	175	201	221	225	236	0
London annual growth rate		1.1%	0.4%		1.4%	1.0%		0.5%	
Manchester	33	41	52	28	34	42	37	48	0
Birmingham	10	13	20	9	10	12	16	24	0
Glasgow	7	8	11	6	6	7	9	10	0
Edinburgh	15	18	20	12	15	18	16	20	0
Bristol	7	9	12	6	7	9	9	12	0
Newcastle	6	7	8	5	5	6	7	8	0
Belfast International	6	8	9	5	6	7	7	9	0
Liverpool	8	9	9	6	7	7	9	11	0
East Midlands	7	9	11	5	6	8	7	11	0
Other modelled UK	26	32	41	20	24	30	31	41	0
Non-London annual growth rate		2.1%	2.5%		1.4%	2.5%		2.9%	
UK Total	**331**	**383**	**430**	**279**	**323**	**368**	**373**	**431**	**0**
UK annual growth rate		1.5%	1.2%		1.5%	1.3%		1.5%	
Paris CDG	81	97	118	79	94	112	83	100	0
Amsterdam	57	68	83	55	65	77	59	71	0
Frankfurt	71	90	113	65	78	101	79	109	0
Dubai	99	123	157	94	117	148	103	130	0
Foreign Hubs Total	**309**	**377**	**472**	**294**	**354**	**438**	**324**	**410**	**0**
Foreign hub annual growth rate		2.0%	2.3%		1.9%	2.2%		2.4%	

Appendix 4

Option catchment area maps

Figure A4.1: Option – Gatwick Airport Second Runway: ground origin passenger catchments at Gatwick and Heathrow

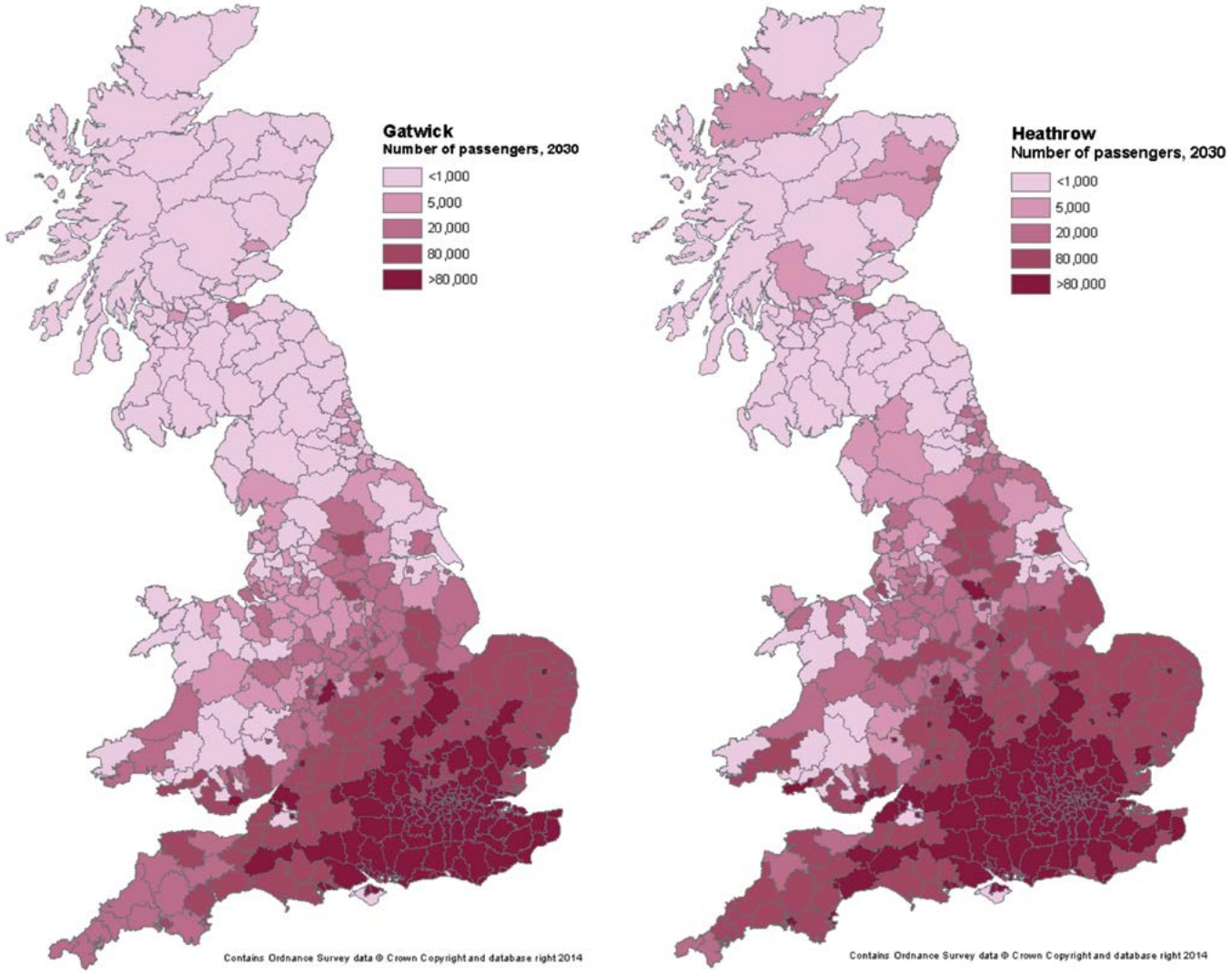


Figure A4.2: Option – Heathrow Airport North West Runway: ground origin passenger catchments at Gatwick and Heathrow

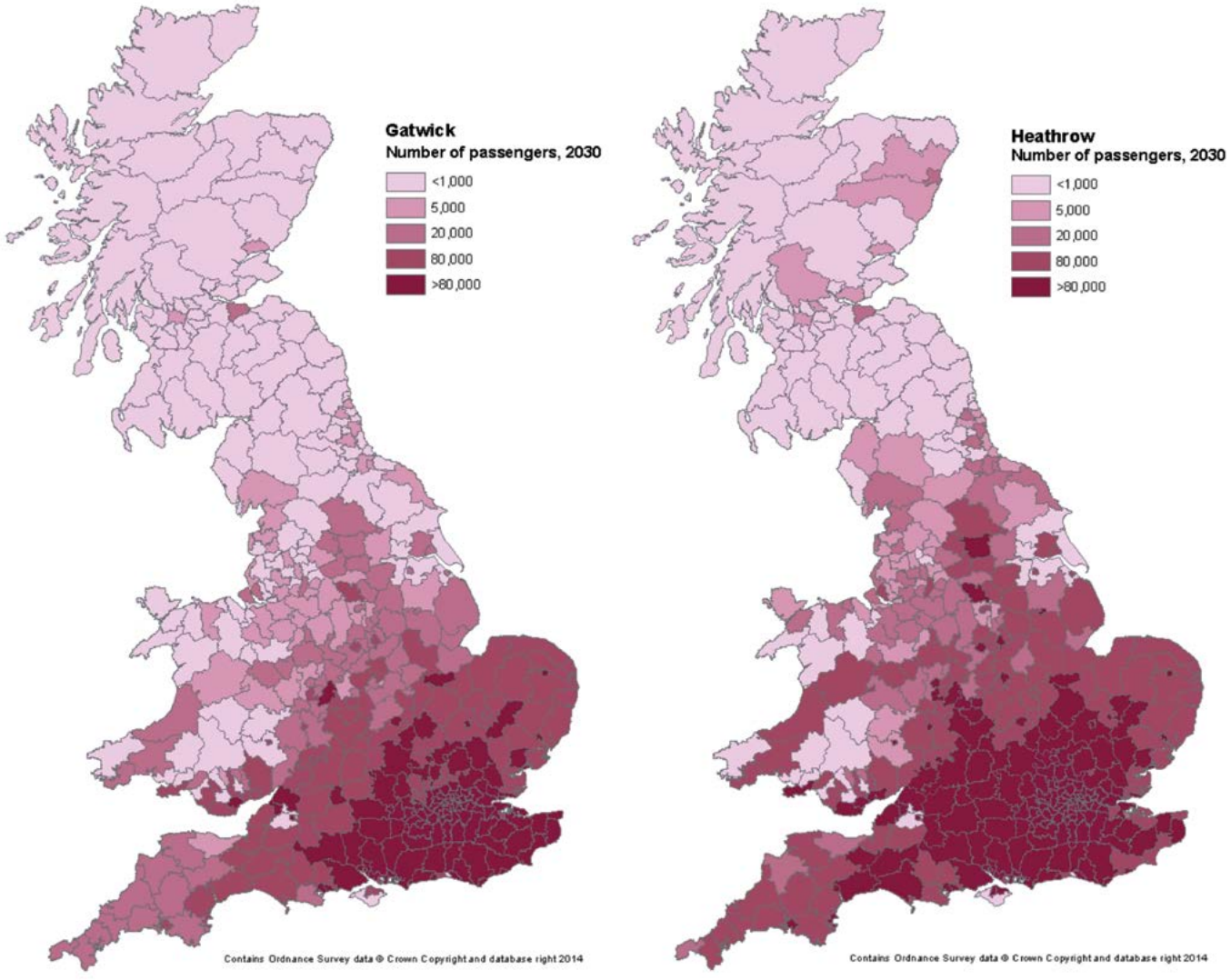
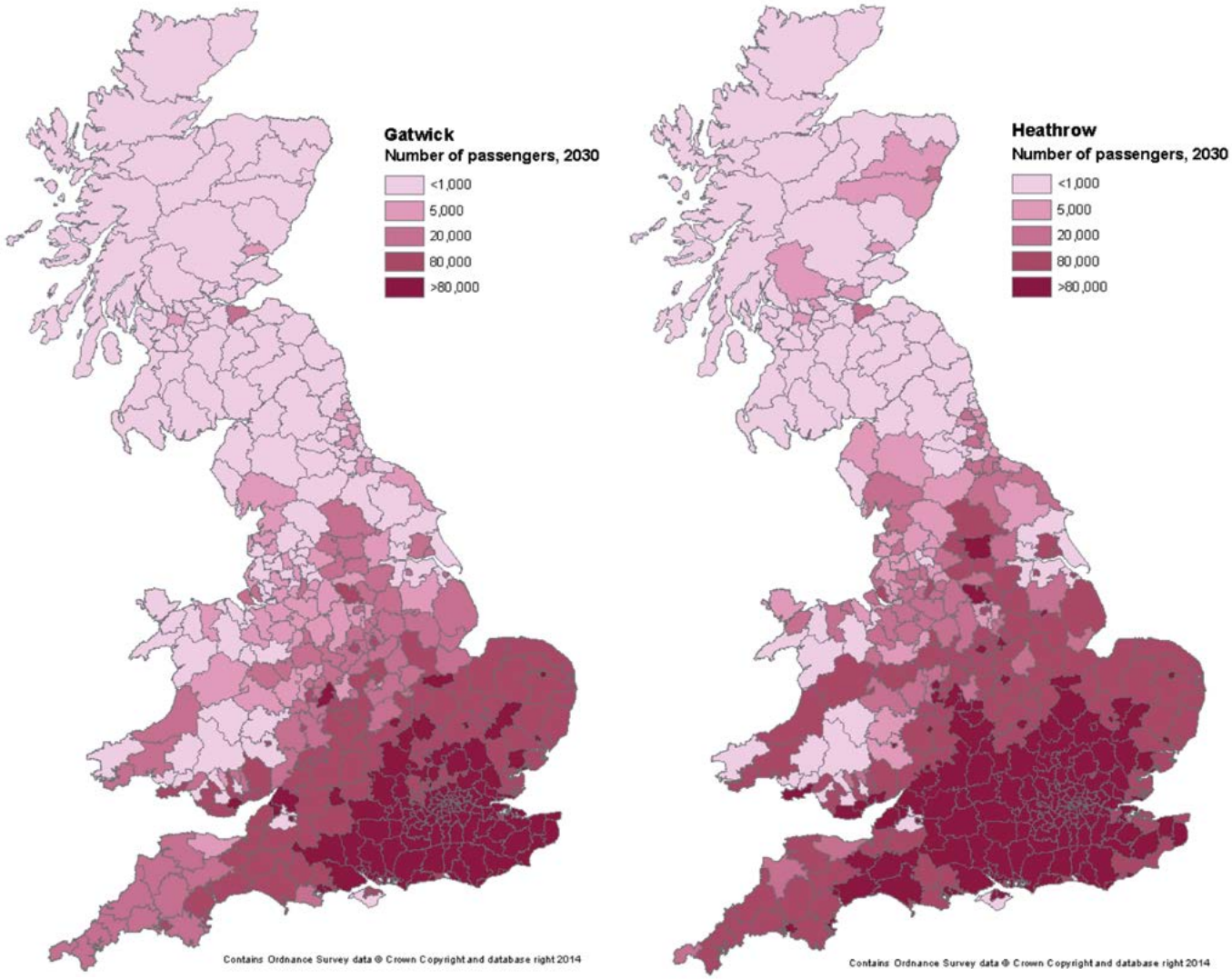


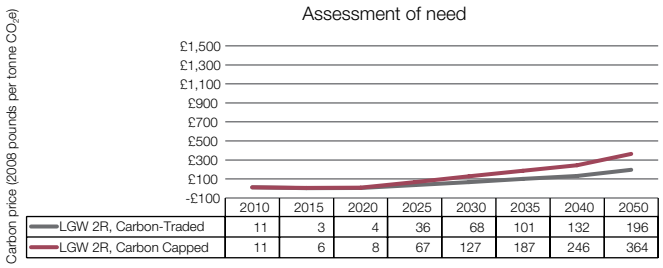
Figure A4.3: Option – Heathrow Airport Extended Northern Runway: ground origin passenger catchments at Gatwick and Heathrow



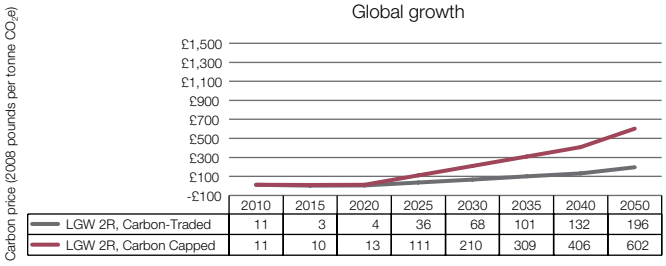
Appendix 5

Carbon capping prices

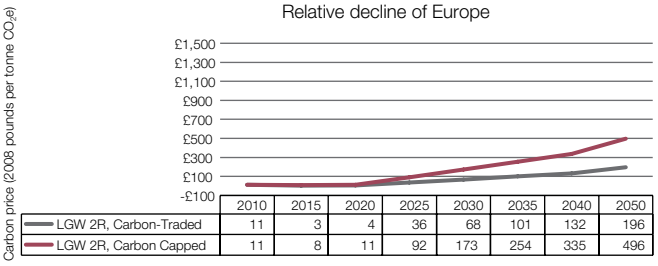
Figure A5.1: Gatwick Airport Second Runway option CO_2e price required to cap to 37.5Mt in 2050



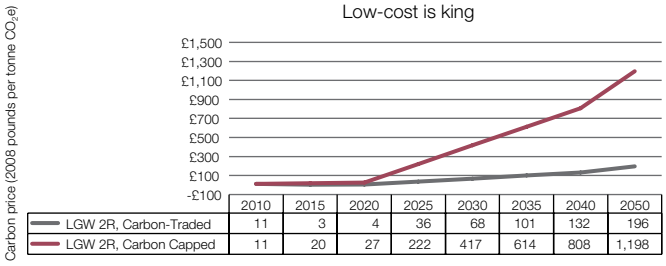
	2010	2015	2020	2025	2030	2035	2040	2050
LGW 2R, Carbon-Traded	11	3	4	36	68	101	132	196
LGW 2R, Carbon Capped	11	6	8	67	127	187	246	364



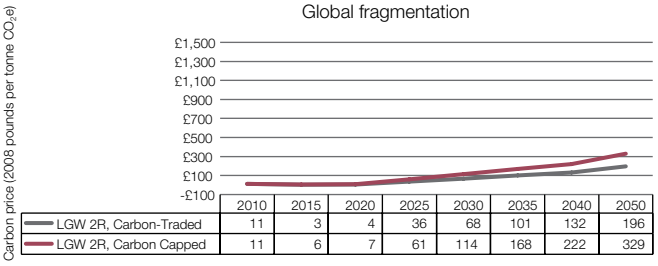
	2010	2015	2020	2025	2030	2035	2040	2050
LGW 2R, Carbon-Traded	11	3	4	36	68	101	132	196
LGW 2R, Carbon Capped	11	10	13	111	210	309	406	602



	2010	2015	2020	2025	2030	2035	2040	2050
LGW 2R, Carbon-Traded	11	3	4	36	68	101	132	196
LGW 2R, Carbon Capped	11	8	11	92	173	254	335	496



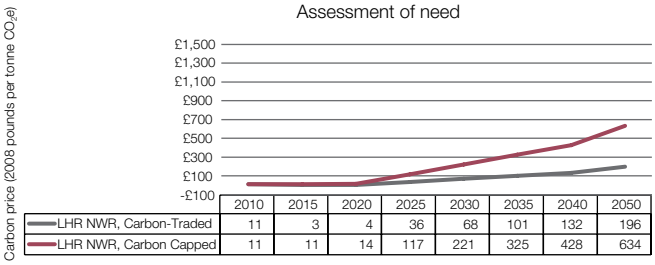
	2010	2015	2020	2025	2030	2035	2040	2050
LGW 2R, Carbon-Traded	11	3	4	36	68	101	132	196
LGW 2R, Carbon Capped	11	20	27	222	417	614	808	1,198



	2010	2015	2020	2025	2030	2035	2040	2050
LGW 2R, Carbon-Traded	11	3	4	36	68	101	132	196
LGW 2R, Carbon Capped	11	6	7	61	114	168	222	329

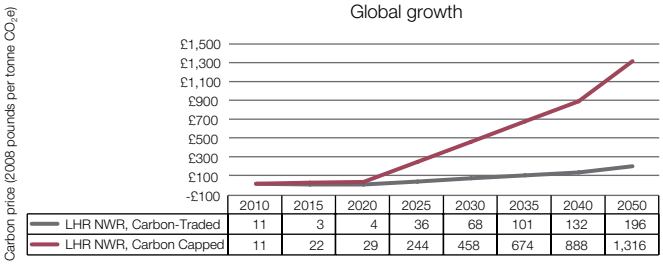
Figure A5.2: Heathrow Airport North West Runway option CO_2e price required to cap to 37.5Mt in 2050

Assessment of need



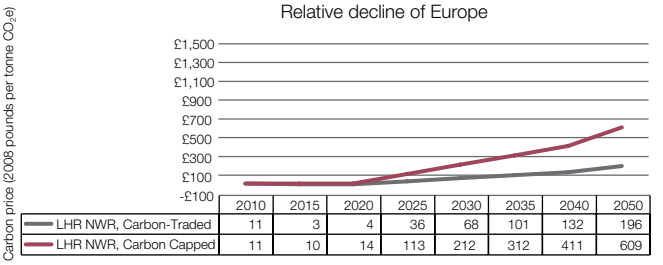
	2010	2015	2020	2025	2030	2035	2040	2050
LHR NWR, Carbon-Traded	11	3	4	36	68	101	132	196
LHR NWR, Carbon Capped	11	11	14	117	221	325	428	634

Global growth



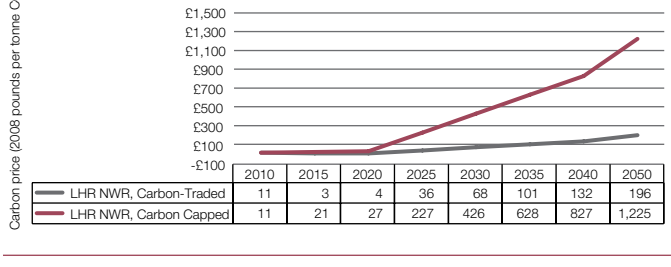
	2010	2015	2020	2025	2030	2035	2040	2050
LHR NWR, Carbon-Traded	11	3	4	36	68	101	132	196
LHR NWR, Carbon Capped	11	22	29	244	458	674	888	1,316

Relative decline of Europe



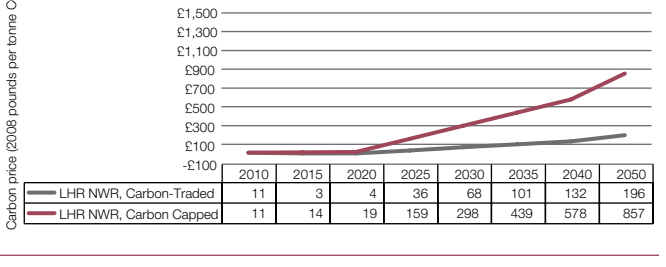
	2010	2015	2020	2025	2030	2035	2040	2050
LHR NWR, Carbon-Traded	11	3	4	36	68	101	132	196
LHR NWR, Carbon Capped	11	10	14	113	212	312	411	609

Low-cost is king



	2010	2015	2020	2025	2030	2035	2040	2050
LHR NWR, Carbon-Traded	11	3	4	36	68	101	132	196
LHR NWR, Carbon Capped	11	21	27	227	426	628	827	1,225

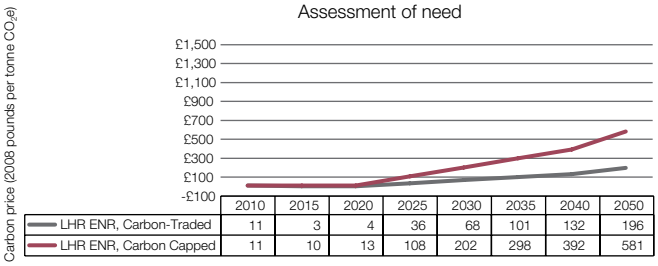
Global fragmentation



	2010	2015	2020	2025	2030	2035	2040	2050
LHR NWR, Carbon-Traded	11	3	4	36	68	101	132	196
LHR NWR, Carbon Capped	11	14	19	159	298	439	578	857

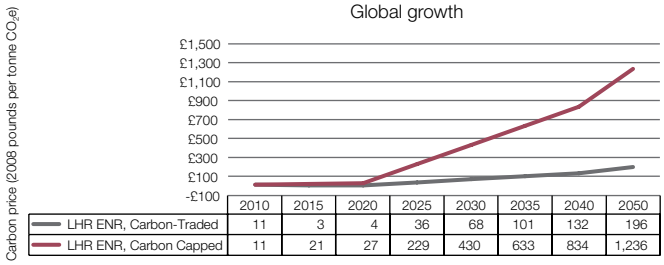
Figure A5.3: Heathrow Airport Extended Northern Runway option CO_2e price required to cap to 37.5Mt in 2050

Assessment of need



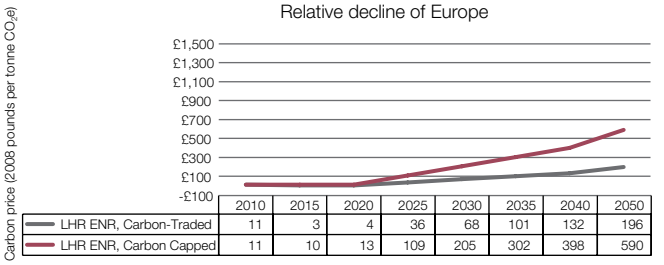
	2010	2015	2020	2025	2030	2035	2040	2050
LHR ENR, Carbon-Traded	11	3	4	36	68	101	132	196
LHR ENR, Carbon Capped	11	10	13	108	202	298	392	581

Global growth



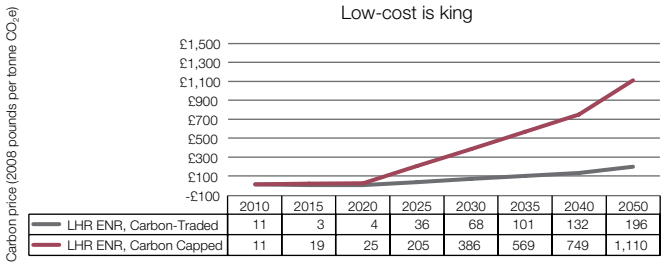
	2010	2015	2020	2025	2030	2035	2040	2050
LHR ENR, Carbon-Traded	11	3	4	36	68	101	132	196
LHR ENR, Carbon Capped	11	21	27	229	430	633	834	1,236

Relative decline of Europe



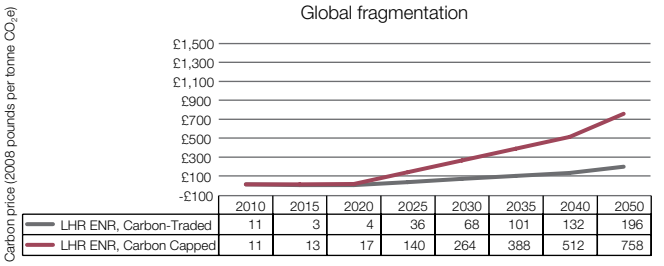
	2010	2015	2020	2025	2030	2035	2040	2050
LHR ENR, Carbon-Traded	11	3	4	36	68	101	132	196
LHR ENR, Carbon Capped	11	10	13	109	205	302	398	590

Low-cost is king



	2010	2015	2020	2025	2030	2035	2040	2050
LHR ENR, Carbon-Traded	11	3	4	36	68	101	132	196
LHR ENR, Carbon Capped	11	19	25	205	386	569	749	1,110

Global fragmentation



	2010	2015	2020	2025	2030	2035	2040	2050
LHR ENR, Carbon-Traded	11	3	4	36	68	101	132	196
LHR ENR, Carbon Capped	11	13	17	140	264	388	512	758

Contact Information

Website: www.gov.uk/government/organisations/airports-commission
Email: airports.enquiries@airports.gsi.gov.uk