[redacted]

Your Ref: TRO20002
My Ref: 20011968

14 February 2019

Dear Sirs

PLANNING ACT 2008
Manston Airport: Application by RSP Ltd for a Development Consent Order

I write further to the representations I submitted via email on 23 August 2018 in which I expressed support for the re-opening of Manston as a viable, cargo airport. I am a local resident with no legal, historical or emotional attachment to the airport or the applicants.

I attended the preliminary hearing on 9 January and the open floor meeting on 10 January. Inevitably there are conflicting views about the proposals submitted by RSP Ltd. Those with an historical attachment to the airport are more likely to support the proposals whereas those against have genuine concerns about noise and pollution. I therefore commend the Examining Authority (ExA) for wishing to adhere to the facts and evidence-base in considering the proposals and also for not allowing cross-examination (as requested by Stone Hill Park's Counsel) since this would result in an unhelpful, adversarial approach detrimental to the scrupulous and unbiased hearing by the ExA.

These further views relate to four of the Principal Issues: Air Quality; Noise, Need and Socio-Economic issues.

1. Air Quality: The Civil Aviation Authority (CAA) published a report in March 2017 on Aviation's Environmental Impact *(Attachment 1).* Aviation accounts for 6% of the UK's emissions, with direct emissions from airports being less than 1% of total emissions by aircraft using the airports. Short-haul and long-haul flights emit more pollutants than medium-distance flights of 3000-5000km as these are the most efficient. The age of aircraft also has a bearing on emissions and the Committee on Climate Change has proposed targets for reducing aviation emissions (See Chapter 2 of the report). The use of biofuels is increasing and the aviation industry is experimenting with sustainable fuels so it is very important to take account of these developments, rather than using historic data that will become less relevant in the future. Could the applicants be requested to specify the types of aircraft that would be most likely to use the re-opened airport, together with an indication of emissions generated?

2. Noise: The CAA report referred to above also refers to noise reduction targets and the need for airports with more than 50,000 ATM's to produce Noise Action Plans and review them every five years (See Chapter 3). Technological advancements in aircraft design and alternatives, such as airships, could have a significant impact in reducing noise (and emissions) in future. An article in *International Airport Review 18 July* 2017, *(Attachment 2)* highlights the current development of cargo airships and the part they could play in the future. Please could the ExA ask the applicants what research they undertaken to identify how these developments could impact beneficially on the long term operation and viability of Manston.

3. Need: York Aviation produced a report in January 2015 for the Freight Transport Association and Transport for London entitled *Implications for the Air Freight Sector*

of Different Airport Capacity Options (Attachment 3). This related largely to capacity at the London airports. Nevertheless it highlighted the importance of air freight to the UK economy and that without creating additional capacity we would lose significant income to airports in Europe where capacity exists. I also draw your attention to a report published in September 2016 by the Centre for Economic and Business Research and entitled *The Importance of Britain's Air Freight to UK Exports (Attachment 4).* Since these reports were published the impact of our departure from the European Union can only strengthen the need for the UK to depend less upon goods transiting through European airports for onward journey by road to Britain and for us to create sufficient capacity ourselves. In the long term I believe Manston will be seen as a critical part of our transport infrastructure and one that we cannot afford to lose.

4. Socio-economic issues: The Thames Estuary Growth Commission has produced a report *Vision 2050 (Attachment 5)* setting out ambitious plans for improving prosperity in the region, including Thanet. It emphasises the importance of job creation, especially in areas such as Thanet which has an unemployment rate of 12.3%. The reopening of Manston would be a positive opportunity for training and for new skilled and semi-skilled jobs to be created, significantly benefitting local people. The alternative proposals for the airport site, largely housing, would only create short-term construction jobs. Housing and the new fast rail link to London would, I suggest, encourage more people to move from the capital and commute to work, contributing little to the local economy and not providing real jobs that the area needs. A report by G L Hearn published in January 2017 *(The updated assessment of Objectively-assessed housing need)* states that *inter alia* "there is no need to increase housing provision…to support the economy".

I trust that the ExA will consider these further representations and I look forward to attending some of the planned meetings.

Yours faithfully

Rod Giddins

Rod Giddins

Enclosures:

1. CAA report on Aviation's Environmental Impact
2. Article in International Airport Review
3. Implications for the Air Freight Sector of Different Airport Capacity Options
4. The Importance of Britain's Air Freight to UK Exports
5. Vision 2050

Implications for the Air Freight Sector of Different Airport Capacity Options

Prepared for the Freight Transport Association
and Transport for London

Final Report

January 2015

York Aviation

Contents

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Key Points

Key Points (1)

- So far, the work undertaken by the Airports Commission has focussed strongly on the needs and requirements of the passenger market at London's airports. Issues around the freight market have largely been underestimated and there are also concerns in the freight industry that the Commission has little understanding of how the air freight market operates or its importance in supporting the UK economy.
- Air freight accounts for about 40% of UK imports and exports by value. It is an essential enabler for a wide range of industry sectors, handling high value goods, which require rapid, secure and reliable transport to destinations all over the globe.
- The UK air freight market is dominated by London and more specifically by Heathrow. In 2013, the main London airports handled around 1.8 million tonnes of freight, with Heathrow accounting for around 1.4 million tonnes.
- Air freight tonnage at the London airports has grown over the last 20 years. However, this disguises a worrying trend. The market grew rapidly until 2000, but since that time it has largely stagnated. This stagnation has coincided with growing capacity constraints at Heathrow and the inability of the London hub to grow in terms of Air Transport Movements (ATMs). The air freight market in London is already being constrained by the capacity issues at Heathrow. It is also seems clear that to a significant degree other airports cannot step in to provide relief as they do not have the long haul networks to support bellyhold capacity. Only Stansted, with its significant spare runway capacity, has emerged as an alternative for pure freighter airlines.
- Air freight is a significant driver for the UK economy. Damaging its ability to function effectively in the longer term through the failure to deliver capacity improvements or the development of the wrong options could have serious implications for the UK economy.
- In 2010, Steer Davies Gleave (SDG), as part of their work for Department for Transport on Air Freight in the UK, estimated the total economic footprint of the sector (direct, indirect and induced effects) to be around £7.3 billion in Gross Value Added (GVA) and 135,300 jobs. The impact of the sector on the wider economy is difficult to quantify effectively. However, SDG estimated that the total value of air freight services including wider impacts to the UK economy was around £14.3 billion and 282,400 jobs.
- By 2050, the London system airports will be full if either no capacity is added or a third runway is added at Heathrow or a second runway is built at Gatwick. Only a 4 Runway Hub would provide some spare capacity at 2050. This has significant implications for the ability to service air freight demand from London. We would expect significant volumes to have to be trucked elsewhere by 2050 in constrained scenarios:
  - No Expansion – 2.1 million tonnes of freight or around half of total freight demand in 2050;
  - Heathrow Runway 3 – 1.2 million tonnes of freight or around 85% of the freight throughput of Heathrow now;
  - 2nd Runway at Gatwick – 1.7 million tonnes of freight.
- This will ultimately have significant negative impacts on the UK economy.
- If no additional capacity is provided in London (No Expansion), the additional trucking costs are estimated to be around £41.6 million per annum in 2050. With a 2nd Runway at Gatwick, these costs reduce to a total of around £36.1 million per annum. Heathrow Runway 3 results in additional costs of around £23.5 million per annum. These costs are likely to be passed through to users of freight services.

Key Points (2)

- There are also potentially significant impacts on freight users time costs from increased transit times. No Expansion of capacity will result in a loss of user time costs of around £378 million per annum. The addition of a second runway at Gatwick improves the situation but the costs are still ultimately significant at around £321 million per annum. Heathrow Runway 3 results in a loss of around £213 million per annum.
- The consequent impacts on long term GVA in the wider economy are again significant. No Expansion results in lost GVA of around £978 million per annum by 2050. Heathrow Runway 3 results in a GVA loss of around £551 million per annum by 2050. 2nd Runway at Gatwick results in a GVA loss of around £836 million per annum by 2050.
- In addition, the impact on the sector's economic footprint (direct, indirect and induced impacts) in 2050 could be :
  - No Expansion – around £637 million in GVA and 6,800 jobs;
  - Heathrow Runway 3 - £359 million in GVA and 3,800 jobs;
  - 2nd Runway at Gatwick - £544 million in GVA and around 5,800 jobs.
- Ultimately, our analysis demonstrates clearly the importance of the provision of sufficient concentrated airport hub capacity in London by 2050. Without this capacity the air freight industry will suffer, as, ultimately, will the end users in the UK economy.

Introduction

Introduction

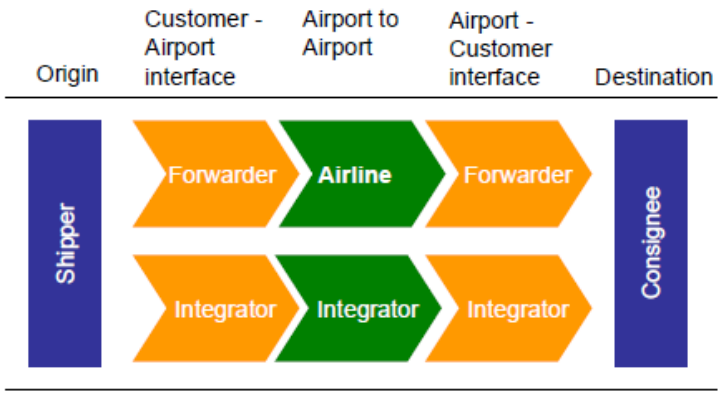
- In August 2014, York Aviation was commissioned by the Freight Transport Association and Transport for London, to consider the potential long term effects on the UK economy from changes in the air freight industry in the UK resulting from different potential development scenarios for runway capacity in London.
- So far, the work undertaken by the Airports Commission has focussed strongly on the needs and requirements of the passenger market at London's airports. The Commission has identified the need for one more runway in London by 2030 and has chosen to focus its work on considering where this additional runway should be located and is currently appraising options at Heathrow and Gatwick and up until September, it was considering the Mayor of London's proposal for a four runway hub in the inner Thames estuary. The Commission has recognised that further runway capacity, beyond the initial additional runway, is likely to be needed soon after 2030 and that certainly by 2050 as, even with one more runway in London, the London airports will be full.
- Clearly, the debate around the location of further runway capacity and, ultimately the amount of further capacity, will not just affect passengers and passenger airlines. There are significant potential implications for air freight operations, with knock-on implications for the broader freight industry and ultimately for freight users. However, to date, issues around the freight market have largely been underestimated in the Commission's publications and there are also concerns in the freight industry that the Commission has limited understanding of how the air freight market operates or its importance in supporting the UK economy.
- This short report seeks to address some of these issues, building on previous work undertaken by York Aviation and on a range of other publicly available information:
  - focussing on potential impacts in the longer term at 2050;
  - examining the implications for air freight capacity in London;
  - considering how the freight industry might react in different scenarios to service demand;
  - identifying and where possible quantifying the potential impacts on freight users.
- The analysis undertaken here necessarily adopts a range of simplifying assumptions given the timescales for the study, the limited availability of information on air freight operations and demand compared to the passenger market and the lack of information on air freight in the forecasting work undertaken by the Department for Transport in its 2013 UK Aviation Forecasts and latterly by the Airports Commission.
- This report is structured as follows:
  - in **Section 2** we set out some basic information on the air freight market in London and across the UK;
  - in **Section 3** we provide some background on the importance of air freight to the economy;
  - in **Section 4** we present our estimates of the impact on air freight capacity in London of the runway development scenarios;
  - in **Section 5** we discuss how the industry might react to these scenarios and present our estimates of the impact on the UK economy;
  - in **Section 6** we outline our conclusions.
- In addition, given the options now being considered by the Airports Commission, we have included an Appendix that specifically considers the relative merits of expansion at Heathrow and Gatwick using the evidence developed during this study.

The Air Freight Market in the UK

Air Freight in the UK

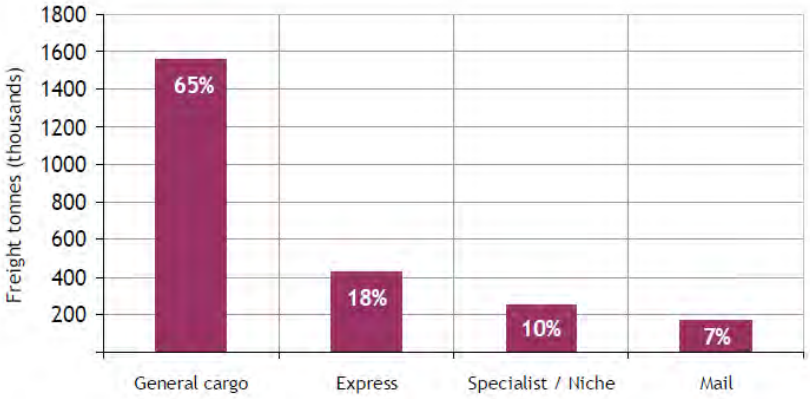
- Air freight accounts for about 40% of UK imports and exports by value. It is an essential enabler for a wide range of industry sectors, handling high value goods, which require rapid, secure and reliable transport to destinations all over the globe. Key users include high end manufacturing, engineering, pharmaceuticals, retailing, financial and business services and the automotive sector.
- Steer Davies Gleave (SDG), in its work for the Department of Transport on UK Air Freight in 2010, identified two broad business models operating in the UK:
  - General Cargo transported by passenger and freight airlines with collection and delivery organised by freight forwarders; and
  - The Integrator model, which tends to focus on smaller consignments, where collection and delivery, and often the air component of the journey are all managed by a single organisation.
- The integrator model, as operated by companies such as DHL, UPS, TNT and Federal Express, has been of growing in importance in the last two decades. This model focussed originally on express courier services but has broadened out substantially. As a consequence, the two models increasingly crossover.
- Broadly, SDG split the air freight market in to four product types. General air cargo, express freight, specialist / niche freight and mail (see figure opposite). Express freight is the fastest growing segment of the market and, while speed is a feature of all air freight, it is within this segment that time critical activities are most extreme.

FIGURE 1.4 SIMPLE DOOR TO DOOR AIR FREIGHT VALUE CHAIN



Source: SDG.

FIGURE 5.1 TOTAL FLOWN UK AIR FREIGHT BY MARKET TYPE 2008 (INBOUND AND OUTBOUND)

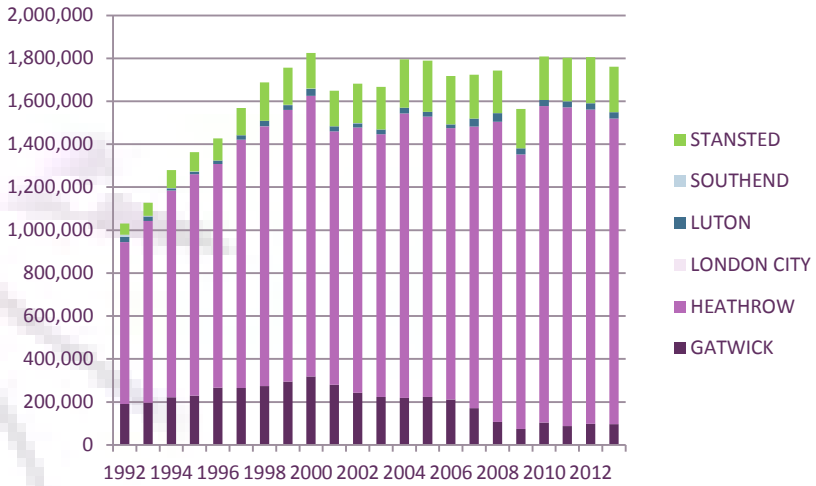


Source: SDG analysis of CAA and other sources.

Air Freight Market in London (1)

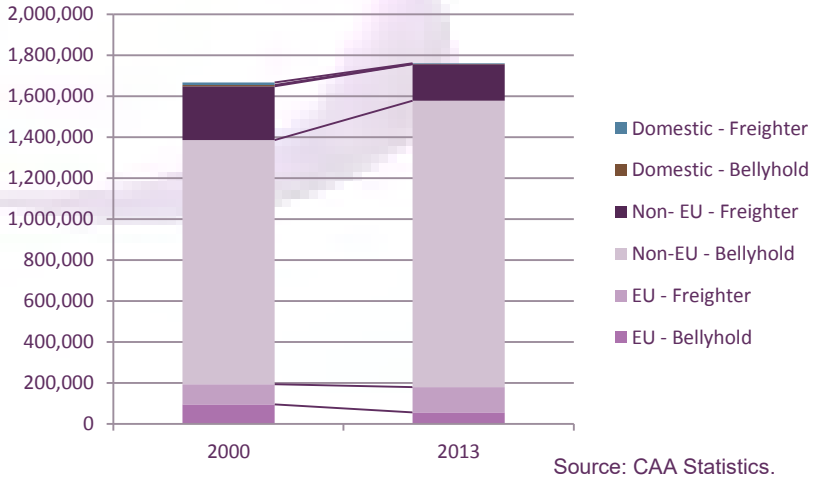
- The UK air freight market is dominated by London and more specifically by Heathrow. In 2013, the main London airports handled around 1.8 million tonnes of freight, with Heathrow accounting for around 1.4 million tonnes. The only other significant player in the London market was Stansted, which handled around 0.2 million tonnes, with Gatwick handling around 0.1 million tonnes. The market has been largely constant over the last 10 years following rapid growth in the 1990s.
- The air freight market is predominantly long haul and had become increasingly so over time. For domestic and short haul destinations in Europe, it is often cheaper, faster and more flexible to truck freight to its destination. It is difficult to precisely define where the tipping point lies between trucking and air freight in terms of distance. However, for overnight parcels it is believed to around 500km but, for less urgent freight, it could be substantially further.
- Air freight is carried in both the bellyhold of passenger aircraft and in dedicated freighter aircraft. The existence of the former method helps to explain the dominance of Heathrow in the market in London. Heathrow, as a global hub airport, offers by far the largest range of long haul destinations of the London airports and by far the most aircraft capacity. Almost all of the 1.4 million tonnes of freight handled at Heathrow in 2013 was carried in the bellyhold of passenger aircraft. Increasingly, pure freighter operations have moved out of Heathrow as higher yielding passenger services have taken over their slots. The same is true of air freight operations at Gatwick
- Conversely, at Stansted Airport, the only other major player in the London market, the focus is on pure freighter aircraft, operated by a range of freight airlines. The Airport's passenger airlines focus on short haul travel using narrow body aircraft. Their business models do not fit well with carrying freight, particularly the low fares airlines.

Freight Tonnage at London Airports



Source: CAA Statistics.

Freight Tonnage at London Airports by Destination and Configuration

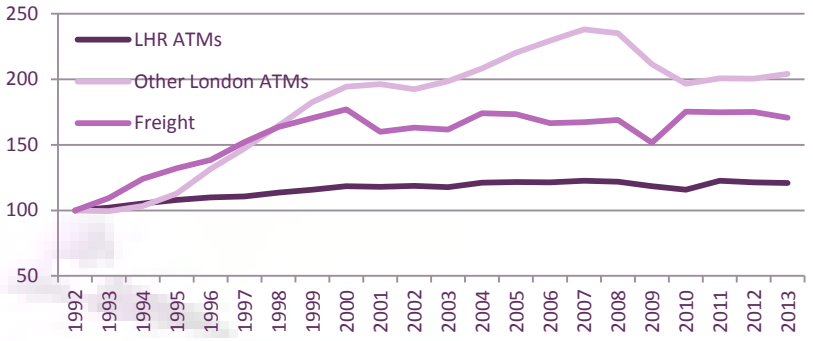


Source: CAA Statistics.

Air Freight Market in London (2)

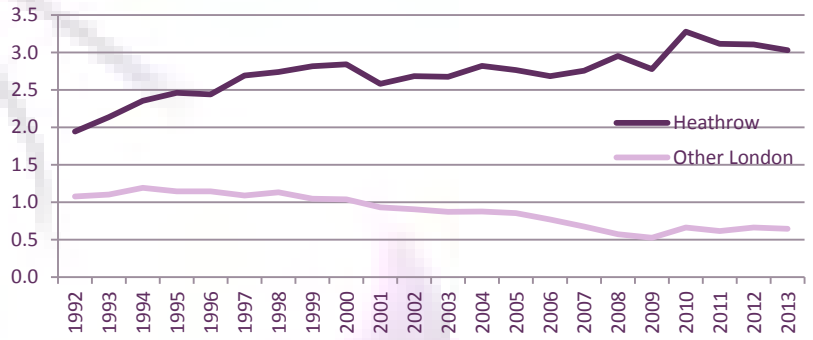
- Air freight tonnage at the London airports has grown over the last 20 years. However, this disguises a worrying trend. The market grew rapidly until 2000, but since that time it has largely stagnated. This stagnation has coincided with growing capacity constraints at Heathrow and the inability of the London hub to grow in terms of Air Transport Movements (ATMs).
- This is demonstrated in the chart opposite which shows freight tonnage tracking ATM growth at Heathrow. The growth in ATMs across the London system as a whole appears to have had no influence at all on air freight growth. This re-emphasises the importance of Heathrow in the air freight market as the primary provider of air freight capacity. The other airports, without Heathrow's long haul connections, simply do not provide an alternative. Only Stansted, with its significant spare runway capacity, has emerged as alternative for pure freighter airlines, albeit the range of destinations served by these aircraft is substantially smaller than is available using bellyhold capacity in passenger aircraft.
- The impact of constraint at Heathrow can also be seen in terms of the increasing freight loads per movement at the airport. Since 1992, the average amount of freight per movement has grown from around two tonnes to around three tonnes. At the same time, the average load at the other London airports has nearly halved, with airlines at the other London airports increasingly focussing on low cost, short haul travel.
- It is also interesting to compare Heathrow's performance to the other major European hub airports. In the last 10 years, both Paris and Frankfurt have outperformed Heathrow. Amsterdam was performing well prior to the global recession but experienced a more significant drop in freight throughput than the others and has still not recovered.
- Overall, it seems to reasonable to suggest that the air freight market in London is already being constrained by the capacity issues at Heathrow. It is also seems clear that to a significant degree other airports cannot step in to provide relief as they do not have the long haul networks to support bellyhold capacity.

Freight Tonnage vs ATM Growth (Index: 1992 = 100)



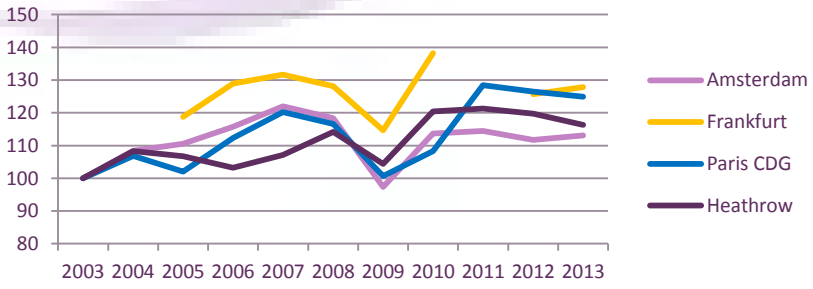
Source: CAA Statistics.

Freight Tonnes per Movement



Source: CAA Statistics.

Freight Tonnes at Europe's Hub Airports (Index: 2003 = 100)



Source: Eurostat.

Air Freight in the Rest of the UK

- Outside of London and the South East, there are only a limited number of UK airports with a significant air freight presence (the main London airports account for 77% of the market).
- East Midlands is by some margin the most significant freight airport outside London, with nearly 0.3 million tonned. It focuses on pure freighter operations and is the main UK base for DHL and a significant base for UPS and TNT.
- Manchester Airport is the largest bellyhold freight airport outside of London. The airport is also the largest long haul passenger gateway outside London, so this is not surprising. Birmingham Airport also has some bellyhold freight traffic, supported by the airport's long haul services, but is substantially smaller than Manchester.
- Manston Airport in Kent did, until recently, provide some additional freighter capacity for London. However, the airport closed in May 2014 following financial difficulties.
- Overall, this suggests that there is no 'ready made' solution to air freight capacity constraints in London immediately obvious in the UK regions.
- East Midlands clearly has the potential and capacity to be significant freighter only location but does not have a long haul passenger offer to support a bellyhold capability.
- Manchester has some potential to offer an alternative for bellyhold freight but is obviously a considerable distance from London and alternatives on the continent, such as Paris CDG or Amsterdam, offer a significantly greater long haul networks if freight needs to be trucked some distance.
- Birmingham may offer some options for bellyhold capacity but again will struggle to compete with the broader long haul networks at the continental hubs.

Air Freight Tonnes at UK Airports

	Tonnes	%
London - Bellyhold	1,455,725	64%
London - Freighter	304,965	13%
East Midlands - Bellyhold	16	0%
East Midlands - Freighter	266,952	12%
Manchester - Bellyhold	81,927	4%
Manchester - Freighter	14,446	1%
Manston - Bellyhold	9	0%
Manston - Freighter	29,297	1%
Belfast - Bellyhold	106	0%
Belfast - Freighter	29,181	1%
Birmingham - Bellyhold	15,269	1%
Birmingham - Freighter	5,797	0%
Other UK - Bellyhold	21,763	1%
Other UK - Freighter	42,356	2%
Total	**2,267,811**	**100%**

Source: CAA Statistics.

Current Economic Importance of Air Freight in the UK

The Economic Impact of Air Freight

GVA and Employment Impact of Air Freight on the UK Economy

Source: SDG.

- The importance of air freight to the UK economy can be demonstrated by its economic impact. It is not only important as an economic activity in its own right, providing jobs and supporting Gross Value Added (GVA), but, as we have described above, it also supports significant employment and Gross Value Added in the wider economy through the provision of its services to a range of industries in the UK economy.
- In 2010, SDG, as part of their work for Department for Transport on Air Freight in the UK, considered the economic impacts of the sector on the UK economy. It estimated that air freight services directly supported around £2 billion in GVA and around 39,100 jobs. In addition, through its supply chain (indirect effects) and through the expenditure of incomes earned in the direct and supply chain activities (induced effects), it supported significant GVA and employment. SDG estimated the total economic footprint of the sector (direct, indirect and induced effects) to be around £7.3 billion in GVA and 135,300 jobs.
- The impact of the sector on the wider economy is difficult to quantify effectively. However, using a multiplier analysis based on the UK input-output tables, SDG developed an estimate of what it termed forward linkage effects in the economy. Taking these impacts into account, SDG estimated that the total value of air freight services to the UK economy was around £14.3 billion and 282,400 jobs.
- Given the dominance of London in the air freight market in the UK, it is reasonable to assume that a significant proportion of these benefits accrue in the greater South East region and relate to activity at the London airports.
- This analysis also begins to demonstrate what is at stake in terms of the potential impact of different airport capacity development scenarios in London. Air freight is a significant driver for the UK economy. Damaging its ability to function effectively in the longer term through the failure to deliver capacity improvements or the development of the wrong options could have serious implications for the UK economy.

Economic Value of Air Freight to Users

- The value of air freight to users and, hence, ultimately its impact on the wider UK economy is driven by what it offers in terms of advantages over freight transport modes. SDG identified four key features and rated their importance to different users based on surveys and consultations.
- It shows that speed is important for all but, for some, it is a key feature of the service. This is potentially important in considering the potential impacts of different capacity scenarios for London, as, if demand cannot be met within the London system, freight will need to be trucked elsewhere, resulting in longer transit times or earlier final pick-up times for shipments. For some parts of the market, this could represent a critical loss of utility with significant impacts on their operations.
- The other key features are subordinate to speed but for some sectors they are valuable features, notably security for jewellery and art, and reach for aircraft parts.
- A number of quotes from the Freight Transport Association's Sky-High Value report, show the real world importance of air freight to example users. FTA members clearly demonstrate the importance of the existing Heathrow hub to their operations.

Ford's air freight needs can vary considerably, from a handful of parts to significant volumes. These can be sent by air in response to scheduling or engineering changes and Ford can also air-freight prototype parts, urgent replacement parts for customer vehicles, and occasionally complete vehicles for auto shows or short-notice testing under different conditions.
Ford

Air Freight Drivers by Importance to Key User Groups

	Security	Speed	Information	Reach
Machinery Parts	●	●●●	●●	●●
Electrical Components	●●	●	●	●
Aircraft Parts	●	●●●	●●	●●●
Jewellery	●●●	●	●●	●
Art	●●●	●	●●	●
High Street Fashion		●		
Pharmaceuticals	●●	●		●
Perishables		●●●		

Key: ● = Important ●● = Very Important ●●● = Key Feature

Source: SDG.

"It is no coincidence that suppliers to the music industry, as with other sectors such as motor sport, are clustered in the West London area. Heathrow's multiple daily departures for a huge number of international destinations are crucial to the company meeting the ever tightening time pressure on tour schedules."
Sound Moves, International Logistics for Bands and Artists

"Our products are used in scanning for, and treating, serious health conditions. However, our products decay continually, so it is essential that we can make and ship the product on the same day a clinician orders it, so that they receive a useable amount"
Pharmaceutical Manufacturer

Estimates of Air Freight Demand and Capacity in 2050

Potential Runway Capacity Development Scenarios

Forecast Movements and Movement Capacity in the London System in 2050 (000s)

	No Expansion	4 Runway Hub	Heathrow Runway 3	2nd Runway at Gatwick
Forecast Movements				
Heathrow / Hub	480,000	903,000	740,000	480,000
Gatwick	280,000	280,000	280,000	540,000
Other London	592,000	592,000	592,000	592,000
Movement Capacity				
Heathrow / Hub	480,000	1,080,000	740,000	480,000
Gatwick	280,000	280,000	280,000	540,000
Other London	592,000	592,000	592,000	592,000
% ATM Capacity Used	*100%*	*91%*	*100%*	*100%*

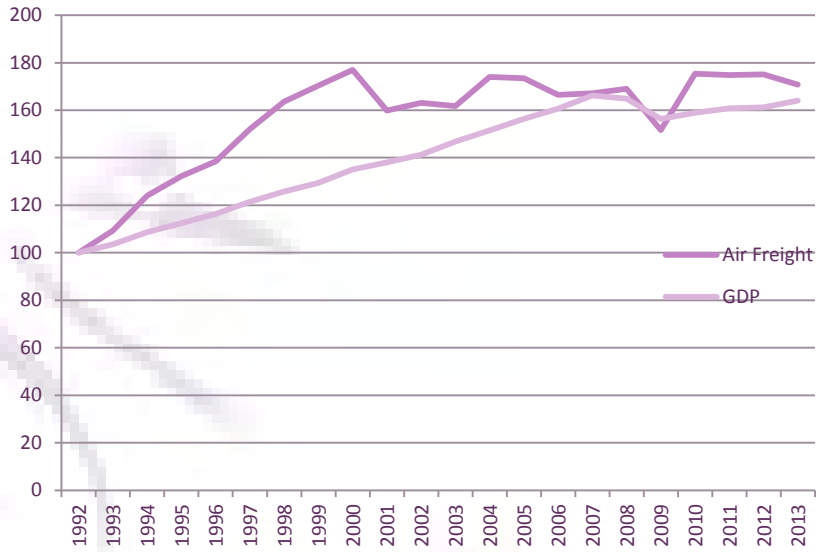
Source: York Aviation analysis of Airports Commission Interim Report, Heathrow and Gatwick submissions.

- In our analysis, we have considered four potential scenarios for runway capacity development in the London system by 2050:
  - No Expansion – no additional runway capacity is built in London before 2050. Movements and movement capacity are as assumed in the Airports Commission Interim Report;
  - 4 Runway Hub – a non-location specific four runway hub airport is developed. This is the only scenario in which there is any spare capacity in the London system. Movements at the hub are assumed to be at a similar level to an unconstrained Heathrow from the Airports Commission Interim Report. Other airports are full and capacities are assumed to be as per the Airports Commission Interim Report. This is included to demonstrate the importance of developing adequate hub capacity in London beyond the 2030 scope of the Airports Commission's current deliberations;
  - Heathrow Runway 3 – a third runway is built at Heathrow, in line with Heathrow Airport Limited's plans as set out on its website. This runway is full before 2050. All other airports are also full and capacities are taken from the Airport's Commission Interim Report;
  - 2nd Runway at Gatwick – a second runway is built at Gatwick in line with Gatwick Airport Limited's published plans on its website. This runway is full before 2050. All other airports are also full and capacities are taken from the Airport's Commission Interim Report.
- These movement forecasts and airport capacities form the basis for our assessment of potential freight capacity in the London system and the extent to which this can meet future demand for air freight in London.

Estimates of Unconstrained Freight Demand at the London Airports in 2050

- Unlike for passenger demand, there are no current published forecasts for air freight demand in the UK. Neither the Department for Transport nor the Airports Commission have produced freight forecasts in any of their recent aviation forecasting work.
- Organisations such as Boeing and Airbus to produce global freight forecasts. However, these typically present an optimistic view of the market, which is not specific to the UK. For instance, Boeing's 2012-2013 World Cargo Forecast predicts global growth of around 5.2% per annum for the next 20 years compared to 3.7% per annum recorded growth over the last 10 years.
- We have, therefore, made a conservative assumption that unconstrained air freight demand in the UK will grow broadly in line with UK GDP through to 2050. The forecasts for GDP growth have been taken from the Office for Budgetary Responsibility's latest short and long term forecasts. These see average per annum growth to 2050 of around 2.3%.
- Given the increasing globalisation of the world economy and the fact that UK trade has tended to grow faster than GDP, we believe this is likely to be a conservative methodology.
- Ultimately, this suggests total unconstrained tonnage demand across the London system in 2050 of around 4.2 million tonnes on a conservative basis.

UK GDP vs. Air Freight at London Airports (Index: 1992 = 100)



Source: ONS and CAA.

Potential Air Freight Capacity in the London System in 2050 (1)

Potential Air Freight Capacity in the London System in 2050

	No Expansion	4 Runway Hub	Heathrow Runway 3	2nd Runway at Gatwick
Total Freight Demand in Tonnes	4,221,831	4,221,831	4,221,831	4,221,831
Bellyhold Capacity				
Heathrow / 4 Runway Hub	1,724,544	3,139,644	2,601,497	1,724,544
Gatwick	127,430	124,775	124,775	465,915
Other London	20,134	19,913	19,913	19,692
Excess Tonnes after Bellyhold	2,349,723	937,499	1,475,646	2,011,680
Residual Freighter Capacity in Constrained Scenarios	240,653	n/a	286,932	286,932
Total Excess Tonnes	2,109,070	937,499	1,188,714	1,724,748
Freighter Movements Required	79,712	35,433	44,927	65,186
Available ATM Capacity	0	177,000	0	0
Accommodated within London with Freighters	0	35,433	0	0
Freight Tonnes to be Diverted Elsewhere	**2,109,070**	**0**	**1,188,714**	**1,724,544**

Source: York Aviation.

- Above, we have considered the potential air freight capacity that might exist in London under different the scenarios. In line with the structure of the market now, we have assumed that the majority of capacity will be provided via aircraft bellyhold freight. We have estimated this capacity based on the number of forecast international movements at the relevant airports in the London system multiplied by the expected average tonnage per international movement in 2050 at each airport. The latter has been derived by taking the tonnes per international movement now estimated from CAA Statistics and growing this by 0.5% per annum to 2050 to reflect increasing loads and larger aircraft. In relation to the 2nd Runway at Gatwick scenario, we have made a further adjustment to allow for the fact that we would expect the airport to attract more long haul services in such a scenario. We have assumed that that tonnage per movement in this scenario would increase significantly to be around double that observed at Gatwick in the other scenarios in 2050. This reflects the Gatwick Airport long term demand forecasts from its submissions to the Airports Commission, which suggest a doubling in the proportion of long haul traffic at the airport by 2050.

Potential Air Freight Capacity in the London System in 2050 (2)

- Within the London system, we have assumed that a hierarchy of preference will exist much as it does now. Heathrow or a 4 Runway Hub will be the first choice for the users of bellyhold freight capacity as they will offer the largest concentration of capacity via their long haul networks and this capacity will be used up first. Excess tonnage will then shift to Gatwick and then finally to other airports in the London system, most likely Stansted.
- For the purposes of this analysis, we have assumed that freighter aircraft primarily act as a means to supplement bellyhold capacity where insufficient bellyhold capacity is available. This is simplification as there are items that cannot be transported on passenger aircraft or for which freighter transport is preferable and destinations that are not served by passenger aircraft. Consequently, we have further assumed that a residual number of freighter movements will still be accommodated in London in capacity constrained scenarios at 2050, i.e. all scenarios other than the 4 Runway Hub.
- These freighter flights may use slots that are not suitable for passenger activities or may simply offer more value than some passenger leisure services and, hence, force such services out of the market. The percentage of total ATMs in the London system accounted for by these services is assumed to be equal to the percentage of pure freighter movements at Heathrow now under these constrained scenarios.
- To the extent that there remains excess tonnage that remains after these two elements of freight capacity have been considered, the scope to accommodate additional freighter aircraft movements within the London system will be dependent on the number of movements entailed and the number of available movements remaining at the airports. As stated above, it is only in the 4 Runway Hub scenario that there is any movement capacity left by 2050 and, hence, it is only in this scenario that any of the excess demand can be accommodated in London. In fact, the available ATM capacity is such all freight demand can be handled at the London airports in this scenario.
- In all the other scenarios, this demand must be satisfied elsewhere at other airports either in the UK or on the continent. By scenario, the excess demand to be accommodated elsewhere is as follows:
  - No Expansion – 2.1 million tonnes of freight or around half of total freight demand in 2050;
  - Heathrow Runway 3 – 1.2 million tonnes of freight or around 85% of the freight throughput of Heathrow now;
  - 2nd Runway at Gatwick – 1.7 million tonnes of freight.

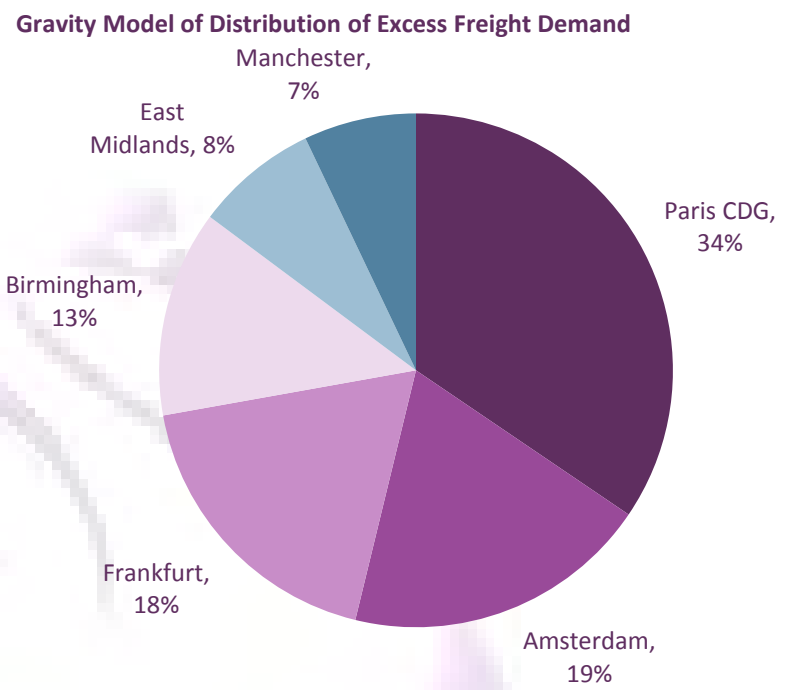
Economic Impacts of Air Freight Development Scenarios

How Will the Freight Industry React

- Our analysis of the potential freight demand and capacity within London in 2050 suggests that the air freight industry is likely to face two issues depending on the runway capacity scenario assumed:
  - if a second runway is built at Gatwick and no additional capacity is developed elsewhere, this has the potential to create a second significant geographic node for bellyhold capacity in London. The industry will need to consider how it structures its operations to make best use of this capacity. It should be noted that, while all scenarios involve some use of bellyhold capacity at airports other than Heathrow or a 4 runway hub, it is only in the 2nd Runway at Gatwick scenario that this is likely to represent any more than a business as usual position;
  - where there is significant excess demand that cannot be accommodated within London, the industry will need to examine how it can meet this demand and, in some cases, if it will choose to meet this demand.
- In terms of the first issue, there are potentially three options for companies in the sector:
  - to effectively ignore the shift in the balance of capacity available towards Gatwick and to continue to focus operations on Heathrow, particularly as it is unlikely that Gatwick will offer a significant number of relevant long haul destinations that are not served from Heathrow in any event. This is certainly a possibility for some time. However, we would expect that freight rates at Heathrow would increase to reflect this, with the result that Gatwick would become more attractive for some operators and with the consequence that ultimately bellyhold capacity at both airports would be fully utilised;
  - to split consolidation operations between the two sites. This is perhaps ultimately the most extreme option and it seems unlikely that many would follow this path as it would likely introduce significant inefficiencies in to their operations through duplication of functions. It should, however, be noted that some functions will have to be duplicated for Gatwick to be used at all, for instance transit shed facilities. So, at a less extreme level, there will be an inefficiency cost to the industry. However, within the scope of this work we have not sought to estimate this;
  - The final option is ultimately the most likely. Operators will continue to focus their operations on the main hub but will truck freight to Gatwick to use bellyhold capacity as appropriate. This will impact on the costs faced by the industry, which, in a competitive market, we would ultimately expect to be passed on to freight users. We present estimates of the impact on these costs below. It should also be recognised that transhipment between the two airports increases the chance of service failures and delays, making the option less attractive to operators and impacting ultimately on users. We have not sought to estimate this latter effect in this work and hence impacts may be conservative.
- The options in relation to the excess demand that cannot be satisfied within the London system are subtly different. Again, some companies may simply choose to step back from the London market, either withdrawing or choosing not to seek to expand with demand. This may be particularly true for major global companies with the ability to shift the emphasis of their activity. However, this will ultimately leave unsatisfied demand in and around London and potentially market space for others to step in and seek to serve the market via a different business model. This is most likely to involve trucking freight from London to other airports either in the UK or on the continent that have the necessary capacity and / or long haul passenger networks to support the required levels of demand. This will, however, come at a cost in terms of both additional trucking costs and a loss of utility to users as these avenues will need more time to ship freight, which in an industry where speed is an essential feature is clearly potentially damaging. Again, there is also the potential for increased service failures and delays via this route.
- We consider potential patterns of distribution of this excess demand below.

Gravity Model of Distribution of Excess Demand

- In considering how excess air freight demand from the London system might be served by trucking to other airports in the UK and on the continent, we have developed a basic gravity model to estimate the distribution.
- The model includes three UK airports: the national freight hub at East Midlands and the two primary regional long haul passenger gateways at Manchester and Birmingham. It also includes the three main European hub airports, which all have a significant freight presence now and are likely to grow both bellyhold and freighter capacity in to the future.
- The attraction factor within this model is forecast workload units (a workload unit is one passenger or 100kg of freight) at each airport in 2050 based on the Airports Commission traffic forecasts in its Interim Report. Passenger numbers have been adjusted to reflect the proportion of long haul passengers. Freight is assumed to grow from current levels through to 2050 in line with passenger numbers.
- The distance decay factor within the model is the road haulage cost of transporting a truck load of freight to the relevant airport from London. Freight rates have been derived from data provided by the Freight Transport Association. Distances have been derived from the fastest road route to the destination airport from Google Maps.
- This demonstrates that we would anticipate that a significant proportion of the excess demand will be trucked overseas to the major continental hub airports to take advantage of their extensive long haul networks.
- UK regional airports, despite being substantially closer to London in most cases, cannot match the level of attractiveness offered by the continental hubs and their wider global networks. Consequently, other UK airports are only expected to handle around 28% of any excess demand.



Impacts on the Wider UK Economy

- Drawing on our analysis of the potential capacity implications and operational impacts of the four runway capacity development scenarios set out, we have considered the potential impacts of each scenario on the UK economy.
- We have examined a number of potential streams of impact:
  - the impact on freight costs from additional trucking, either within London in the case of the 2nd Runway at Gatwick scenario or to other UK regional and continental airports where demand has to satisfied away from the London system;
  - the impact on users' utility from increased transit times / earlier cut-off times. As we have discussed, one of the key reasons users choose air freight as a means of transporting goods is speed and, for some parts of the market, speed and time is critical. Therefore, changes in the operating environment that affect speed of delivery or transit times will have an effect on the usefulness or usability (utility) of air freight for some users, which will represent a disbenefit to the economy;
  - the impact on long term productivity in the wider economy from constraints on air freight demand. Ultimately, rising freight costs from additional trucking and the implied rise in costs associated with lost utility to end users will result in reduced demand and impact on productivity in the wider economy, through changes in the ability to trade effectively or decisions around location and investment. This results in lower GVA in the long term;
  - the impact on the sector's economic footprint in the UK from constraints on air freight demand. As we have set out above, air freight services in themselves support significant employment and GVA through their economic footprint (their direct, indirect and induced impact on the economy). Reduced demand for air freight services will ultimately impact on the sector's ability to support this economy activity.

Impact on Freight Costs from Additional Trucking

The Impact on Freight Costs from Additional Trucking in 2050 (2014 Prices)

	No Expansion	4 Runway Hub	Heathrow Runway 3	2nd Runway at Gatwick
Costs of Trucking within London (1)	£0.0	£0.0	£0.0	£2.0
Costs of Trucking to Other UK Airports	£7.5	£0.0	£4.2	£6.2
Costs of Trucking to Overseas Airports	£34.1	£0.0	£19.2	£27.9
Total Additional Costs	£41.6	£0.0	£23.5	£36.1

(1) All scenarios involve some trucking of freight from Heathrow or a new Hub to other airports. However, in most scenarios this is assumed to be 'business as usual', much as it is now. It is only in the second runway at Gatwick scenario that the development of a significant second centre of freight activity is assumed that would result in truly additional trucking costs.

Source: York Aviation.

- Failure to provide sufficient capacity at London's main hub airport or within the London system generally to support the air freight market is likely to result in additional costs to the industry, either from the need to move freight from facilities near to the main hub airport to another airport within London or from London to a range of other airports in the UK or on the continent.
- The costs of trucking in London apply primarily in relation to the scenario whereby a second runway is built at Gatwick and no additional capacity is provided at Heathrow. Using data provided by the Freight Transport Association, we have calculated the number of truck journeys that would be required to move the freight displaced from Heathrow to Gatwick assuming typical loads per truck in the industry and also the likely costs of these journeys based on freight rates. On this basis, we estimate that building a second runway at Gatwick would result in additional costs to the industry of around £2 million per annum from moving freight within London (2014 prices). Much greater costs are, however, incurred by the need to move freight out of the London system to other UK airports or to the continent to meet demand. Again, we have calculated the number of journeys that would be need to accommodate this excess freight tonnage and the associated costs of these journeys.
- If no additional capacity is provided in London (No Expansion) the additional trucking costs are estimated to be around £41.6 million per annum in 2050. With a 2nd Runway at Gatwick, these costs reduce to a total of around £36.1 million per annum. Heathrow Runway 3 results in costs of around £23.5 million. The difference between Heathrow Runway 3 and Second Runway at Gatwick stems primarily from the need to truck freight to Gatwick in the latter scenario.
- A 4 Runway hub provides sufficient capacity such that no additional trucking is required. Hence, there are no additional costs.

Impact on Users Utility from Increased Transit Times / Earlier Cut-off Times

Impact on Users Utility from Increased Transit Times / Earlier Cut Off Times

	No Expansion	4 Runway Hub	Heathrow Runway 3	2nd Runway at Gatwick
Average Increase in Transit Times	158	0	90	136
Time Sensitive Proportion of the Market	30%	30%	30%	30%
Value of Time per Tonne (per hour)	£120.07	£120.07	£120.07	£120.07
Total Impact on Freight User Utility (£m)	**£378**	**£0**	**£213**	**£321**

Source: York Aviation.

- The need to truck freight around London or, more importantly, further afield will impose not only an additional trucking cost but also a utility cost on users that are time sensitive. Users are prepared to pay significant additional amounts for express delivery of air freight and increased transit times or earlier end of day cut off times will impact on these users as the quality of service they experience will be reduced. The value of this time is difficult to calculate and standard values are not available (as they are for passengers). We have, therefore, estimated the extent to which express freight users are willing to pay for an hour's faster delivery for express services using data published in the SDG report for DfT (see assumptions book for additional information). This suggests that value of saving an hour for a tonne of freight for time critical users is around £120.
- For the purposes of this analysis, we have assumed that the time critical portion of the market is approximately represented by the size of the express freight industry. Currently, this is stated by SDG to be around 18% of the market. However, this sector has been growing faster than general air cargo. We estimate that, by 2030 and thereafter, it will account for around 30% of the market.
- The impact on transit times is based on the weighted average of additional time required to truck freight to / from the airport at which it is shipped or received across the market as a whole. This includes freight which continues to travel via its preferred London airport, for which additional trucking time is assumed to be 0. Trucking costs for freight displaced from Heathrow to Gatwick are included.
- The results suggest that there are potentially significant impacts on freight user utility from increased transit times. No Expansion of capacity will result in a loss of user utility of around £378 million per annum. The addition of a second runway at Gatwick improves the situation but the costs are still ultimately significant at around £321 million per annum. Heathrow Runway 3 results in a loss of around £213 million per annum. Only a 4 Runway Hub, which provides sufficient capacity to avoid any additional trucking, does not result in a cost to users.

Impact on Long Term Productivity in the UK Economy (1)

Impact on Wider UK Economy from Lost UK Freight Demand

	No Expansion	4 Runway Hub	Heathrow Runway 3	2nd Runway at Gatwick
Estimated Value of Unconstrained Air Freight Market in 2050 (£m at 2014 prices)	£4,508	£4,508	£4,508	£4,508
Increase in Costs from Trucking and Lost Utility	£419	£0	£236	£358
% Impact on Costs	9.3%	0.0%	5.2%	7.9%
Price Elasticity	-0.5	-0.5	-0.5	-0.5
Lost Tonnage	-196,301	0	-110,639	-167,679
GVA Impact on the Wider Economy (£m at 2014 prices)	**-£978**	**£0**	**-£551**	**-£836**

Source: York Aviation.

- The increase in costs associated with additional trucking and the loss of utility to users will ultimately affect the level of air freight demand in and around London, which will in turn impact on economic activity as productivity will be reduced through channels such as the ability to trade being impaired or companies moving away from the area to a location with the services they need or through lost future investment.
- In previous work for Transport for London Oxford Economics has statistically estimated the link between the level of activity in the economy and a combined index of the level of business air travel and air freight. We have used this relationship to estimate a long term GVA impact of each of the scenarios . The change in the level of demand for air freight is assumed to reflect the percentage increase in total revenues from air freight in the UK caused by increased trucking costs and lost utility to users via a price elasticity relationship. The value of the unconstrained air freight market in 2050 is based on our estimate of air freight demand described above, an analysis of air freight turnover in the UK from the ONS Annual Business Survey and CAA Statistics. This assessment is also consistent with global freight rates as set out in the latest IATA Cargo eChartbook.
- The price elasticity of air freight demand is a poorly researched area. Consequently, we have had to assume an elasticity of around -0.5. This is broadly in line with available data for the price elasticity of business passenger air travel. We believe the figure to be potentially conservative but reasonable in the absence of more specific information.
- The resulting impact on freight tonnage demand in effected scenarios ranges between around 111,000 tonnes (Heathrow Runway 3) and 196,000 tonnes (No Expansion). As before, a 4 Runway Hub has sufficient capacity that the air freight market is not constrained and hence there is no loss.

Impact on Long Term Productivity in the UK Economy (2)

- The consequent impacts on GVA are again significant:
  - No Expansion results in lost GVA of around £978 million per annum by 2050;
  - Heathrow Runway 3 results in a GVA loss of around £551 million per annum by 2050;
  - 2nd Runway at Gatwick results in a GVA loss of around £836 million per annum by 2050.
- In 2013, Oxford Economics in its work for TfL estimated that the GVA loss from constrained business travel would be around £6.9 billion per annum in 2050. Considering the relative sizes of the passenger and freight markets at the London airports, this demonstrates that the impact from the impairment of freight services should be taken at least as seriously as that from passenger markets. The impacts are likely to be proportionately significant.

Impact on Air Freight's Economic 'Footprint'

GVA and Employment Impact on the Air Freight Services Sector Economic Footprint

	No Expansion	4 Runway Hub	Heathrow Runway 3	2nd Runway at Gatwick
Direct Effect				
GVA Lost (£m at 2014 prices)	£174	£0	£98	£149
Employment Lost	2,000	0	1,100	1,700
Total Economic Footprint Effect				
GVA Lost (£m at 2014 prices)	£637	£0	£359	£544
Employment Lost	6,800	0	3,800	5,800

Source: York Aviation analysis of SDG.

- Finally, we have considered the impact of reduced freight demand in the UK on the sector's economic footprint. For the purposes of this analysis, we have assumed that the loss of demand is equal to that described above in relation to the long term impact on GVA in the wider economy. In other words, we have assumed that much of the processing and consolidation of freight will be retained within the UK before freight is ultimately trucked overseas. In this regard, this may mean that the estimates are conservative in terms of the losses demonstrated. However, we believe this to be the most prudent assumption.
- Based on the previous work undertaken by SDG on the economic impact of the sector, we estimate that the impacts of constraint in the London system will be as follows:
  - No Expansion – around £637 million in GVA and 6,800 jobs;
  - 4 Runway Hub – this an unconstrained scenario and hence there are no impacts;
  - Heathrow Runway 3 - £359 million in GVA and 3,800 jobs;
  - 2nd Runway at Gatwick - £544 million in GVA and around 5,800 jobs.

Summary Comparison Between Heathrow & Gatwick Expansion

Summary Comparison Between Heathrow & Gatwick Expansion (1)

- Given the Airports Commission's decision to focus on expansion options relating solely to Heathrow or Gatwick, we have in this Appendix provided some additional analysis of the evidence presented in the main body of the report to consider the relative merits of expansion at Heathrow and Gatwick compared to the No Expansion case.
- We have projected that by 2050, all airports servicing London will have reached full capacity even if either the Gatwick or Heathrow expansions go ahead, which will have significant impact on freight efficiency and the economy. Six key comparisons were made between the Gatwick and Heathrow expansion scenarios and 'No expansion', using the analysis above. These comparisons are presented in the Table below.
- Of the three options, the Heathrow expansion provides the most significant economic benefits, in terms of cost reduction, job creation and minimization of extra costs associated with increased freight transit times. For the six key freight comparisons the Heathrow expansion is on average 43% more economically beneficial than 'No expansion' whereas Gatwick is only on average 15% more beneficial than 'No expansion'. We consider this evidence in more detail overleaf.

Comparison of 'No expansion' to London airports with Gatwick 2nd runway and Heathrow 3rd runway

Projections to 2050	No Expansion	Gatwick 2nd runway	Heathrow 3rd runway	Gatwick 2nd runway % difference	Heathrow 3rd runway % difference
Truck elsewhere (m tonnes)*	2.1	1.7	1.2	19.1%	42.9%
Cost of trucking elsewhere (£m)	41.6	36.1	23.5	13.2%	43.5%
Freight user time costs (£m)	378	321	213	15.1%	43.7%
Lost GVA to wider economy (£m)	978	836	551	14.5%	43.7%
Lost GVA to sector's economy (£m)	637	544	359	14.6%	43.6%
Jobs Lost	6,800	5,800	3,800	14.7%	44.1%

Source: York Aviation

Summary Comparison Between Heathrow & Gatwick Expansion (2)

- The freight comparisons for **six key economic measures** are projections for the year 2050 comparing Gatwick and Heathrow expansions with 'No expansion':
  - **Truck elsewhere:** Significant volumes of freight will be trucked elsewhere to cover the shortfall in air freight capacity in the region. The amount diverted is however reduced if either Gatwick or Heathrow undergo expansion (as opposed to 'No expansion'). If Gatwick is expanded then the amount trucked elsewhere is reduced by almost 20%. Under the Heathrow expansion however, this reduction is more than doubled to 43%;
  - **Cost of Trucking elsewhere:** Heathrow expansion is a saving of nearly 44%, or £18.1 million. Gatwick expansion means the cost reduction is only 13%;
  - **Freight User Time Costs:** Trucking elsewhere also incurs extra costs associated with increased transit times for goods. The 'No expansion' scenario equates to an extra time cost of £378 million. The Gatwick expansion would see this cost lowered by 15%and expansion of Heathrow would result in a lowering of nearly 44% which equates to a saving of £165 million;
  - **Knock-on reduction of Economic Gross Value Addition (GVA):** There is an impact to the wider economy measured by a reduction in Gross Value Addition (GVA) arising from supporting goods and services associated with the air freight industry. The loss to the wider economy is estimated to be £978 million which is reduced by nearly 15% if the Gatwick expansion occurs and around 44% if the Heathrow expansion takes place;
  - **Loss of job creation:** Along with a loss of GVA, there is inevitably a reduction in job creation. With 'No expansion', a total of 6,800 extra jobs would not be created. This is reduced by 1,000 with the expansion of Gatwick and by 3,000 with the expansion of Heathrow.
- Of the three options, the Heathrow expansion provides the most significant economic benefits, in terms of cost reduction, job creation and minimization of extra costs associated with increased freight transit times.

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- London Airports Route Networks in 2050 – York Aviation for Transport for London (July 2013)

Assumptions Book

Bellyhold Capacity Assumptions

% International Passenger Movements by Scenario

	No Expansion	New 4 Runway Hub	Third Runway at LHR	2nd Runway at LGW
Hub	93%	90%	91%	93%
Gatwick	96%	94%	94%	91%
Other London	91%	90%	90%	89%

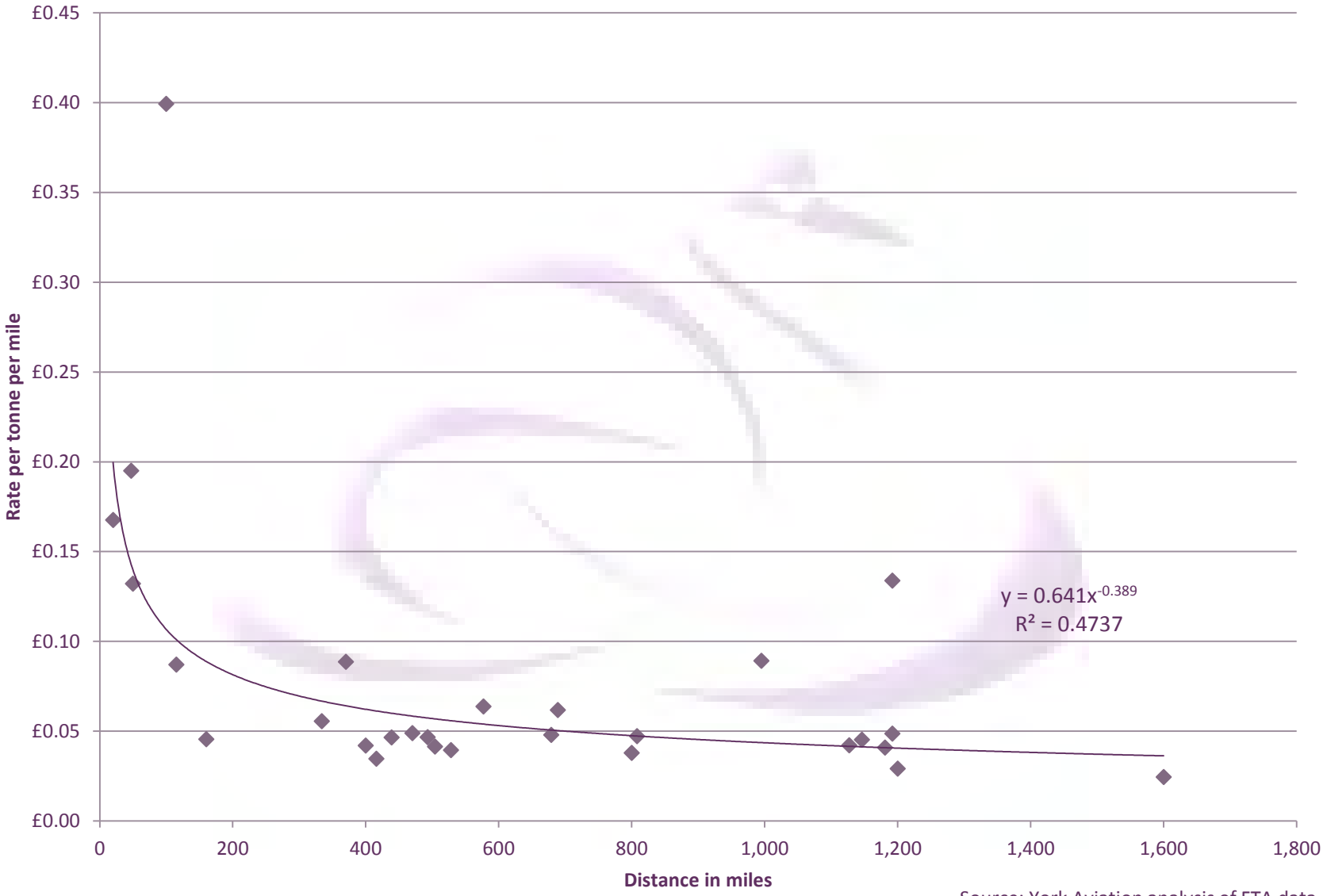
Source: York Aviation London Route Networks 2050 Model.

Freight Tonnes per ATM in 2050

	No Expansion	New 4 Runway Hub	Third Runway at LHR	2nd Runway at LGW
Hub				
Tonnes per Freighter	35.6	35.6	35.6	35.6
Tonnes per Bellyhold Movement	3.9	3.9	3.9	3.9
Gatwick				
Tonnes per Freighter	24.6	24.6	24.6	24.6
Tonnes per Bellyhold Movement	0.5	0.5	0.5	0.9
Other London				
Tonnes per Freighter	24.6	24.6	24.6	24.6
Tonnes per Bellyhold Movement	0.0	0.0	0.0	0.0
London Average				
Tonnes per Freighter	26.5	26.5	26.5	26.5
Tonnes per Bellyhold Movement	2.0	2.0	2.0	2.0

Source: York Aviation analysis of CAA Statistics.

Estimated Road Haulage Rates

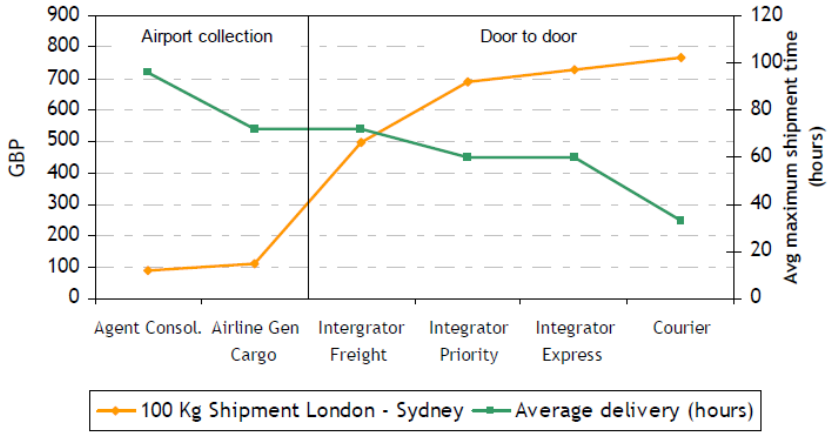


Source: York Aviation analysis of FTA data

Estimate of Value of Time per Hour per Tonne

- A value of time per hour per tonne for time sensitive air freight has been calculated based on the data collected by SDG as part of their work for DfT on Air Freight in 2010.
- The original data has been plotted as an S-curve in the chart below.
- The value of time per hour is assumed to be equal to the average additional amount that would be charged to save an hour on the delivery of a package using an express type service (Integrator Priority, Integrator Express or Courier).
- This has then been converted to a figure for a tonne by multiplying by 10.
- On this basis, the value of time per hour per tonne is around £120.07.

FIGURE 5.3 RELATIONSHIP BETWEEN PRODUCT, SERVICE PROVIDER AND PRICE



Source: Combined tariff from AMI / integrators.

Source: SDG for DfT 2010.

Cost of 100kg Package to Sydney by Delivery Time

Information on aviation's environmental impact

CAP 1524

Published by the Civil Aviation Authority, 2017

Civil Aviation Authority,

Aviation House,

Gatwick Airport South,

West Sussex,

RH6 0YR.

First published 2017

The latest version of this document is available in electronic format at www.caa.co.uk, where you may also register for e-mail notification of amendments.

Contents

Introduction

Purpose

The purpose of this document is to bring together environmental information and data published on the CAA website between 2011 and 2014.

This data was initially presented with the intention of providing a ‘one stop shop’ for publicly available information on the environmental impact of the UK’s civil aviation activity.

As the CAA no longer considers this the most effective way of providing the public with environmental information, this data is no longer published on the CAA’s environment web pages and exists here in archive form.

In addition to specific figures on the environmental impact of airports, airlines and other bodies, this document also contains some high level explanations of how aviation affects the environment. Additionally, it provides more detailed explanation of how to interpret the relevant metrics of environmental impact than can be found on the CAA’s environmental web pages. While this information represented the most up to date thinking at the time it was published on the CAA website, we cannot ensure its continued accuracy.

General

The most common concerns around the environmental impact of aviation are climate change and noise, but air quality and local environments are also directly impacted by aviation.

Airlines and airports are not obliged to produce the data below, and while there are standard protocols (particularly around emissions) there are no standardised requirements for reporting. This makes it extremely difficult to produce comparable data, and users should be wary of drawing comparisons from the material in this document. In many cases the methodologies and time periods between entries are inconsistent, and users are advised to refer to source material from the airline or

airport in order to understand the specific conditions under which their data was produced. More recent data, subsequent to that below, can also be found from the relevant airline/airport website.

This document will not be updated and no responsibility can be taken for the continued accuracy of any part.

Chapter 1

Climate change

Introduction

Aircraft emit a range of greenhouse gases throughout different stages of flight. Aircraft are fairly unique in that they directly emit gases into the higher levels of the atmosphere. When emitted at this altitude, the same gases can have very different effects than when emitted at ground level.

Scientific evidence strongly indicates that these greenhouse gases contribute to climate change.

Greenhouse gases move throughout the atmosphere and so do not respect international boundaries. This means that they are an international issue regardless of where the emissions were released.

Types of greenhouse gases created by aviation

Many different gases contribute to climate change. CO2 is generally viewed as the most problematic greenhouse gas. It has a long life cycle and plays a key role in global warming. In aviation, it is primarily generated by burning carbon-rich 'fossil fuels' in engines. Other gases emitted by aircraft are:

- Oxides of nitrogen (NOx)
- Ozone (O3) – created by the reaction of NOx and sunlight
- Soot and aerosols
- Water vapour – causing contrail or man-made cirrus clouds

Less is known about the effects of these other gases. Some researchers predict that these gases have a far greater effect than CO2 when emitted in the higher levels of the atmosphere.

Aviation's contribution to CO2 generation

The following table shows direct emissions from a number of sectors in 2012, according to data from the Committee on Climate Change:

Industry	Emissions (million tonnes per annum)
Power generation	150
Road transport	108
Industry	105
Aviation	34
Waste	22
Shipping	11

Table 1: Emissions by sector in 2012. Source: Committee on Climate Change

The Energy Savings trust estimated that the average house produces 4.5t of CO2 per annum. CO2 generation from aviation was therefore equivalent to 7.7 million homes in 2012.

CO2 emissions are directly proportionate to the amount of fuel burned by an aircraft. In approximate terms, every tonne of aviation fuel burned produces between 3.15 and 3.18 tonnes of CO2.

Aviation accounts for approximately 6% of total UK emissions. Of this, around 90% of these emissions arise from international flights; and 10% from domestic flights. Aviation emissions have doubled since 1990. Over the same time period, aircraft have become substantially more energy-efficient, through improvements in engine and airframe technology: but these improvements have not kept pace with the growth in emissions from increased air traffic. Because of continued increases in forecast demand for aviation and a lack of low carbon alternative technologies, aviation will increase its relative share of UK's emissions if greater improvements are not made.

Government has produced a series of aviation growth forecasts that predicts at what level CO2 emissions could be in the future. The Government forecasts have been reproduced in the table below and relate to emissions on all flights departing UK

airports. The figures assume the central range forecast of an aviation sector that is constrained by available capacity.

2010 (actual)	2030 (forecast)	2050 (forecast)
33.2	43.5	47.0

Table 2: DfT UK aviation forecasts for CO2 emissions from flights departing UK airports (million tonnes)

It should also be remembered that activities associated with flying also create CO2 emissions. These can be:

- From airport buildings;
- Onsite ground vehicles; and
- From those travelling to the airport in vehicles whether to work at the airport or take a flight.

These activities constitute a relatively small proportion of total aviation emissions: the majority originate directly from aircraft. For example, in 2010 the direct emissions from major airports were less than 1% of the total emissions emitted by aircraft using the airports.

Climate change policies

In the UK, the Department of Energy & Climate Change (DECC) is responsible for delivering the UK Government's commitments under the Climate Change Act 2008. Under this Act, the UK is required to achieve an 80% cut in greenhouse gas emissions on 1990 levels by 2050. This applies to all sectors and is not specific to aviation.

The Government's target is to reduce UK aviation emissions so that by 2050 they are back to 2005 levels or lower. The Government has asked the Committee on Climate Change to suggest which emissions can be reduced and how. The Committee has also been asked to assess how further expansion in aviation beyond 2020 would affect the sector's ability to meet the Government target. The full report by the CCC is available on its website.

In 2012 the CCC also recommended that emissions from international aviation should be included in the UK Carbon budget. However, due to the uncertainty over the international framework for reducing aviation emissions, this decision has been deferred by Government

Within the Aviation Policy Framework, the Government set out its expectation for aviation in relation to climate change – 'to ensure that the aviation sector makes a significant and cost-effective contribution towards reducing global emissions.' (2.4).

The policy framework goes on to say that 'Our emphasis is on action at a global level as the best means of securing our objective, with action within Europe the next best option and a potential step towards wider international agreement.' (2.5)

Within the European context, emissions from aviation are being tackled through the EU Emissions Trading System (ETS). The ETS regulates emissions in those sectors with the highest emissions such as power generation. The aviation sector became part of the scheme in 2012, and flight operators in the European Economic Area are required to submit data under the ETS.

The EU Commission publishes annual lists of emissions for those in the scheme.

At the international level, ICAO has agreed to targets for delivering carbon neutral growth from aviation from 2020 and delivering 2% annual emission improvements up to 2050. This will be achieved using a combination of improvements in technology, operational procedures, use of alternative fuels and the introduction of a global market based measure.

The ICAO General Assembly, through Resolution A38-18, agreed to develop this global market-based measure scheme for international aviation. The scheme that is being developed would be implemented from 2020. The design of this measure will require the agreement of the ICAO member states at the next ICAO General Assembly in September 2016.

More information can be found on this by visiting:

- The policy owner – The European Commission
- Responsibility for delivering EU-ETS policy within the UK – Department of Energy & Climate Change

- The regulator for the EU-ETS – the Environment Agency

Factors contributing to aviation's CO2 emissions

There are many factors that affect the amount of CO2 emissions from a flight. Some of these are in the control of airlines; some can be controlled or influenced by airports and regulators; some are to do with the weather.

The main factors are:

- Aircraft type
- Flight profile and distance
- Weight of the aircraft
- Operational procedures
- Use of next generation biofuels
- The weather
- Efficiency improvements

Aircraft type

Each aircraft will burn fuel at a different rate. There can be variances between models: air frame design and modifications will affect drag and weight; different engines will operate at varying levels of efficiency depending upon the range that they are designed to fly. Between aircraft families the variances can be even greater.

Aircraft and engine manufacturers have significantly improved the efficiency of aircraft and engines since the early 1960s. Newer aircraft are in general more fuel-efficient and produce fewer emissions. While airlines obviously can control the age of their fleet, there is often a long lead time between order and delivery - meaning investments they make in fuel-efficient aircraft can take some time to make a difference to emissions performance.

Flight profile and distance

Aircraft burn fuel and emit emissions at differing rates during the different stages of a flight. These can be broadly categorised as:

Take-off and climb to cruise altitude

There is a higher fuel burn rate at this stage because of the power needed to get the aircraft to climb to its cruise altitude. Air at a lower altitude is denser, creating more drag on the aircraft: at this stage the aircraft is at its heaviest because it holds all the fuel needed for the journey.

At cruise altitude

This is the most fuel-efficient stage of the flight because the air is less dense and the aircraft is flying at its most efficient operating speed.

Landing

At this stage the aircraft is at its lightest because it will have consumed most of its fuel load. The aircraft is also descending, requiring less power to be in operation, emitting proportionally lower emissions than at the start of the flight.

Efficiency and distance

Because of the high emissions at the start of a journey, short-haul flights are deemed the most inefficient because they spend a greater proportion of their total journey in the high emissions phase. These aircraft are also likely to do more short flights during a day, spending more time in the take-off and climb phase than longer haul aircraft.

Long-haul journeys are broadly speaking the next most inefficient type of flight. Although the aircraft spends a long time at its most efficient cruise altitude, the aircraft has to carry more fuel to cover the long distance and this extra weight makes it burn more fuel.

Medium distance flights of between 2,000 and 5,000 km are therefore the most fuel-efficient flights and tend to emit the lowest emissions per km travelled.

External factors

There are factors outside of an airline operator’s control in relation to duration of flight. Very few flights can fly the most direct ‘as the crow flies’ route because of the need to safely manage aircraft traffic. In more congested airspace – such as above London and the South East of England – aircraft are often held in holding patterns or

stacks before they are allowed to land. Airspace is also controlled for military purposes; and some airspace in the world is deemed not safe to fly over due to conflict on the ground which means greater distances have to be flown to avoid such areas.

Weather can also influence flight profiles – see below for further details.

Weight of the aircraft

The lighter an aircraft is, the less fuel it will burn. Reducing unnecessary weight on an aircraft can therefore reduce CO2 emissions (as well as fuel costs). Airlines are always looking for ways to reduce the weight of their aircraft, and have taken a wide range of steps to do so. These include:

- using lighter types of paint
- taking fewer and lighter catering trolleys on board
- removing in-flight magazines
- reducing the baggage allowance rates

Per flight, the level of emission saving is negligible. However, a Project Omega study found that if all these measures were taken on a single Boeing 747 (Jumbo Jet) that operated a daily return from the UK to the US, it would save 456.2 tonnes of CO2 per year. That's roughly equivalent to the average domestic carbon footprint of 45 UK residents.

Operational procedures

Changes to aircraft operational procedures both in the air and on the ground can reduce the amount of fuel they burn and hence the volume of CO2 they emit.

Continuous Climb Operations and Continuous Descent Operations aim to make the climb to or descent from cruising altitude more efficient. Just as in a car, smoother acceleration and deceleration burns less fuel, so a smoother, steadier climb with fewer changes of speed will require less aircraft fuel. A similar principle applies to descent, where a smoother descent, perhaps begun earlier, reduces the need for braking and re-acceleration.

Clearly, this requires detailed flight planning and assistance from air traffic control. However, the aviation industry is looking to increase its use: industry body Sustainable Aviation has launched a campaign to increase the use of Continuous Descent Operations in the UK by 5%, which could reduce CO2 emissions by 10,000 tonnes a year. On the ground reduced engine taxiing and the use of Fixed Electrical Ground Power can also reduce the amount of fuel used. Further information can be found in relation to air quality in subsequent chapters.

Use of next generation biofuels

Conventional jet fuel, in common with other road transport fuels such as diesel and petrol, is based on fossil fuels and has a high carbon content - creating high levels of CO2 emissions. The aviation industry has looked at alternatives, such as biofuels (fuels derived from organic matter such as plants) which enable overall CO2 emissions to be reduced by taking account of the carbon absorbed during plant growth.

Early development of biofuels typically involved growing crops solely for fuel. However, it's now recognised that this approach can be environmentally counterproductive, because of the effects of land use change, competition with food crops and water supplies. Instead, there is a concerted effort to produce biofuels from waste sources.

Industry body Sustainable Aviation has published a roadmap outlining where the industry believes growth in biofuels can come from and what the barriers are to this growth.

The weather

The weather can worsen or improve the environmental impact on the environment from flight to flight:

- Headwinds will require more fuel to be burnt so increases emissions, although a tailwind will help reduce emissions.
- Bad weather such as snow, high winds or fog can cause delays with take-off and landing which see aircraft idling on the ground or being held in stacks which increases the emissions of the aircraft.

- Temperature can result in higher and lower emission rates; with aircraft requiring less fuel to take off in colder temperatures due to the air being denser which enables the engine to run more efficiently.
- Indirect environmental effects can also occur from bad weather such as an increase in the amount of de-icing fluid needed to be used in prolonged spells of cold weather.

Efficiency improvements

In addition to reducing emissions levels overall, the aviation industry seeks to increase its efficiency. In environmental terms, this means reducing the level of emissions per passenger or tonne of freight carried.

Passengers make up a relatively small proportion of the total weight of an aircraft, but an aircraft is more 'efficient' when more passengers are carried as the total emissions are shared between larger numbers of people.

Consumer ability to reduce CO2 emissions

The easiest way to reduce CO2 emissions from flying is to reduce the amount you fly. This is not always practical: aviation is an important and convenient form of transport for millions of people.

Some steps can be taken to reduce emissions without ceasing to fly:

- Select airlines with modern (i.e. more efficient) aircraft
- Consider flying economy rather than business or first class
- Fly with airlines with lower CO2 performance figures
- Use public transport to get to the airport
- Make a carbon offset payment when you fly. This involves the payment of a sum to compensate for the emissions produced by a flight. Money from these schemes goes to projects working to reduce emissions. Some airlines offer a carbon offset charge when booking a flight, but specialist carbon offsetting companies are another option. Research your options. Information is available from the International Carbon Reduction and Offsetting Alliance.

Data

Issues with CO2 emissions reporting and forecasts

Emissions calculations are difficult and in the absence of solid data, must often use assumptions. There are a number of factors to be aware of when studying and comparing emissions data. These include:

- **Differences in calculation methods**. The UK Government calculates emissions based on fuel usage. It tracks sales of bunker fuel (the fuel used by airlines), then uses a conversion factor to generate the CO2 figure. Airlines typically calculate emissions using fuel burn data and a conversion factor. Each method will lead to a different figure, so when comparing emissions data, it is important to ensure the calculation method used is the same.
- **Risk of double counting.** Different organisations report the same emissions – for example airports and airlines. So, there is a danger that emissions can be double counted.

The difficulty of emissions reporting and forecasting is demonstrated by the difference in the forecasts for 2050 between the Government and industry body Sustainable Aviation. They have used different assumptions about air traffic control efficiency improvements, the speed of introduction of sustainable fuels, the relative efficiency of new aircraft and the degree of carbon trading that may occur.

Observations on emissions reporting

Airports are not required to publish data about their greenhouse gas emissions. There are no official standards, and while most organisations report emissions using standard greenhouse gas reporting protocols, there are often slight variants in their calculations. Users are advised to visit organisations' websites to determine the details of exact methodologies and to be wary of making comparisons. In general, data is published in terms of CO2 equivalent (CO2e) which includes greenhouse gases besides carbon dioxide.

It should be noted that although airports generate direct CO2 emissions, the majority of airport emissions are from the arrival and departure of aircraft.

The most appropriate method of comparison for the performance of airlines is to use efficiency metrics. In order to compare operators, the same efficiency metric must be used, but the lack of common reporting practice used across airlines makes it difficult for consumers to make these comparisons. Efficiency metrics in the tables below will have been calculated using different methodologies. The CAA is encouraging airlines to report in a more standardised format to increase the availability of more comparative environmental performance data.

CO2 emissions by airline

This table shows publicly available reported emissions for the fifteen largest airlines that operate out of the UK based on passenger numbers.

NOTE: Many of these airlines operate internationally – figures given for emissions represent global operations, not only flights from UK airports.

NOTE: No common reporting practice has been used in the production of these figures. No 'like for like' comparison can be made from the table below. Some figures may include total greenhouse gas emissions; others CO2 only, and some combine aircraft emissions with operational infrastructure emissions (e.g. office buildings).

Airline	Total global emissions (million tonnes)	Global passengers carried (millions)	Efficiency	Source
Aer Lingus	-	11.9	-	-
American Airlines	26.8 (2011 data)	86.8 (2013 data)	-	Environmental data, 2011
British Airways	18.1 (CO2e)	39.9	101.7g CO2 per pax-km	Corporate Responsibility Report 2013
EasyJet	6.1	69.8	81.05g CO2 per pax-km	Corporate Responsibility Report 2013
Emirates	25.6	44.5	100.3g CO2 per pax-km	Environment Report 2013/14
Flybe Ltd	-	7.7	-	-
Jet2.com	-	5.5	-	-
Lufthansa	27.7	102	9.84kg CO2 per 100 pax-km	Sustainability Report 2014
Monarch	-	7.0	-	-

Airline	Total global emissions (million tonnes)	Global passengers carried (millions)	Efficiency	Source
Ryanair	-	81.3	-	-
Thomas Cook	3.9 (CO2e)	6.1	71.5g CO2 per pax-km	Sustainability Report 2014
Thompson*	5.1	10.3	70.7g CO2 per revenue pax-km	Sustainable Holidays Report 2013
United Airlines	31.3 (CO2e)	90.1	1.56 CO2e tonnes/1,000 revenue tonne miles	Corporate Responsibility Report 2013
Virgin Atlantic	4.8 (CO2e)	6	0.799kg CO2 per revenue tonne-km	Change is in the Air Sustainability Report 2014
Wizz Air	-	-	-	-

Table 3: CO2 emissions by airline

NOTE: 'CO2e' means 'carbon dioxide equivalent' – where total greenhouse gases have been accounted for

NOTE: No attempt has been made to standardise the metrics in this table

Sustainable Aviation members' absolute CO2 emissions and efficiency between 2003 and 2012

Sustainable Aviation member airlines are: British Airways, Flybe, Monarch, Thomas Cook Airlines, TUI Group and Virgin Atlantic.

The following table is reproduced from Sustainable Aviation's Progress Report 2013:

Year	Total CO2 emissions (million tonnes/year)	Fuel efficiency (litres of fuel per revenue tonne km)
2003	27.14	0.414
2004	28.3	0.4
2005	29.61	0.399
2006	31.56	0.399
2007	32.33	0.406
2008	32.15	0.403
2009	30.52	0.396
2010	30.65	0.376
2011	32.17	0.381
2012	32.24	0.374

Table 4: Sustainable Aviation members' total CO2 emissions and fuel efficiency

CO2 emissions and efficiency by airline

This table shows the three airlines operating in the UK with the highest CO2 emissions based on the most recent data published by airlines themselves.

Airline	Year	Total CO2 emissions	Efficiency	Source
United Airlines	2010	33.2 million tonnes	0.179 (emissions / 1000 RPM)	United Airlines Eco-Skies Report
Lufthansa	2013	27.7 million tonnes	9.84 kg CO2 per 100 passenger km	Lufthansa Sustainability Report 2014
American Airlines	2011	26.8 million tonnes	Not available	American Airlines Environmental Data

Table 5: Table of CO2 emissions and efficiency by airline

NOTE: This data is not comparable due to the different years and efficiency metrics used.

Greenhouse gas emissions by airport

The following table contains data for all UK airports with more than 50,000 air transport movements a year (excluding training, aero club and military movements). Three levels ('scopes') of reporting are included, alongside DfT forecasts made in 2013. The DfT's forecasts assume a capacity restrained aviation environment, based on the central forecast in the range.

As a general rule, the three scopes of reporting are:

- **Scope 1:** direct emissions – emissions that the airport can control (from sources owned or controlled by them
- **Scope 2:** indirect emissions – emissions that an airport generated from the purchase of electricity, heat or steam
- **Scope 3:** indirect emissions – emissions outside the control of the airport but those generated due to the activities of the organisation and that they may have influence over (e.g. emissions from aircraft in landing and take-off cycles, or passenger travel to the airport). This figure will be lower than forecast emissions from departing aircraft because it only includes the emissions from the aircraft as they take off and land (not the entire flight).

Airport	Pax No.	Scope 1 (tonnes)	Scope 2 (tonnes)	Scope 3 (tonnes)	Emissions 2010 (tonnes)	Forecast 2030 (tonnes)	Forecast 2050 (tonnes)
Aberdeen	3,440,000	-	-	-	200,000	200,000	200,000
Birmingham	9,114,000	-	-	-	800,000	1,700,000	4,600,000
Bristol	6,125,000	-	-	-	400,000	700,000	1,000,000
East Midlands Intl	4,328,000	1,829	5,972	-	300,000	300,000	1,100,000
Edinburgh	9,775,000	-	-	-	600,000	700,000	1,000,000
Gatwick	35,429,000	13,589	45,791	641,182	3,900,000	4,700,000	4,300,000
Glasgow	7,358,000	2,973	15,788	112,548	500,000	700,000	800,000

Airport	Pax No.	Scope 1 (tonnes)	Scope 2 (tonnes)	Scope 3 (tonnes)	Emissions 2010 (tonnes)	Forecast 2030 (tonnes)	Forecast 2050 (tonnes)
Heathrow	72,332,000	43,000	241,000	1,987,000	18,800,000	21,400,000	18,200,000
London City	3,380,000	-	-	-	200,000	500,000	500,000
Luton	9,693,000	-	-	-	700,000	1,300,000	900,000
Manchester	20,680,000	13,415	46,361	-	2,200,000	3,200,000	5,300,000
Newcastle	4,415,000	-	-	-	300,000	300,000	500,000
Stansted	17,849,000	9,940	29,684	-	1,100,000	3,500,000	1,900,000

Table 6: Passenger numbers, emissions by scope and DfT forecast emissions by airport

NOTE: Passenger numbers (Pax No.) are CAA statistics from 2013.

NOTE: Scopes 1, 2 and 3 are airports' own data.

NOTE: Emissions from departing aircraft (2010) are DfT data from DfT Aviation Forecasts 2013.

NOTE: Scope 2 for Glasgow Airport is 2012 data.

NOTE: Bristol Airport and Edinburgh Airport collect CO2 data but this is not presented using GHG protocol reporting.

NOTE: Fields for which data is absent represent a lack of publicly reported data.

CO2 emissions by airport in 2012

This table shows the three UK airports with the highest CO2 emissions, based on data published by the airports themselves.

The three 'scopes' in the table are explained above. Emissions are shown in tonnes CO2.

Airport	Scope 1	Scope 2	Scope 3	Total emissions	Source
Heathrow	91,000	225,000	1,923,000	2,248,000	Heathrow Airport 2012 Sustainability Performance Summary
Gatwick	13,202	48,867	705,146	705,146	Gatwick Airport – Our Decade of Change 2013 Performance
Stansted	46,826	-	361,240	408,066	Stansted Airport Sustainability Report 2013-14

Table 7: 2012 CO2 emissions by airport

Aircraft age by airline

This table shows the average age of the fleet of Europe's busiest airlines by passenger number, based on Buchair/JP Fleets database for September 2013, and European rank based on 2013 European Passenger numbers.

Company	Average aircraft age	European rank
Air France-KML	12	3
UTair	24	20
Aegean Airlines	5	24
Aeroflot Russian Airlines	6	9
Air Berlin	5	8
Air Europa	6	23
Alitalia	9	11
British Airways	21	4
Brussels Airlines	23	28
eastJet	6	5
Finnair	10	22
Flybe	10	25
Iberia	9	14
Jet2	22	29
Lufthansa Group	22	1
Monarch Airlines	13	27
Norwegian	9	13
Pegasus Airlines	4	15
Ryanair	5	2
S7 Airlines	13	21
SAS	13	10
SunExpress	9	26

Company	Average aircraft age	European rank
TAP Portugal	12	18
Thomas Cook	12	12
Transaero Airlines	15	17
TUIfly	8	7
Turkish Airlines	8	6
Virgin Atlantic	11	30
Wizz Air	4	16

Table 8: Aircraft age and European rank by airline. Source: Buchair/JP Fleets 2013

Use of next generation biofuels

This table shows which of the 15 airlines carrying the most passengers in the UK have a stated policy on the use of biofuels.

Airline	Commitment to biofuel development	Proposed feedstock source	Source
Aer Lingus	None stated		
American Airlines	None stated		
British Airways	Yes	Domestic waste	British Airways Corporate Responsibility Report 2012
EasyJet	None stated		
Emirates	None stated		
Flybe	None stated		
Jet2.com	None stated		
Lufthansa	Yes	A number of trials operated	Lufthansa Sustainability Report 2014
Monarch	None stated		
Ryanair	None stated		
Thomas Cook	None stated		
Thomson	Yes	Used cooking oil	Thomson Airways press release, Oct 2011
United Airlines	None stated		
Virgin Atlantic	Yes	Waste gases	Airline website
Wizz Air	None stated		

Table 9: publicly stated policies on use of biofuels by airline. Source: airline websites

Passenger load factors by airline in 2013

Passenger load factors are the percentage of actual passengers carried relative to the number of seats available. This is a good indicator of efficiency. This table shows 2013 passenger load factors for the ten largest UK airlines by passenger number.

Airline	Passenger load as % available
British Airways	81.5
eastJet	87.9
Virgin Atlantic	78.6
Thomson	92.4
Thomas Cook	93.1
Monarch	85.1
Jet2.com	89.8
Flybe	63.5
BA Cityflyer	69.3
Titan Airways	73.9
Other	54.2
Total	83.9

Table 10: Passenger load factors by airline in 2013 Source: CAA statistics

Chapter 2

Air quality

Introduction

Poor air quality is known to have a damaging effect on health. Depending on the level and type of pollution, symptoms can range from minor irritation to severe effects (particularly amongst those suffering from respiratory illnesses). Air pollution can also damage vegetation and ecosystems.

Pollutants are emitted from aircraft engines, particularly affecting those working and living near an airport. Ground vehicles operating at airports, passenger transport, employee transport and delivery vehicles also contribute to aviation's pollutant emissions.

Types of pollutant created by aviation

The main pollutants that are monitored are:

- Nitrogen dioxide (NO2)
- Nitrogen oxides (NOx)
- Particulate matter (PM)

Carbon monoxide, polycyclic aromatic hydrocarbons, benzene and 1,3-Butadiene are also amongst pollutants of concern.

Aviation's contribution to protecting from air pollutants

The aviation industry is working to reduce the level of pollutants emitted through improvements to aircraft and engine design, operational procedures and fuels.

Changes made by airlines

Airlines can help to improve air quality by:

- Switching off main engines on arrival and, where possible, limiting the use of aircraft auxiliary power units by using fixed electrical ground power, ground power units and pre-conditioned air.
- Delaying the switching on of main engines until absolutely necessary on departure.
- Whilst parked at aircraft stands, operating aircraft on the lowest possible energy draw (e.g. turning off unnecessary electrical systems such as In Flight Entertainment).
- Reducing the number of engines used when taxiing.
- Applying reduced-thrust take-off.

Changes made by airports

Airports can help to improve air quality by:

- Providing fixed electrical ground power and pre-conditioned air for aircraft.
- Optimising the most efficient flow of aircraft when moving between runways and stands.
- Investing in lower emission ground vehicles for use at the airport.
- Considering charging higher landing charges for aircraft with higher NOx emissions.
- Developing surface access strategies that encourage the use of public transport.

In 2013, one monitoring station at Heathrow showed that local air quality annual mean limits for NO2 had been exceeded. All other airports were within legal limits. Heathrow has developed a dedicated website, Heathrow Airwatch, to allow data to be closely monitored and presented in order to tackle this issue.

Air quality policies

EU Member States are set air quality targets through European legislation. Some of these targets are reflected as UK-wide objectives whilst others are devolved objectives with separate targets for England, Scotland, Wales and Northern Ireland.

Defra is the Government department with responsibility for setting national policy on air quality to meet these targets. At a local level, local authorities are required to assess air quality and Air Quality Management Areas (AQMAs) are declared if national air quality objectives are not being met.

Two of these targets are for average mean levels of 40µgm^{-3} for NO2 and PM10 in the UK. Data is available below for a number of UK airports in relation to both targets.

There are no specific air quality targets for the UK aviation industry. Instead, air quality at airports is measured as part of a local authority's duties around air quality and any issues are dealt with between the airport and local authority.

Different airports have different obligations for monitoring and reporting air quality, with some reporting requirements necessary by law through planning obligations.

Consumer ability to reduce pollutant emissions

Passengers can influence air quality in their travel choices to and from airports. Public transport and car park use impact air quality less than being dropped off and collected from airports.

Data

Issues with air quality reporting

Monitoring stations capture air pollution from all sources in a particular area and it is therefore impossible to isolate the pollution arising from aviation activity in these measurements.

Contextual data from other parts of the UK

Monitoring location	NO2 2014 annual average mean	PM10 2014 annual average mean
Manchester, Oxford Road	68	28
Cambridge, Parker Street	45	22
Hounslow, Brentford (M4)	53	36
London, Euston Road	98	-

Table11: Air quality readings for parts of the UK. Source: All but London, Euston Road from Air Quality England (London, Euston Road from London Air Quality Network)

Nitrogen dioxide (NO2) at UK airports

This table shows the mean level of NO2 in μgm^{-3} at UK airports with more than 50,000 air transport movements per year.

Airport	2005	2006	2007	2008	2009	2010	2011	2012	2013
Aberdeen	-	-	-	-	-	-	-	-	-
Birmingham	-	27	28	25	21	28	24	24	24
Bristol	-	-	-	-	-	-	-	19	20
East Midlands	-	-	-	-	-	-	27	29	23
Edinburgh	-	-	-	-	-	-	-	-	-
Gatwick	-	-	-	-	-	37	32	33	32
Glasgow	-	-	-	-	-	-	-	-	-
Heathrow LHR2	53	52	54	53	50	50	50	48	48
Heathrow Harlington	38	37	37	35	36	34	34	33	38
Heathrow Green Gates	36	37	38	38	38	41	35	33	33
Heathrow Oaks Road	38	33	38	35	33	37	30	30	34
London City	-	-	-	-	-	35	33	35	32
Luton	-	-	-	-	-	-	-	-	-
Manchester	-	-	-	-	-	-	23	24	22
Newcastle	-	-	-	-	-	-	-	-	-
Stansted Location 3	-	-	-	-	-	-	22	26	24
Stansted Location 4	-	-	-	-	-	-	19	19	19

Table 12: Annual average mean NO2 levels at UK airports. Source: Airport websites. Figures not publicly available are marked with '-'

Particulate matter (PM) at UK airports

This table shows the mean level of PM10 in μgm^{-3} at UK airports with more than 50,000 air transport movements per year.

Airport	2005	2006	2007	2008	2009	2010	2011	2012	2013
Aberdeen	-	-	-	-	-	-	-	-	-
Birmingham	-	22	21	16	18	19	21	18	19
Bristol	-	-	-	-	-	-	-	18	19
East Midlands	-	-	-	-	-	-	19	18	18
Edinburgh	-	-	-	-	-	-	-	-	-
Gatwick	-	-	-	-	-	22	22	22	24
Glasgow	-	-	-	-	-	-	-	-	-
Heathrow LHR2	28	28	25	23	23	24	25	25	25
Heathrow Harlington	25	23	21	21	16	14	-	18	20
Heathrow Green Gates	24	24	22	17	17	19	21	21	21
Heathrow Oaks Road	24	24	22	20	20	21	24	22	22
London City	-	-	-	-	-	22	24	21	23
Luton	-	-	-	-	-	-	17	15	21
Manchester	-	-	-	-	-	-	15	13	15
Newcastle	-	-	-	-	-	-	-	-	-
Stansted Location 3	-	-	-	-	-	-	15	20	15
Stansted Location 4	-	-	-	-	-	-	-	-	-

Table 13: Annual average mean PM10 levels at UK airports. Source: Airports' websites. Figures not publicly available are marked with '-'

Chapter 3

Local environment

Introduction

Aviation can affect a number of features in local environments. Biodiversity and landscape can be affected by habitat loss and fragmentation; light pollution can be visually intrusive; wildlife can be disturbed by increased noise and vibration levels; and measures taken to reduce the risk of planes colliding with birds can have their own disruptive effects.

Types of local environment impact by aviation

Different local environmental impacts of aviation include:

- Biodiversity
- Water
- Waste
- Surface access
- Air quality – this is dealt with above

Aviation's contribution to local environment

Biodiversity

Airports manage large sites which are not accessible by the general public and can therefore provide good opportunities to increase biodiversity. Many airports are proactive in encouraging biodiversity on their sites and further information on a specific airport's activities can found from the airport itself.

Wildlife

Wildlife – particularly birds and large mammals such as deer and foxes – can pose a hazard to aircraft. Airports have wildlife management strategies to reduce the

incidence of these species in and around airports. Airports must report birdstrikes by aircraft to the CAA.

Aircraft flying over protected sites have the potential to cause disturbance (particularly during breeding seasons) and bird congregations cause a particularly high risk.

There are also a limited number of areas around the UK that, for civil aviation purposes, are officially designated as bird sanctuaries. Civilian pilots are asked to avoid flying over these areas below a specified altitude, but this is not mandatory and these areas are not ‘no-fly’ zones. The UK Aeronautical Information Publication (UK AIP) provides a list of designated sites.

Surface access

Thousands of people travel to airports each day. The transport choices they make can have a significant effect on the environmental impact of the airport as a whole.

Where airports are located near busy roads, for example, extra traffic can create significant congestion and have an impact on air quality.

There are many ways to improve airport surface access. The best options depends on location and existing infrastructure. Many airports have published surface access strategies, and measures taken have included:

- Invest in new or improved infrastructure to enhance traffic flow and ease congestion
- Encourage more public transport use
- Develop staff car sharing schemes
- Actively discourage the number of car journeys to and from the airport

Waste – airports

Waste is generated both at the terminal and when constructing new airport infrastructures. Waste is managed locally by airports and involves a mixture of waste disposal methods. As with any other organisation, airports are being challenged to

recycle and re-use waste wherever possible. Waste performance data is available below.

Waste – airlines

Waste is generated during flight. Some airlines have waste policies in place to reduce the amount of waste as well as to encourage the re-use and recycling of generated waste.

Catering waste originating outside of the EU must be carefully treated for bio security reasons and must either be sent to deep landfill or incinerated.

A number of airlines publish information on waste management approaches and performance. Visit an airline's website to find this information.

Water quality

Aviation fuel leaks and spillages can damage water quality. There are strict rules in place around the storage and handling of fuels. More information is available in CAP 784: Aircraft fuelling and fuel installations management, published by the CAA.

During winter months, aircraft sometimes have to be de-iced to allow their safe departure. De-icing fluid can impact water quality if not handled correctly. The Environment Agency has produced a report on the possible environmental impacts of de-icing chemicals used in the UK which also contains priorities for environmental quality standards development.

Water consumption

Some larger airports consume as much water as small towns. It is therefore important that measures are put in place to manage water consumption and reduce the amount of water used.

Tranquillity

Tranquillity is often linked to engagement with the natural environment and aviation activity can disturb this. Refer to our publications around noise for further information. Tranquillity maps are also available from the Campaign to Protect Rural England.

Local environment policies

To minimise the impact on wildlife, airports are required to meet a range of legislation and carry out environmental impact assessments for any new construction. They are also expected to be involved in local planning processes that affect areas close to airports. There is Government guidance on safeguarding airports which covers planning issues, but please contact your local authority or airport for further information.

Wildlife

Across the UK, there are dozens of protected wildlife sites. The level of protection is set out in legislation and details of such sites in England can be found on the Natural England website.

New sites would only be added to this list where there is an existing and quantifiable problem, supported with evidence. Any proposal for a new bird sanctuary would be considered by the CAA and we would take account of the potential impact on both aviation and wildlife.

National Parks and Areas of Outstanding Natural Beauty

The UK has 15 National Parks and 49 Areas of Outstanding Natural Beauty (AONBs). These span a large area of the country and it would be impractical to ban flight over them.

The CAA is required by law to ‘have regard to the effects’ of flying over these areas. This must be balanced with the established Government policy of minimising flights over densely populated areas. The CAA’s general principle is therefore to encourage planes to avoid flying over national parks and AONBs below 7,000 ft wherever possible while balancing this requirement with other environmental and safety considerations.

As a public authority, the CAA also has a duty under the Natural Environment and Rural Communities Act 2006 to conserve and enhance biodiversity.

Data

Modes of transport used to access airports, 2014

This table and the graph below show the modes of transport used by passengers departing UK airports in 2014 (percentage)

Airport	Bus	Car (drop)	Car (park)	Car (rent)	Rail	Taxi	Tube / DLR	Other
Aberdeen	8	29	17	4	1	40	-	1
London City	-	10	1	-	-	42	46	1
East Midlands	8	35	36	2	-	19	-	-
Bristol	17	24	37	6	1	10	-	5
Glasgow	14	36	19	1	-	29	-	1
Birmingham	3	25	29	5	19	18	-	1
Luton	16	28	21	2	16	17	-	-
Edinburgh	29	25	16	6	-	24	-	-
Stansted	29	21	15	3	22	10	-	-
Manchester	2	29	26	3	14	26	-	-
Gatwick	7	16	25	2	36	14	-	-
Heathrow	13	15	12	3	10	29	18	-

Table 14: Modes of transport by airport. Source: CAA statistics 2014

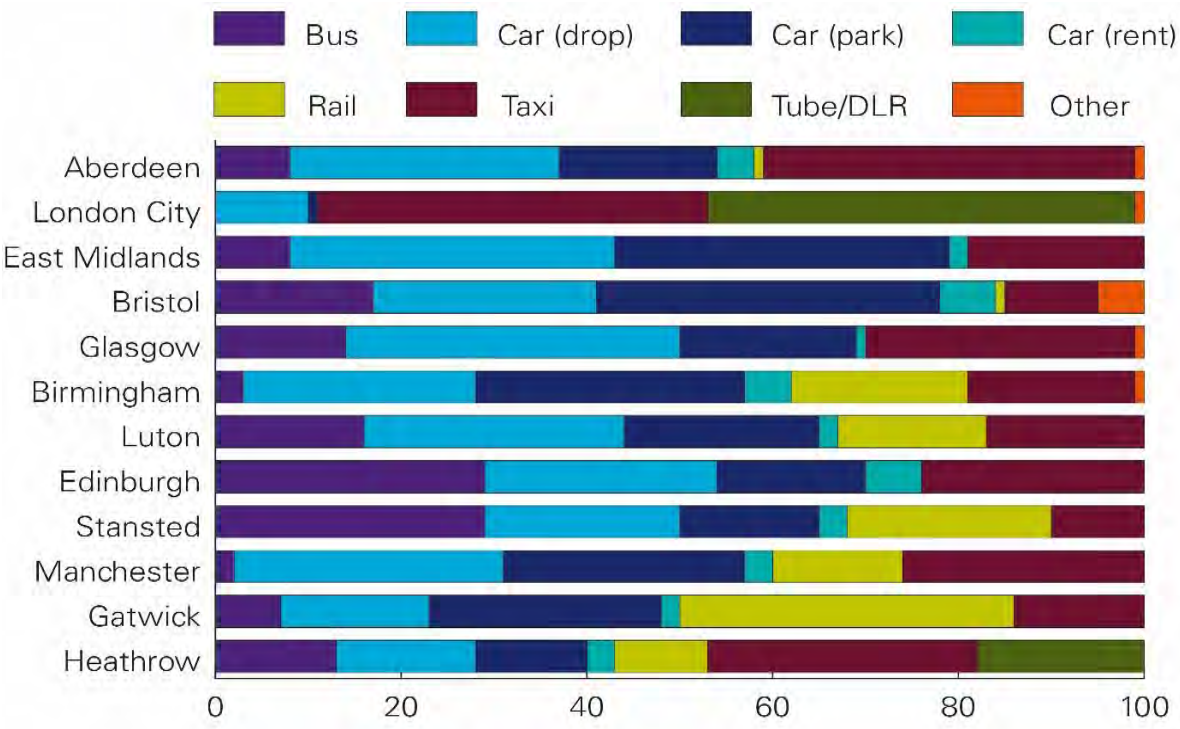


Figure 1: Modes of transport used by passengers departing UK airports, 2014 (percentage)

Waste and recycling/diversion performance by airport

This table shows waste and recycling performance for all UK airports with more than 50,000 air transport movements per year (excluding training, aero club and military movements).

Airport	Total waste	Recycling and diversion performance	Source
Heathrow	26,693 tonnes 0.37kg per pax	5.9% waste to landfill 94% of hazardous waste recycled 99% of construction waste recycled	Heathrow Airport Sustainability Summary 2013
Gatwick	9,315 tonnes 0.26kg per pax	38.7% waste re-used and recycled	-
Manchester	7,698 tonnes	71% waste diverted from landfill	-
Stansted	5,809 tonnes 0.27kg per pax	93% waste diverted from landfill	-
Luton	-	-	-
Edinburgh	1,392 tonnes	98% waste diverted from landfill	Edinburgh Airport Corporate Responsibility Report 2014
Birmingham	-	-	-
Glasgow	1,925 tonnes	84% waste diverted from landfill	Glasgow Airport Sustainability Report 2014
Bristol	0.21kg per pax	93.9% waste recycled or diverted	Bristol Airport Operations Monitoring Report 2013
Newcastle	-	-	-
East Midlands	508 tonnes	69% waste diverted from	-

Airport	Total waste	Recycling and diversion performance	Source
		landfill	
Aberdeen	-	-	-
London City	-	35-40% recycling rate	London City Airport Annual Performance Report 2013

Table 15: Waste and recycling by airport. Source: Airports' websites

Water consumption by airport

This table shows water consumption at all UK airports with more than 50,000 air transport movements per year (excluding training, aero club and military movements).

Airport	Water consumption	Source
Heathrow	2,220,772 m^3 in total 0.032 m^3 (32 litres) per pax	Heathrow Airport Sustainability Summary 2013
Gatwick	700,902 m^3 in total	-
Manchester	556,341 m^3 in total	-
Stansted	669,978 m^3 in total	-
Luton	-	-
Edinburgh	151,348 m^3 in total	Edinburgh Airport Corporate Social Responsibility Report 2013/14
Birmingham	-	-
Glasgow	140,960 m^3 in total 0.02 m^3 (19.7 litres) per pax	Glasgow Airport Sustainability Report 2014
Bristol	61,390 m^3 in total 0.01 m^3 (10 litres) per pax	Bristol Airport Operations Monitoring Report 2013
Newcastle	-	-
East Midlands	121,502 m^3 in total	-
Aberdeen	-	-
London City	-	-

Table 16: Water consumption at UK airports

Chapter 4

Noise

Introduction

Noise is an issue at almost every airport. The laws around noise make it clear that sound only becomes noise when it exists in the wrong place or at the wrong time, causing annoyance, sleep disturbance or other effects. Airports in more densely populated areas will have a greater noise impact as more people are likely to be affected.

Aviation's contribution to noise management

With noise best managed locally, different airports offer different types of information and assistance depending upon both local circumstances and legal requirements. Information available from airports may include:

- Details of operational information such as runway use and direction of take-off and landing to assess when aircraft will be flying overhead
- Flight tracking tools to allow individual flights to be tracked. A number of airports have online tools for this
- More detailed information on what generates noise and how the airport is attempting to reduce this impact
- Performance reports of how an airport is performing in relation to noise
- Explanation of airspace change proposals or trials being operated

Some airports also offer schemes to help local residents insulate homes and community buildings such as schools against noise. A few also provide direct financial assistance to help severely affected residents relocate to quieter areas.

Noise complaints should be made to the airport in question.

Noise can still be an issue at smaller airports. The CAA provides guidance on noise management at these sites.

Other actions that can be taken by different sectors of the aviation industry include:

- Aircraft and engine manufacturers can design quieter aircraft
- Air navigation service providers (ANSPs) can design airspace, air traffic routes and operational procedures that aim to reduce the number of people affected by noise
- Airlines can use their quietest aircraft at airports where noise impacts more people
- Research organisations can undertake research into methods for reducing aviation noise

Noise policies

European legislation

Under the EU Environmental Noise Directive, any airport with more than 50,000 aircraft movements a year or that has a significant noise impact on a densely populated urban area must produce a noise action plan and strategic noise plans. These must be updated every five years.

This EU Directive was transposed into the UK's Environmental Noise Regulations 2006, and the UK Government publishes guidance to help airports in England to develop noise action plans.

Local regulation

As noise is a local issue, some local authorities have placed additional obligations on airports through their planning frameworks. These can include caps on the total number of aircraft movements or restrictions on night flights. Currently, some form of restriction exists on night flights at nineteen UK airports.

An airport or the relevant local authority should be contacted about the obligations affecting that particular airport.

National regulation – designated airports

Under section 78-80 of the Civil Aviation Act 1982, Government has the power to decide to regulate certain airports directly in relation to noise. Currently, Heathrow,

Gatwick and Stansted are regulated in this manner. At these airports, the Government:

- Sets noise preferential routes (NPRs) and any associated swathes
- Sets limits and quotas on night flights
- Produces noise contour maps

Data

Measuring noise

Two basic measures are used for assessing the impact of noise:

- L_{eq} is the 'equivalent continuous sound level'. The UK Government considers a L_{eq} of over 57dBA to represent the noise level for the onset of significant community annoyance.
- L_{den} uses an annual average of L_{eq} but also takes into account the additional disturbance of noise generated in the evening and at night.

Noise in the following tables is measured in dBA. 'A-weighted decibels' (dBA) reduce the decibel value of sounds at low and high frequencies to account for the human ear being less sensitive to these.

Aircraft movements by airport

This table shows the number of aircraft movements at all UK airports with more than 50,000 air transport movements per year (excluding training, aero club and military movements).

Airport	Aircraft movements 2013
Heathrow	472,000
Gatwick	250,000
Manchester	169,000
Stansted	146,000
Aberdeen	112,000
Edinburgh	111,000
Birmingham	95,000
Luton	95,000
Glasgow	78,000
East Midlands	76,000
London City	74,000
Bristol	62,000
Newcastle	57,000

Table 17: Aircraft movements in 2013 by UK airport. Source: CAA statistics 2013

L_{eq} sound level at UK airports

This table shows the equivalent continuous sound levels at airports in the UK.

Airport	Area within 57dBA L_{eq} day time contour (km^2)	Population within 57dBA L_{eq} day time contour (thousands)	Year	Period
Heathrow	107.3	264.2	2013	Summer
Gatwick	40.9	3.2	2013	Summer
Manchester	26.3	24.6	2011	Annual
Stansted	20.0	1.2	2013	
Luton	13.8	7.1	2013	
Edinburgh	13.0	3.3	2011	
Birmingham	12.6	17.45	2013	
Glasgow	8.9	5.7	2011	
Bristol	8.3	-	2013	
Newcastle	6.5	0.5	2011	
East Midlands	7.2	1.1	2011	
Aberdeen	8.4	5.1	2011	
London City	-	13.6	2011	

Table 18: Sound levels at UK airports. Source: Airports' websites

NOTE: Some values for area in the table above are based on a 55dBA contours due to the presentation of data in five decibel intervals, rendering 57dBA contours unavailable.

L_{den} sound level at UK airports

This table shows the L_{den} at airports in the UK.

Airport	Area within 55dBA L_{den} day time contour (km^2)	Population within 55dBA L_{den} day time contour (thousands)	Year	Period
Heathrow	221.9	766.1	2011	Annual
Gatwick	85.6	11.3	2011	Annual
Manchester	57.5	73.4	2011	Annual
Stansted	57.5	7.4	2011	Annual
Luton	33.3	14.3	2011	Annual
Edinburgh	37.0	16.9	2011	Annual
Birmingham	27.9	44.3	2011	Annual
Glasgow	20.7	29.8	2011	Annual
Bristol	19.1	2.2	2011	Annual
Newcastle	16.1	4.1	2011	Annual
East Midlands	37.1	12.8	2011	Annual
Aberdeen	17.1	12.3	2011	Annual
London City	12.2	26.1	2011	Annual

Table 19: Sound levels at UK airports. Source: Airports' websites

Appendix A

Sources of further information

Climate change

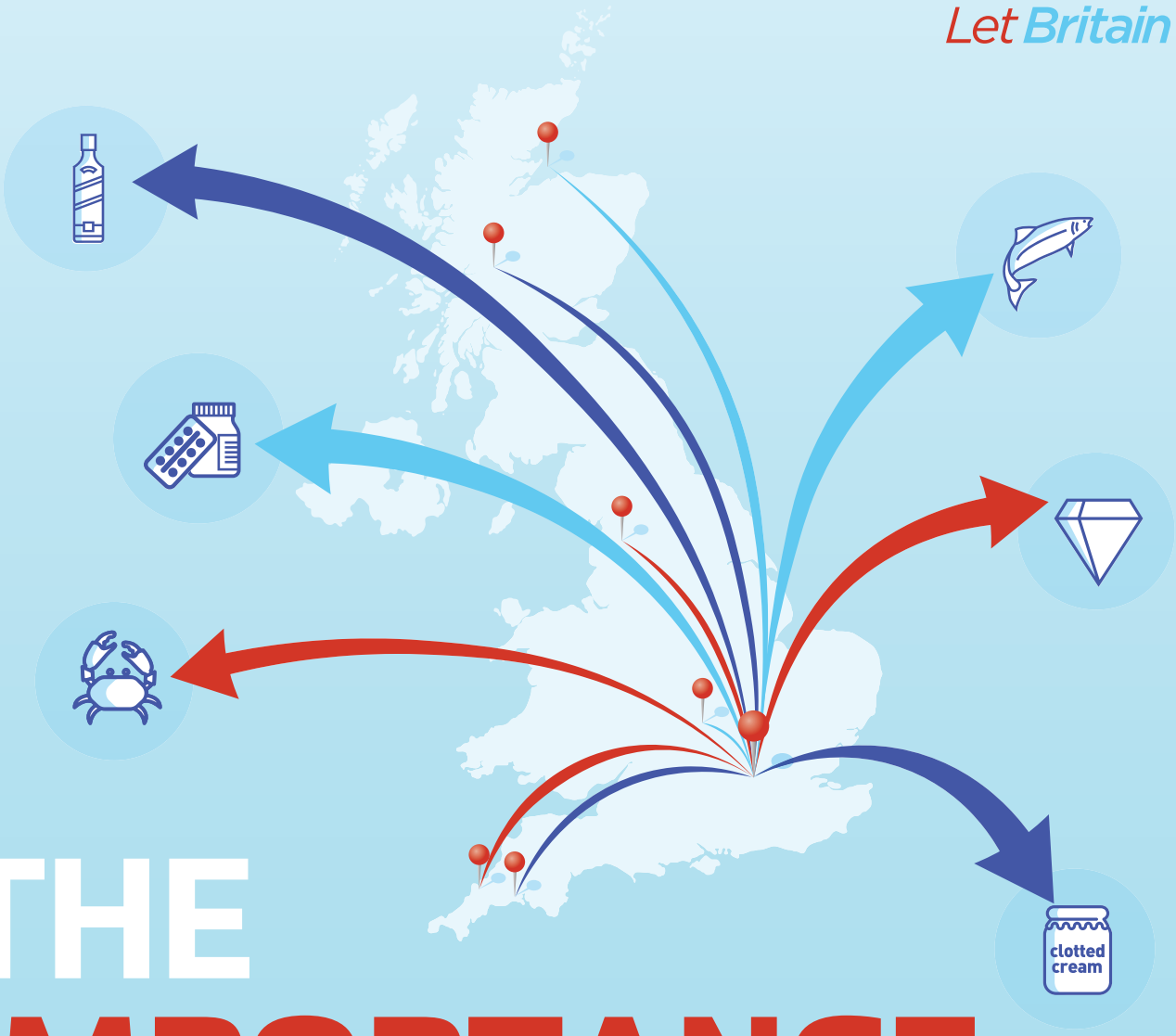
- The Omega Project, run by the Manchester Metropolitan University between 2007 and 2009, investigated factors associated with the sustainable development of the UK air transport sector. The project involved many leading individuals and organisations in the world of sustainable aviation and led to a wealth of resources and knowledge being created on the subject, including greenhouse gases.
- The UK Government's Non-CO2 greenhouse gas emissions projections report: Autumn 2013
- The Climate Change Act 2008
- The Committee on Climate Change (CCC), an independent body set up under the Climate Change Act, has assessed the evidence behind climate change and has extensive information on climate effects.
- The CCC's Meeting the UK Aviation target – options for reducing emissions to 2050
- The Carbon Disclosure Project

Air quality

- UK Air provides comprehensive information on types of pollutants, their sources and their effects
- Aviation-specific information on local air quality can be found from the Centre for Aviation Transport and Environment at Manchester Metropolitan University, and the Laboratory for Aviation and the Environment at MIT.
- You can find out if you live in an AQMA (air quality management area) online.

- You can check the local air quality in your area using UK Air's Daily Air Quality Index.
- ICAO air quality pages
- Sustainable Aviation's Industry Code of Practice for Reducing the Environmental Impacts of Ground Operations and Departing Aircraft (technical information).

Let Britain Fly



THE IMPORTANCE OF AIR FREIGHT TO UK EXPORTS

The impact of delaying the runway capacity decision on UK international trade growth

A report by the Centre for Economics and Business Research
for the Let Britain Fly campaign
September 2016

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Authorship and acknowledgements
This report has been produced by Cebr, an independent economics and business research consultancy established in 1992. The views expressed herein are those of the authors only and are based upon independent research by them.

Let Britain Fly is the campaign to build cross-party political support to expand airport capacity in London and the South East. It is an independent campaign coalition whose founding statement has support from more than 100 senior business leaders from Britain's top companies, trade and professional associations, unions and educational institutions, along with business organisations including the British Chambers of Commerce, London Chamber of Commerce and Industry, London First, Institute of Directors, Federation of Small Businesses and the British Hospitality Association.
For more information visitletbritainfly.com

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FOREWORD

David Sleath,
Chief Executive, SEGRO

Whilst we come to terms with the vote to BREXIT there has never been a more important time for the Government to send out a positive message to the rest of the world that Britain is open for business.

A quick and decisive decision on airport expansion provides that opportunity in a time of economic uncertainty. Because, one of the most compelling arguments for building a new runway is the role it would play in promoting UK trade, in particular boosting British exports.

It may come as a surprise, but air cargo accounts for forty per cent of the value of Britain's exports. From Scottish salmon to pharmaceuticals, Brompton bikes to formula 1 cars, the UK products that are valuable, perishable or are required just-in-time, will travel by air and probably via Heathrow the UK's only hub airport.

In fact, over a quarter of all our exports go via Heathrow. Recommended by the Airports Commission as the preferred airport for a new runway, more goods leave Britain via Heathrow than all the other UK airports combined. With 95% of these goods carried in the belly-holds of passenger planes, the UK's success in exporting both services and products are intrinsically linked.

The world is changing. Whilst Europe will remain an important market for UK exporters, most of the future growth in the world is in Asia, Africa, North and South America. By value 51% of UK exports to non-EU countries currently go by air and for the UK to succeed in the global economy we need more frequent and direct flights to these destinations. We trade twenty times more with countries with whom we have a direct air link. So it is clear why investment in our airports infrastructure is critical to the UK's economic success.

UK businesses are already losing out to their French and German rivals in the race to do business with China. Paris and Frankfurt have 60 weekly flights to China compared to 40 at Heathrow, making it more difficult for many British firms to compete effectively. To rebalance and strengthen the economy, the UK needs a hub airport that can compete with our unconstrained hub rivals abroad, providing direct air links to new markets and opportunities.

Decades of uncertainty on airport expansion is putting Britain at an economic disadvantage. As our research suggests, for every year that passes without a new runway in operation, the UK could be losing out on as much as £9.5bn in trade with the top ten fastest growing emerging market economies. One year has already passed since the Airports Commission published its final report and we still don't have a final decision. Can the Government afford to delay further?

We believe the results of our research send a clear and compelling message to politicians that further delay on this issue will undoubtedly impact on the British economy and UK exporters both large and small. Indecision on this nationally important issue needs to end.

The simple question for government to address is this: what type of country does Britain want to be? Do we want to be a global player, operating seamlessly for business, helping exporters to grow and attracting inward investment? Or do we want to fall further behind our European competitors?

So the message from businesses right across the UK is clear. The Government must make a final decision quickly and back the Airport's Commission recommendation to build a new runway.

EXECUTIVE SUMMARY

The decision of where to build a new runway in London and the South East has proved to be a highly contentious issue. Whilst there is general agreement that there is a requirement for new runway capacity in London, the decision of where to build it has divided public, and political, opinion.

The Airports Commission was tasked with recommending to government where airport capacity should be expanded. It narrowed down the potential options to three at two airports - London Heathrow (LHR) and London Gatwick (LGW). In July 2015, the Commission published its final report recommending the northwest runway option at LHR. However in December 2015, due to environmental concerns, the Government delayed its final decision until *at least* summer 2016. Following the vote to leave the EU the Government has announced a *further delay* until *at least* October 2016.

Further delaying the decision has clear implications for UK trade, which is what this study, by the Centre for Economics and Business Research (Cebr) on behalf of London First and the Let Britain Fly campaign, seeks to examine. Based on the analysis and conclusions set out in this report, the message is clear. The Government needs to get on with building a new runway in order not to stifle further growth in trade and FDI between the UK and the fast growing emerging market economies. Not doing so is, and will, ultimately be to the benefit of the UK's European competitors that have plenty of spare airport capacity at their key hub airports.

Aviation plays a key role in facilitating international trade in both goods and services. It provides businesses with a rapid and global transport network, crucial where speed of delivery is of the essence. It also affords businesses access and entry to new markets and enables them to better manage their supply chains. It is most often high value goods which are transported by air, with HMRC's overseas trade statistics illustrating that over half (51%) of the UK's exports to non-EU countries by value were transported by air in 2015, but just 1% by volume.

The importance to trade of the London airports

Exports

- In 2015, the total volume of goods exported from the UK amounted to 154 billion kilograms (kg) with a total value of approximately £305 billion. Of the total by volume, 30% went to non-EU countries (45.7 billion kg), of which 1% (479 million kg) was sent by air. By value, exports to non-EU countries accounted for 56% of the total (£171 billion), of which £87.2 billion (51%) was transported via air.

- The proportion of total exports by air to non-EU countries that travelled from the London airports was 74% in 2015. By value, LHR accounted for the largest proportion of total exports by air to non-EU countries at 77% (or £67.3 billion) in 2015. The value of exports travelling through London's airports has increased rapidly since 2009, from £35.5 billion to £72.8 billion in 2015 (growth of 105%).
- Historically, the largest export market by volume for goods travelling by air is Asia and Oceania, followed by North America. LHR carried 77% (134 million kg) of the total UK aviation goods exports, by volume, to Asia and Oceania in 2015.
- By value, the majority of exports travelling by air from London are destined for Asia and Oceania. 32% of non-EU exports by value from London went to this continent in 2015, worth approximately £23.4 billion.

Imports

- In 2015, the total volume of goods imported to the UK was approximately 287 billion kg. The total value of goods imported into the UK amounted to £412 billion in the same year.
- Of the total imports by volume, 61% arrived from non-EU countries, with 0.4% of this arriving by air. By value, non-EU countries accounted £192 billion (47%) of the total value of goods imported, of this, £67.1 billion (47%) was transported via air.
- By volume, the proportion of imports from non-EU countries arriving in the UK via London airports amounted to 72% of all imports arriving by air from non-EU countries in 2015. The majority were from Asia and Oceania and arrived at LHR.
- By value, in 2015, the London airports accounted for the largest proportion of non-EU imports arriving by air – 78% of the total in 2015, with LHR accounting for 69% (£52.6 billion) of this. The majority of imports from non-EU countries arriving by air in the UK come from North America (38%, with a value of £28.8 billion in 2015).

Goods trade from London and the South East

- In 2015, approximately 52% of the UK's exports by value were destined for non-EU countries (£146 billion). The majority of these came from businesses based in England (76%), with 28% coming from the economies of London and the South East, compared with 48% from the other English regions – from the North East to the South West. For instance, 12% of all UK exports by value destined for non-EU countries originated in the West Midlands in 2015, amounting to £12 billion. The remainder, 24%, comes from elsewhere in the UK – Wales, Scotland and Northern Ireland.

- By volume, the majority of exports to non-EU countries originated in London in 2015 (18% of the UK total). For those exports destined for the EU, the majority by value again originated in London and the South East (24%).
- 11% of exports to the EU by volume originated from businesses located in London in 2015 (12.2 million tonnes), an increase of 71% on the previous year. A significant volume of exports to the EU also originated from businesses based in the North West and Yorkshire and the Humber, at 8% of the UK total.

Trade from other regions passing through London

- We have estimated the value of exports to non-EU countries from the regions other than London and the South East that are moved through the London airports. With goods worth £41.2 billion of exports to non-EU countries originating from businesses located in London and the South East, we estimate that approximately £24.6 billion of this was moved through London airports in 2015.
- HMRC records £72.8 billion worth of goods being exported through the London airports system to non-EU destinations in 2015. On this basis, it is clear that a significant proportion of this originates from the other regions of England and the rest of the UK – including Wales, Scotland, Northern Ireland, as well as the northern English regions, the Midlands and the South West. Our estimates suggest that in 2015, £48.2 billion worth of the goods exports that passed through London airports, destined for non-EU countries, originated in businesses located outside London and the South East.
- This very clearly highlights the importance of runway capacity in London and the South East in supporting exporting businesses located throughout the UK, not just those in London and the South East.

Goods trade with non-EU countries by product category

- For the UK as a whole, across all ports, the largest export by value in 2015 was machinery and transport equipment. However, for the London airports, the largest export by value was commodities/transactions not classified elsewhere, which amounted to £25.3 billion in 2015.
- In 2015, the other main categories of export by value transported through the London airports included machinery and equipment (£18.6 billion, 62% of total UK exports in this category) and miscellaneous manufactured articles (£14.3 billion, 30% of the total from the UK in this category).
- By volume, the largest export category across all UK ports was mineral fuels, lubricants and related materials

(18.5 billion kg exported in 2015). However, by air, the most significant categories were machinery and transport equipment and miscellaneous manufactured articles.
- The London airports are prominent. For example, 86% of food and live animal exports by volume to non-EU countries were moved through the London airports in 2015 (70.3 million kg), and 84% of miscellaneous manufactured articles.

UK trade in services

Beyond being important for trade in goods, aviation also plays a major role in trade in services, as well as in supporting tourism. For the UK, aviation is particularly important for its services sectors, which are highly dependent on fast, timely business travel enabling face-to-face contact both with existing clients, and when establishing new ones.

According to the Pink Book, the UK's services exports have been steadily increasing over time, with a significant portion of these exports coming from London. In 2014, service exports from the UK amounted to £220 billion, with £115 billion of this originating from businesses located in London.

According to ONS International Trade data, total services to the USA far exceeded those to any other country in 2014. In that year, services exports to the USA amounted to £27.8 million. Meanwhile, exports to the EU consistently account for around 35% of the total services exports.

Foreign Direct Investment

Aviation is an important and well-recognised contributor to encouraging FDI. The link between aviation connectivity and FDI largely relates to the requirement to move staff around the globe, thereby facilitating the transfer of knowledge. Aviation connectivity helps inward investment by creating a more favourable environment for foreign firms and their workers.

For the UK, FDI is attracted to regions such as London for reasons including the quality of its aviation links. It has been estimated that FDI contributes more than £52 billion each year to London's economy.

The relationship between trade, FDI and air transport links

We undertook econometric modelling to establish a statistical relationship between aviation connectedness, trade and investment flows. To do this, we drew on a number of different data sources, including HMRC on UK goods trade, Eurostat's Balance of Payments database for trade in services data, and the Civil Aviation Authority (CAA) for data on routes, flights and

passenger numbers. The CAA data spans a ten-year period from 2002 to 2012, the time period that this part of our study examines. Although the period of analysis is limited, there are good reasons for choosing one that ends in 2012. These are:

- *The 'dither clock'*: The analysis in this section leads ultimately to the 'dither' clock developed in Section 5 below. This imagines trade growth being spread smoothly and continuously through time, and considers what is potentially being lost in trade terms by delaying the runway capacity decision. The Airports Commission was established in 2012, and this represents the start date of the dither clock – the year the Government decided to create a lengthy commission rather than reach a decision itself.
- *Minimising distortions of the relationships*: with LHR operating at capacity and LGW close to capacity, and the fact that new routes tend to push others out, it made sense to go back in time a little to minimise the potential for routes dropping in and out to distort the relationships we are endeavouring to establish.

In developing the econometric model, we considered the number of routes, flights and passengers travelling between the UK and two groups of ten partner countries, referred to in this report as the 'mature-trade' markets and the 'emerging markets'. The countries included in each list are presented in Table 1 below.

Table 1: UK trade partner countries, defined as 'mature-trade' markets or 'emerging markets'

Mature-trade markets	Emerging markets
Belgium	**Poland**
France	**Turkey**
Germany	**South Africa**
Ireland	**Nigeria**
Italy	**Mexico**
Netherlands	**Brazil**
Spain	**India**
Switzerland	**China**
USA	**Malaysia**
Hong Kong	**Thailand**

Source: Cebr analysis

The 'mature-trade' markets group refers to the ten partner countries with which the UK has the most mature trading

relationships in goods and services. This was identified through an examination of historic trends in trade between the UK and its partner countries. The 'emerging' markets group refers to ten economies that are among the fastest growing in the world, and according to the IMF's and Cebr's own forecasts, are expected to contribute an increasing proportion of the world's economic growth over the next 5 years. In particular, by 2020, the contribution to world GDP of the mature-trade markets is expected to decline to 37% while the emerging markets' share is estimated to rise to 28%. By as early as 2029, we estimate that the contribution to world GDP made by the emerging markets group could overtake the mature-trade markets' contribution.

As the balance of economic strength and significance shifts away from the mature-trade markets towards the emerging markets, strong connectivity to the UK will become imperative for the UK to capitalise on new export and investment opportunities.

Our econometric analysis of the data for the mature-trade group confirms a statistically significant relationship between aviation connectedness and the level of total trade, and between aviation connectedness and the level of total FDI. We estimate that a 10% increase in the connectedness variable (the product of routes, flights and passengers by country) across the mature-trade markets can be associated with an increase in UK trade of 1.2%. Similarly, we estimate that in any given year, a 10% increase in connectedness has the potential to increase total UK FDI flows by 0.7%.

Estimated potential boost to UK trade in goods and services

Our analysis suggests that if aviation connectedness between the UK and the emerging markets group reached similar levels as that seen between the UK and the mature-trade economies, the UK could benefit from a boost to trade of approximately £28.2 billion per annum by 2030.

This prediction is based purely on the estimated statistical relationship. However, at the aggregate level, there are a range of factors requiring consideration that are beyond what a statistical model can take into account, such as political institutions, historic links and so forth that make it easier or harder to trade with these countries. By accounting for these factors we calculate a lower bound estimate of the trade that could be sacrificed by not having additional runway capacity. In reality, the true impact is likely to lie somewhere in the range of this lower bound and the upper bound suggested by the unadulterated statistical model.

Accounting for such factors that may increase or constrain any potential trade gains to the UK, such as varying trading conditions, economic growth, political stability of individual emerging markets, we estimate the UK could benefit from a boost to trade of approximately £8.6 billion by 2020, and £10.1 billion by 2030.

But this includes exports and imports, so narrowing the focus on exports (using the current UK export-import split) gives lower bound estimates of £3.2 billion by 2020 and £3.7 billion by 2030.

Estimated potential boost to UK FDI

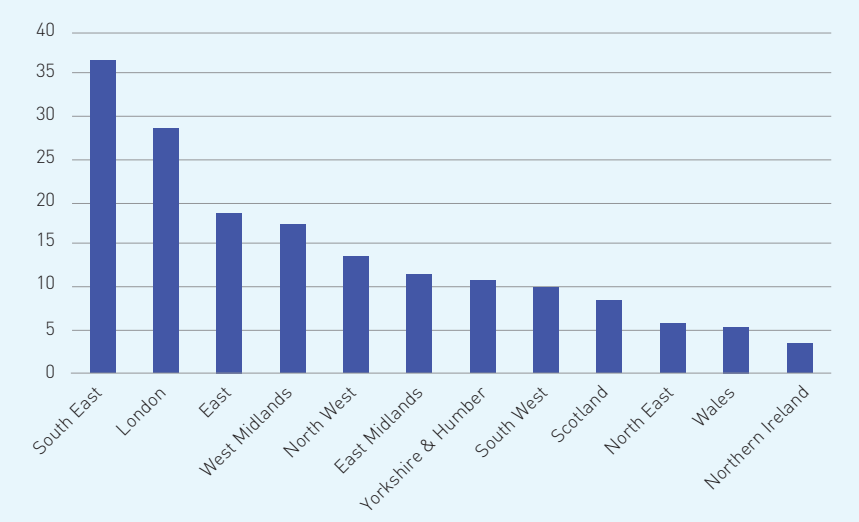
In 2012, the value of total (inward and outward) FDI flows between the UK and the emerging markets group totalled approximately £8.0 billion. If the average level of aviation connectedness between the UK and the emerging markets were to reach parity with that between the UK and the mature-trade economies, our analysis suggests that the UK could benefit from a boost to total FDI flows of approximately £1.7 billion per annum.

The 'dither-clock'

We use the analysis above to estimate the value of lost trade due to a lack of connectedness between the UK and the emerging markets. We consider this over the time period in which connectedness with emerging markets would grow if additional runway capacity were made available. This has been coined as the 'dither clock'. The 'dither clock' imagines trade growth being spread smoothly and continuously through time for illustrative purposes.

Given this, we estimate the total value of potential exports that the UK could gain from could reach a cumulative £63.6 billion over the 18 years from 2012 to 2030. Based on current trends in regional trade, we estimate that the South East of England could be hurt the most, as the region could potentially lose out on approximately £36.6 billion of total trade over the 18 year period (Figure 1). London could also be disadvantaged, losing out on roughly £28.6 billion of trade between 2012 and 2030.

Figure 1: The value of lost potential trade over the 18 year period, by region (£ billions)



Source: HMRC, Cebr analysis

To illustrate what this means by unit of time, we have produced the 'dither clock' shown in Table 2 and Table 3 below.

This analysis suggests that the UK could be losing out on as much as £9.5 billion for each year that passes without runway capacity expansion. For every month that the level of air connectedness between the UK and the emerging markets remains under-developed due to a lack of new runway capacity, the UK could be losing £790 million of trade, equivalent to approximately £182 million per week. On a daily basis, the loss is approximately £26 million worth of trade with the emerging markets group. This is equivalent to a loss of approximately £1.1 million per hour, or £18,000 per minute.

Table 2: The 'dither clock': the value of lost potential trade over time

Value of lost potential trade, £	Per unit of time
£9.5 billion	**Year**
£790 million	**Month**
£182 million	**Week**
£26 million	**Day**
£1.1 million	**Hour**
£18,000	**Minute**

Source: Cebr analysis

Narrowing the focus to exports only gives the 'dither clock' estimates shown in Table 3, which is based on the current ratio of exports to imports to the emerging markets group.

Table 3: The 'dither clock': the value of lost potential exports over time

Value of lost potential trade, £	Per unit of time
£3.5 billion	**Year**
£294 million	**Month**
£68.0 million	**Week**
£9.7 million	**Day**
£0.4 million	**Hour**
£6,700	**Minute**

Source: Cebr analysis

ONE
Introduction

This study, by the Centre for Economics and Business Research (Cebr) on behalf of London First and the Let Britain Fly campaign, examines the importance of air freight to UK trade. It also considers the implications for international export growth of delays in making the decision on where to deliver new runway capacity in London and the South East of England.

1.1. Background and context

On 7 September 2012, the Government announced its intention to create an independent commission, chaired by Sir Howard Davies, to identify and recommend options for maintaining the UK's status as a global aviation hub. In July 2015, the Airports Commission published its final report which set out its recommendations to government for expanding airport capacity in the UK. It narrowed down the potential solutions to three options at two airports – London Heathrow (LHR) and London Gatwick (LGW) – and recommended the new northwest runway option at LHR. However, the Government has now delayed the decision as to whether a third runway could even be allowed at LHR until summer 2016, as a result of environmental concerns.[1]

In response to political procrastination on the issue and in an attempt to help break the political deadlock, in September 2013 London First initiated the Let Britain Fly campaign. The aim of the campaign is to build cross-party political support to build new runway capacity. It is supported by a broad strategic campaign coalition that includes business leaders, business organisations, trade and professional associations, trade unions, think tanks, academics and economists.

Aviation connectivity plays a key role in facilitating international trade in both goods and services. It provides businesses with freight access to export markets, as well as enabling business travellers to meet new and existing clients. Given the Government's initiatives around exporting for growth, aviation can provide businesses with important routes to market for their goods and services, supporting growth and employment in the UK and ensuring that the UK remains internationally competitive.

1 www.bbc.co.uk/news/business-35062739

Therefore, this study seeks to help London First and the Let Britain Fly campaign illustrate the importance of air freight to UK exports and in turn, the negative consequences for export growth of delaying airport expansion in London and the South East.

1.2. Structure of the report

The rest of the report is structured as follows:

- **Section 2: London's airports and their role in UK trade**
  Cebr illustrates the share of goods trade passing through airports in London and the South East and where the goods originate from in the UK. It also considers how this picture varies by industry sector.
- **Section 3: The relationship between trade, FDI and air transport links**
  Using econometric analysis we establish relationships between aviation connectivity, trade and investment flows for the UK. We specifically consider the ten partner countries with which the UK has the most mature trade and FDI relationships and how these correlate with air transport routes and their density in terms of both flight frequency and passenger throughput.
- **Section 4: The growth potential and cost of delaying the new runway decision**
  An analysis of how trade could be impacted if the amount of air links to the ten fastest-growing economies were to increase to varying degrees.
- **Section 5: The 'dither clock'**
  We present the estimated value of trade lost per year, month and day over the period of time taken for the ten fastest growing economies to reach similar levels of trade as existing links with the ten partners with which the UK has the most mature trading and investment relationships.

TWO
London's airports and their role in UK trade

Aviation plays a key role in facilitating international trade in both goods and services. It provides businesses with access and entry to new markets and enables them to better manage their supply chains. This section illustrates the importance of trade from the UK to both EU and non-EU countries and the role of the London airports in this trade.

Aviation links provide businesses with a rapid, worldwide, transport network, and as such, it plays an important role in facilitating trade, particularly where speed of delivery is crucial. In addition, air freight is more sensitive to weight than other options of transportation, such as rail or sea. Therefore, it is smaller, lighter and higher value goods that are transported by air. This is echoed in HMRC's overseas trade statistics (OTS) which show that in 2015, over half (51%) of the UK's exports to non-EU countries by value were transported by air, but just 1% by volume.

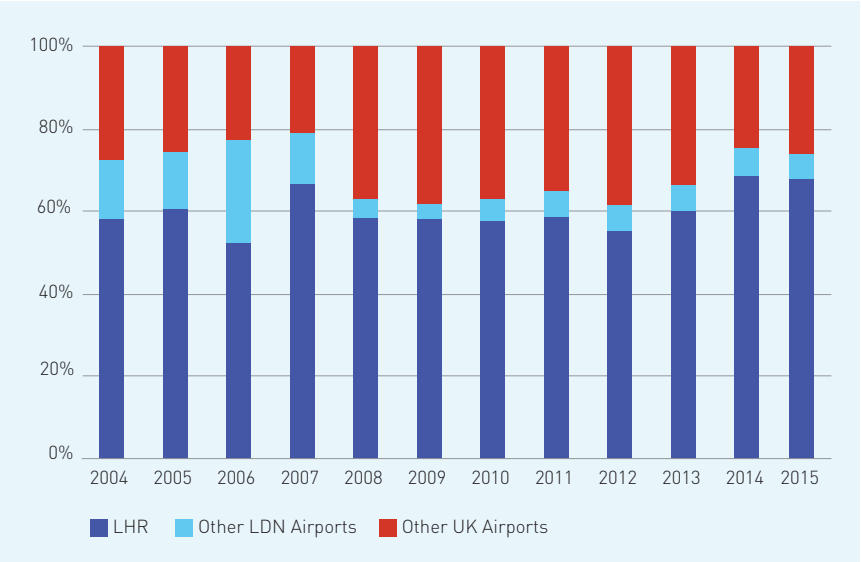
2.1. Value and share of goods trade to non-EU countries travelling through airports in London and the South East

Using the OTS, we have built up a picture of the value and volume of trade passing through London airports which is destined for, or arriving from, non-European Union (EU) countries. The equivalent data (at port level) for trade with EU countries is not currently made available by HMRC.

Exports by volume

The total volume of goods exported from the UK in 2015 was approximately 154 billion kilograms (kg). Non-EU countries accounted for 30% of this total volume exported, that is, 45.7 billion kg. Of this, 479 million kg (1%) was transported by air. Figure 2 below breaks this down by the airports from which the goods were exported.

Figure 2: Proportion of exports to non-EU countries transported by air, through London vs. rest of the UK, by volume



Source: HMRC, Cebr analysis

The share, in volume terms, from the London airport system[2] has been steadily increasing since 2009, after declining significantly as a result of the global recession. Between 2009 and 2015, these volumes have increased by 29%, from 286 million kg to 368 million kg. But this is still below the pre-recession peak of 463 million kg.

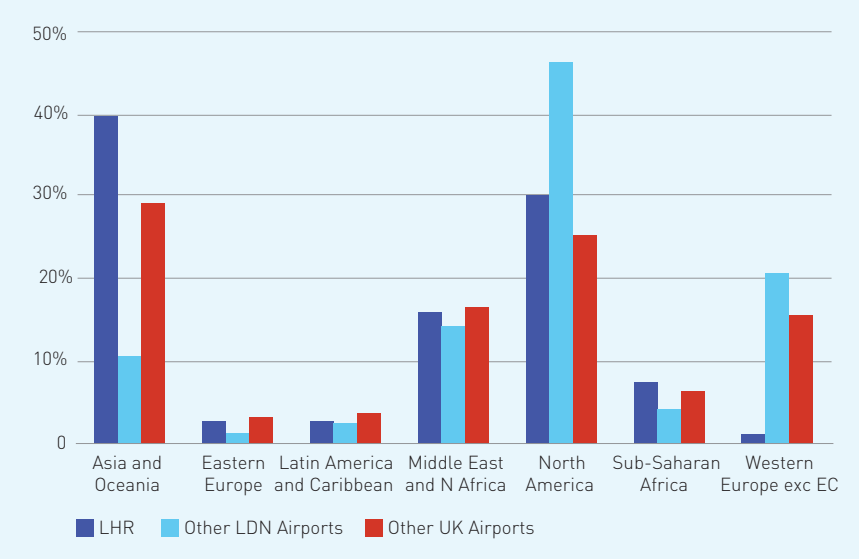
The proportion of exports to non-EU countries from London airports, relative to total exports by air, peaked in 2007 at 79%. After remaining at around 63% in the following years, London's share increased again in 2013 and 2014 (to 67% and 75% respectively) before falling back slightly in 2015 to 74%.

LHR individually accounts for the largest proportion of aviation export trade in both London, and the UK as a whole. In 2015, LHR exports by volume amounted to 68% of total exports by air to non-EU countries.

The proportion of exports which travel by air to different non-EU regions follow broadly the same pattern for London as for all UK airports. Historically, at LHR and at the non-London airports, the largest non-EU export market by volume for goods travelling by air is Asia and Oceania, closely followed by North America (Figure 3). For the other London airports, the largest share goes to North America, followed by Western Europe (excl. the EC) and the Middle East and North Africa.

2 The London Airports system consists of London Heathrow Airport (LHR), London Gatwick Airport (LGW), London Stansted Airport (STN), London Luton Airport (LTN), London City Airport (LCY) and London Southend Airport (SEN).

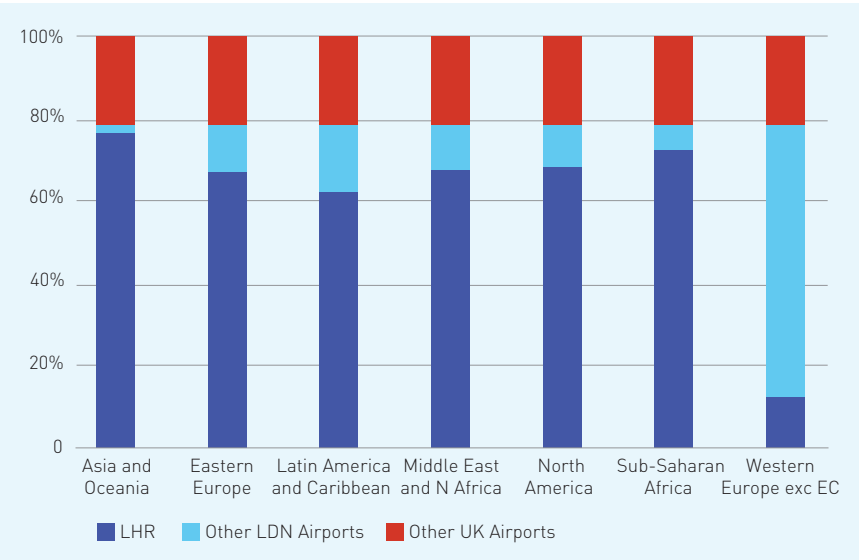
Figure 3: Proportion of UK's air exports by volume, by UK airport and non-EU destination, 2015



Source: HMRC, Cebr analysis

As illustrated in Figure 4 (which provides the non-EU regional breakdown of the 2015 data presented in Figure 2 above, LHR carried 77% (134 million kg) of the total UK goods exports by air to Asia and Oceania, and 72% (25 million kg) of those to sub-Saharan Africa.

Figure 4: Share of exports travelling by air to different non-EU regions by airport, volume



Source: HMRC, Cebr analysis

Exports by value

The total value of goods exported from the UK in 2015 was approximately £305 billion. Non-EU countries accounted for

56% of this, that is, £171 billion. Of this, £87.2 billion (51%) was transported by air.

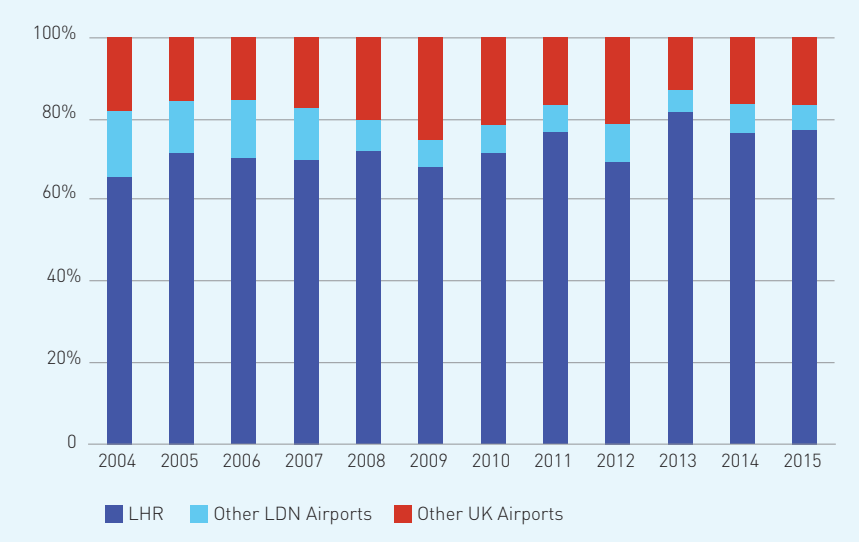
As with the volume of exports travelling through the London airports to non-EU countries, the value has increased rapidly since 2009, although at a faster rate than volume, from £35.5 billion to £72.8 billion in 2015 (representing growth of 105% over the entire period).

The London airports system accounted for more than four-fifths of the total value of exports transported by air to non-EU countries from the UK in 2015 (84%). This is slightly down on 2013 when they accounted for 87%. This is illustrated in Figure 5.

By comparison, LHR accounted for the largest proportion of total exports via air by value from the UK, making up 77% (or £67.3 billion) in 2015. This represents growth of 108% since 2009.

On these measures, 39% of the total value of all UK exports to non-EU countries (£171 billion) were transported through LHR, up by 8 percentage points from its share in 2009.

Figure 5: Proportion of exports to non-EU countries travelling by air, London vs. rest of the UK, by value

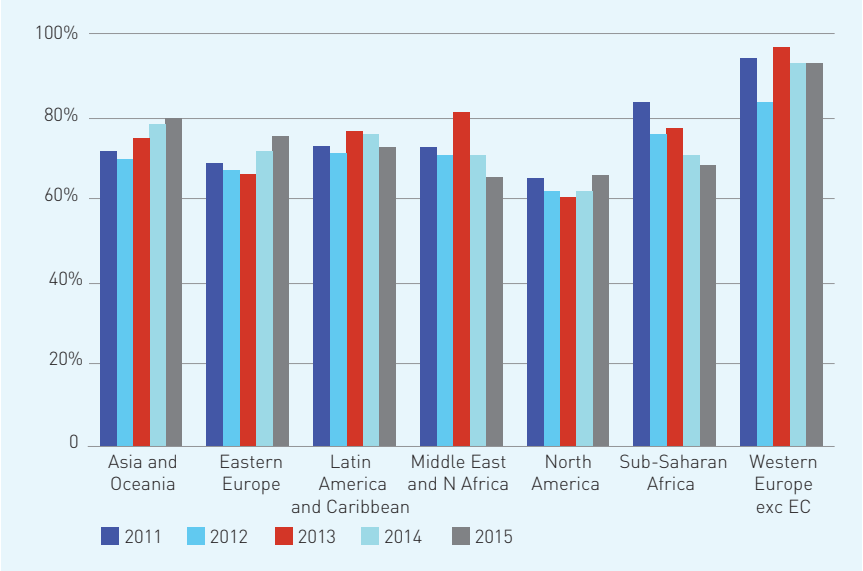


Source: HMRC, Cebr analysis

The majority of exports by value travelling by air from London go to Asia and Oceania. In 2015, the total value of exports to this region from the London airports were worth approximately £23.4 billion. This amounted to 32% of total non-EU exports by value from London's airports, which was £72.8 billion in 2015, as noted at the beginning of this subsection.

As illustrated in Figure 6 below, in value terms LHR accounts for significant shares of goods being transported by air to the various non-EU markets for which UK airport-specific data were available. Figure 6 shows how the 2015 data on LHR in Figure 5 above breaks down across the non-EU regions.

Figure 6: Proportion of UK exports to each non-EU region which travel from London Heathrow Airport, by value



Source: HMRC, Cebr analysis

Imports by volume

The total volume of goods imported to the UK in 2015 was approximately 287 billion kg. Non-EU countries accounted for 61% of this total volume, that is, 174 billion kg. Of this, 775 million kg (0.4%) were transported from non-EU countries to the UK by air.

Imports by volume to London airports amounted to 560 million kg in 2015, 72% of all imports from non-EU countries arriving to the UK via air. The total volume of imports arriving to the UK via air declined significantly as a result of the global financial crisis, but London's share of the total has remained high. This is despite the absolute value of imports by air declining in 2015, both in the UK as a whole, and in London.

The majority of imports arriving through the London airports come from Asia and Oceania, with the total volume of imports arriving at London airports from this region amounting to 257 million kg (46% in 2015). Of these imports, the vast majority arrived at LHR, with imports from this region amounting to 247 million kg (that is, 96% of the total from this region passing through the London airports or 44% of the total volume of imports by air arriving at the London airports from all non-EU regions).

Imports by value

The total value of goods imported to the UK in 2015 was approximately £412 billion. Non-EU countries accounted for 47% of this total value, that is, £192 billion. Of this, £67.1 billion (47%) was transported by air from non-EU countries to the UK.

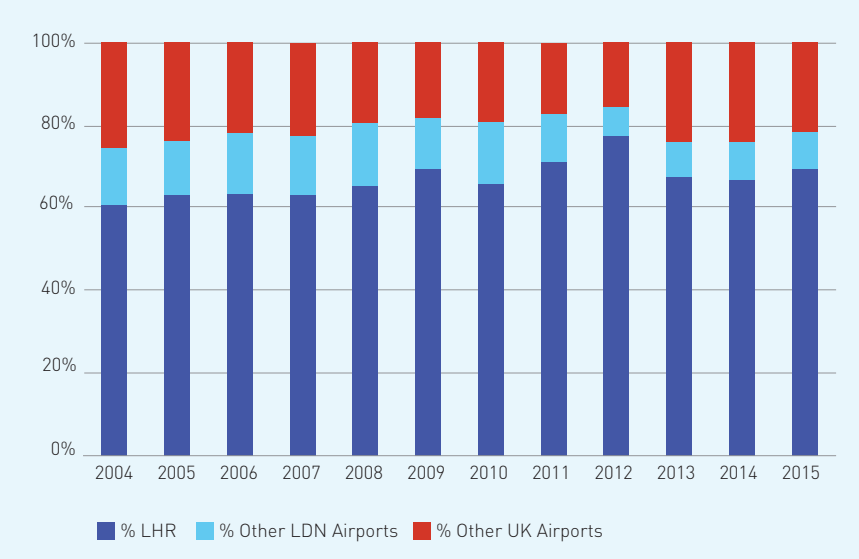
London airports consistently account for the largest proportion of all UK imports from non-EU countries arriving by air. In 2015, they accounted for 78% of the total, with LHR accounting

for 69% – the latter amounting to £52.6 billion worth of goods in absolute terms. This amounts to a share for LHR of over 27% of the value of all imports to the UK from non-EU countries.

Figure 7 illustrates the proportion of the value of imports from non-EU countries arriving via air to the UK which come through the London airports, LHR specifically, and the other airports in the UK.

Underlying the picture in 2015, 97% of UK imports arriving by air from Sub-Saharan Africa arrived at London's airports, with 99% of the total at London airports arriving at LHR.

Figure 7: Proportion of imports by value which arrive by air at the London airports vs. other UK airports



Source: HMRC, Cebr analysis

The majority of imports from non-EU countries arriving by air to the UK come from North America (38%). The story is similar looking at the London airports specifically, with 36% of total imports by value from non-EU countries at London airports coming from North America. In 2015 imports by air to London airports from North America were worth £28.8 billion.

2.2. Goods trade from London and the South East

Non-EU exports

According to HMRC's regional trade statistics (RTS), in 2015, approximately 52% of the UK's exports by value were destined for non-EU countries (amounting to £146 billion).[3] In that year, of all the exports from the UK headed for non-EU countries, the

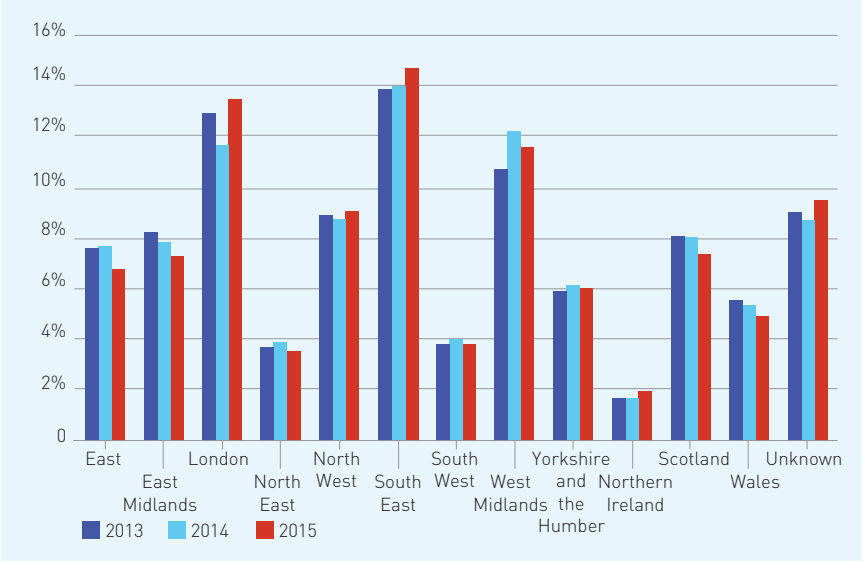
3 We note the difference between this number and the £171 billion noted in Subsection 2.1 ('Exports by value'). The lower £146 billion is taken from the Regional Trade Statistics (RTS) dataset, which excludes certain items that are included in HMRC's Overseas Trade Statistics (OTS). The items excluded from RTS are, specifically, trade in non-monetary gold and what are called 'late response estimates', an estimate of exports by businesses that have responded too late to the relevant survey to have the data included in RTS. See HMRC (2016), "Regional Trade Statistics: Fourth Quarter 2015", London. Available at www.uktradeinfo.com/Statistics/RTS/Pages/default.aspx

majority were from businesses based in England (76%), and over a quarter (28%) came from the economies of London and the South East.[4] This means that 48% originated from businesses located in the North, Midlands and South West of England and that 24% originated in Wales, Scotland and Northern Ireland.

In absolute terms, the value of exports from the South East amounted to £21.5 billion (15%) in 2015, the highest value since 2012, when exports from this region amounted to £22.5 billion. In 2015, the value of exports from London amounted to approximately £19.7 billion (13%). A significant amount of exports by value also originated in the West Midlands in the same year – £12.0 billion or 12% of all UK exports destined for non-EU countries.

The proportion of total UK exports to non-EU countries originating from businesses in each of the UK regions has remained reasonably stable over time, as illustrated in Figure 8.

Figure 8: Proportion of exports to non-EU countries by UK region, by value 2013–15



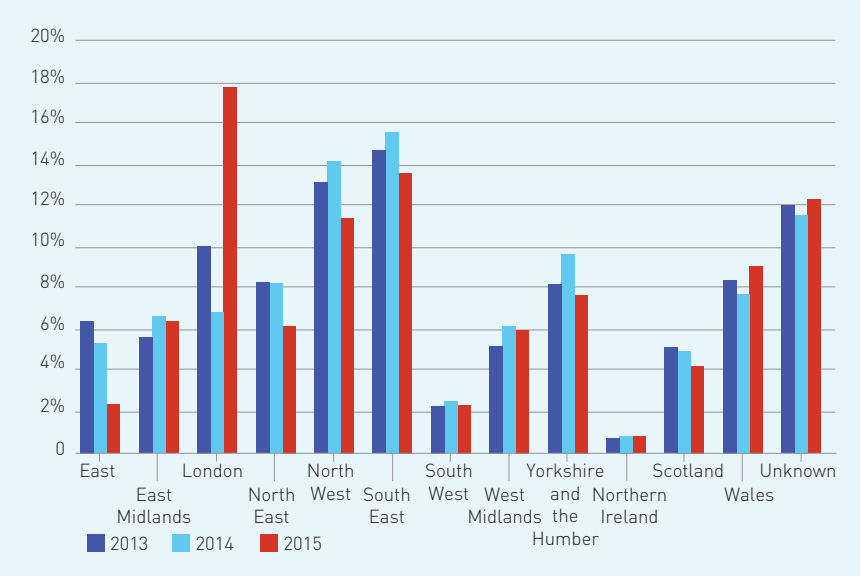
Source: HMRC, Cebr analysis

In volume terms, the vast majority of exports to non-EU countries in 2015 were from businesses based in London (18% of the UK total and 24% of the England total). This was a marked increase of 177% on 2014, increasing from 2.9 million tonnes to 8.1 million tonnes. This was primarily driven by a significant increase in the volume of exports of petroleum, petroleum products and related materials to South Korea. Over the same period, the volume of exports originating in the South East declined by 0.5% to 6.2 million tonnes. Exports from that region have also seen a more general decline over time.

4 The Regional Trade Statistics (RTS) take data primarily from Customs systems for non-EU trade and the Intrastat survey for EU trade. HMRC does not receive information in respect of goods that move wholly within the UK, nor in intangibles and services such as banking or tourism. In RTS, trade is mainly allocated to regions according to the postcode associated with a company's VAT registration.

74% of exports from the UK to non-EU countries originated in England in 2015, amounting to 33.6 million tonnes, a 5% increase since 2014. Figure 9 illustrates the share of the volume of UK exports originating in each of the regions heading for non-EU destinations over the past three years.

Figure 9: Proportion of exports to non-EU countries by originating UK region, by volume, 2013–15



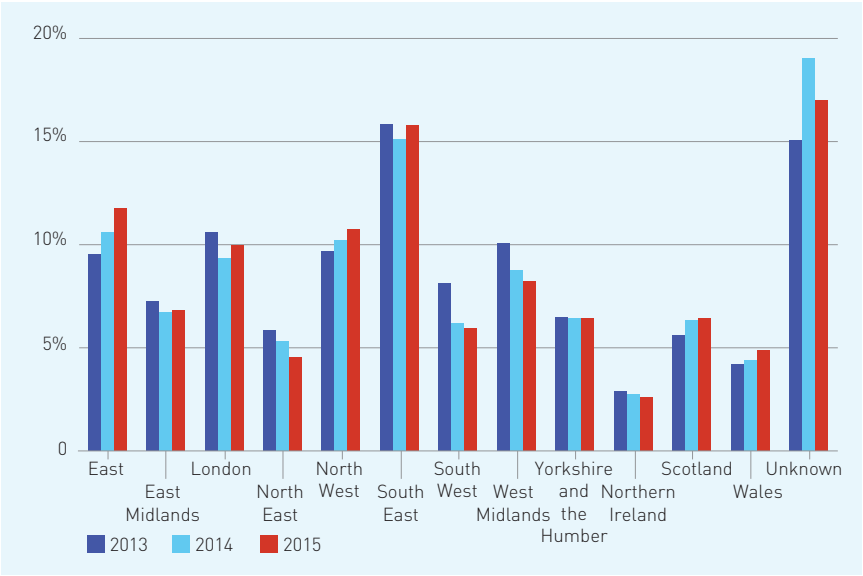
Source: HMRC, Cebr analysis

Exports to the EU

By value, the South East and London are the originating destination for a large proportion of the UK's exports to the EU. In 2015, these two regions were the originating location for 24% of all UK exports to the EU by value. However, exports originating in the South East were noticeably higher than those originating in London, £19.0 billion (or 14%) as opposed to London's £12.7 billion (or 10%) in 2015.

As with non-EU export destinations, the proportion of exports originating in different regions has remained fairly stable over the past five years. However, there are a few regions that have seen a more noticeable decline in the value of goods originating there, as shown in Figure 10. Most noticeably, the North East, South West and the West Midlands.

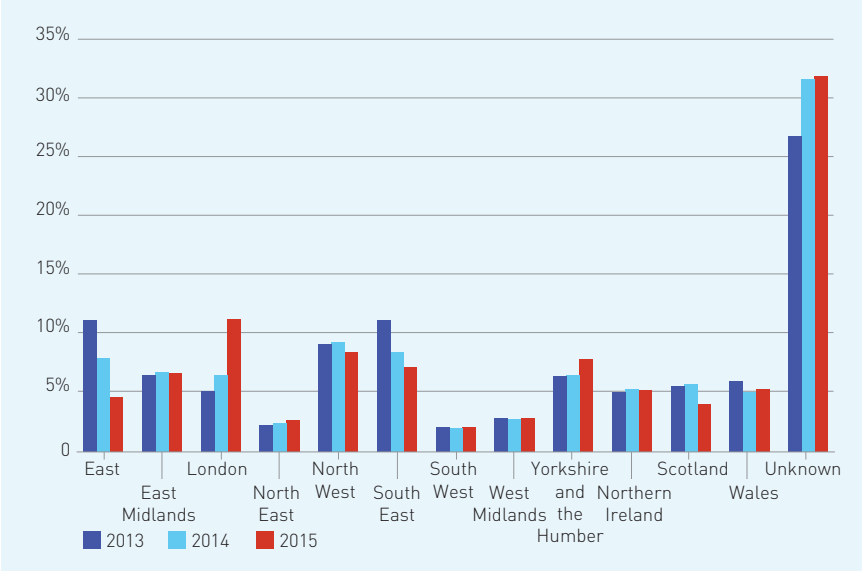
Figure 10: Proportion of exports to EU countries by originating UK region, by value, 2013–15



Source: HMRC, Cebr analysis

By volume, 11% of exports to the EU originated in London in 2015 (12.2 million tonnes), a 71% increase on 2014. Its share has increased substantially from 2013, when it accounted for just 5% (5.6 million tonnes) of total UK exports to EU countries in that year. Exports by volume from the South East to the EU comprised a smaller portion of the total, accounting for just 7% in 2015. This is significantly down from 11% in 2013. In absolute terms, this is a decline in volumes from 12.3 million tonnes to 7.7 million tonnes.

Figure 11: Proportion of exports to EU countries by originating UK region, by volume, 2013–15



Source: HMRC, Cebr analysis

However, in volume terms, there were a significant amount of exports from businesses based in the North West and Yorkshire and the Humber (both 8% of the UK total). Furthermore, businesses in the East used to account for more of UK exports to the EU than London (11% in 2013) but has since declined to just 5% of the total.

2.3. Trade from other regions passing through London

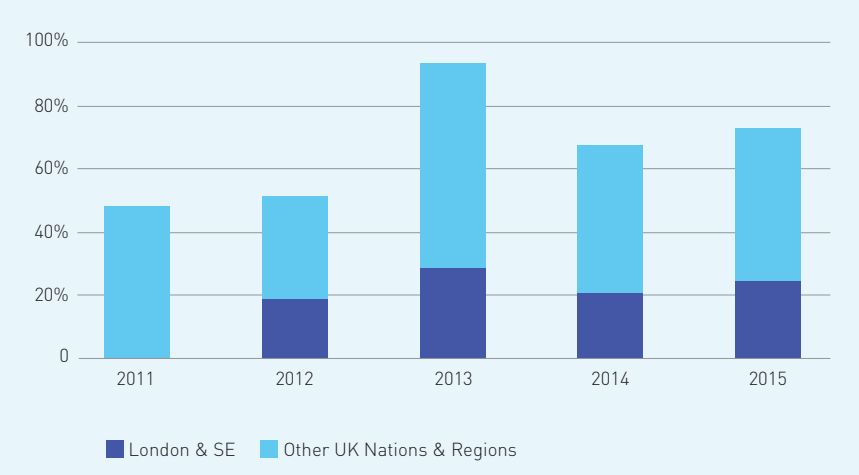
Combining the analysis from the earlier two sub-sections, we have estimated the value of exports to non-EU countries from other UK regions which travel through the London airports. Our analysis is based on the simplifying, yet reasonable, assumption that all trade from London and South East regions passes through the London airport system. We focus the analysis on exports by value, given that high value goods are invariably transported by air and the more representative picture that it paints.

Goods worth approximately £41.2 billion were exported from businesses based in London and the South East to non-EU countries in 2015. By applying the proportion of all exports that travel via air to non-EU destinations (by value), based on data from HMRC, we estimate that £24.6 billion worth of exports from London and the South East travelled through London airports.

However, HMRC records £72.8 billion worth of goods being exported through the London airport system to non-EU destinations in 2015. On this basis, it is clear that a significant proportion of the total exports that travel via air from the other UK regions to non-EU countries pass through the London system.

Based on our estimate of the amount from London and the South East, the residual of £48.2 billion of the exports by value passing through the London airports (over 60% of the total) originate from other UK nations and regions in 2015, as illustrated in Figure 12.

Figure 12: Exports by value travelling through the London airports, by originating regions, £ billion



Source: HMRC, Cebr analysis

This very clearly highlights the importance of runway capacity in London and the South East in supporting exporting businesses from elsewhere in the UK, as well as London and the South East.

2.4. Goods trade across product categories

In this section we consider the types of goods that are transported via air to non-EU continents. The equivalent data for trade with EU countries is not available.

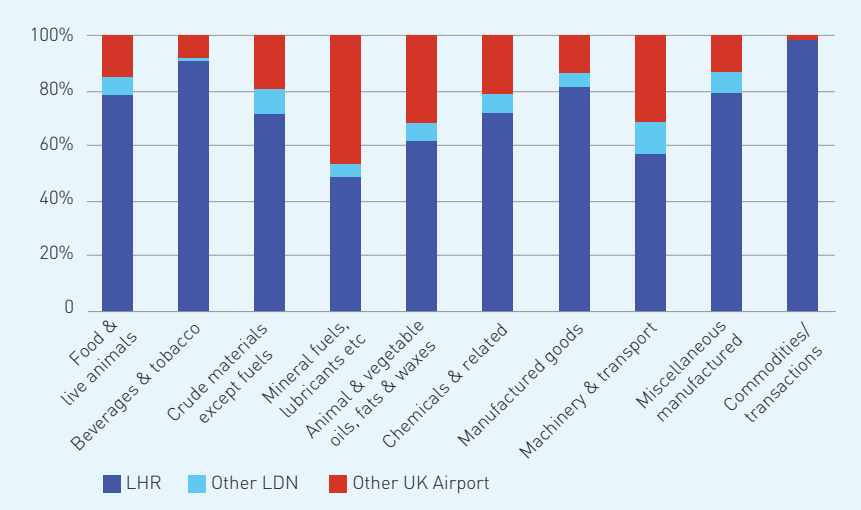
Exports by value

For the UK as a whole, across all ports, the largest export by value in 2015 was machinery and transport equipment.[5] The value of these exports amounted to £62.4 billion in 2015. However, for the London airports, the largest export by value was commodities/transactions not classified elsewhere,[6] which amounted to approximately £25.3 billion in 2015. Exports through the London airports in this SITC category accounted for 95% of the UK total (through all ports).

The other main categories of export transported through the London airports include machinery and transport equipment (£18.6 billion, 62% of the UK total) and miscellaneous manufactured articles (£14.3 billion, 30% of the UK total).

The vast majority of exports transported via the London airport system leave through LHR. This is clearly illustrated in Figure 13 below, in which LHR accounts for significant shares of total exports by air under all of the SITC categories and 99% in the largest category (commodities/ transactions not classified elsewhere).

Figure 13: Total aviation exports by value travelling by air in 2015, by SITC



Source: HMRC, Cebr analysis

5 This category includes power generating machinery and equipment, machinery specialised for particular industries, metalworking machineries, general industrial machinery, office machines, telecoms and sound recording, road vehicles, other transport equipment.

6 This category includes special transactions and commodities not classified according to kind; coin (other than gold coin) not being of legal tender; gold, non-monetary (exc gold ores and concentrates) and gold coin not of legal tender; military arms and ammunition.

As highlighted previously, the majority of exports from LHR to non-EU destinations travel to Asia and Oceania. The most sizable amount of exports to this continent are of commodities/transactions not classified elsewhere (£8.4 billion in 2015), followed by machinery and transport equipment (£6.0 billion). However, exports from LHR of chemicals and related products mostly go to North America, with their value totalling £5.2 billion in 2015.

Exports by volume

By volume, the largest export category across all UK ports is mineral fuels, lubricants and related materials, with 18.5 billion kg exported in 2015. However, when considering exports carried by air, the most significant categories are machinery and transport equipment (151.2 million kg) and miscellaneous manufactured articles (129.7 million kg).

London's airports transport over half of the exports which travel via air in each SITC category, aside from crude materials. Most significantly, London airports transported 86% of food and live animal exports by volume (70.3 million kg) and 84% of miscellaneous manufactured articles. LHR accounts for over 90% of the exports for each SITC category travelling by air from London, highlighting LHR's importance for exporting a variety of different goods, not just high-value items.

From LHR, the largest volume of exports are destined for Asia and Oceania. Of these exports, the most significant in volume terms were miscellaneous manufactured materials (40.7 million kg) and machinery and transport equipment (39.1 million kg) in 2015.

2.5. UK trade in services

Aviation is not only important for trade in goods, it also plays a major role in trade in services, helping businesses to establish and maintain fruitful business relationships. Being an island nation, aviation is also crucial in supporting tourism and labour supply, creating the conditions necessary (the ability to fly to visit friends and relatives) to incentivise productive inward migrants to work in the UK.

The UK has a very strong services sector, including financial services, insurance and the creative industries. These businesses are highly dependent on fast, timely business travel enabling face-to-face contact both with existing clients, and when establishing new ones. This led to the Airports Commission highlighting that the services sector is particularly reliant on aviation, as the industry is dominated by highly-globalised firms which serve an international client base.[7] This is reflected in the high degree of expenditure related to aviation within these sectors.

According to the Pink Book, UK services exports have been steadily increasing over time, with a significant portion of these exports coming from London, as illustrated by Figure 14. In 2014,

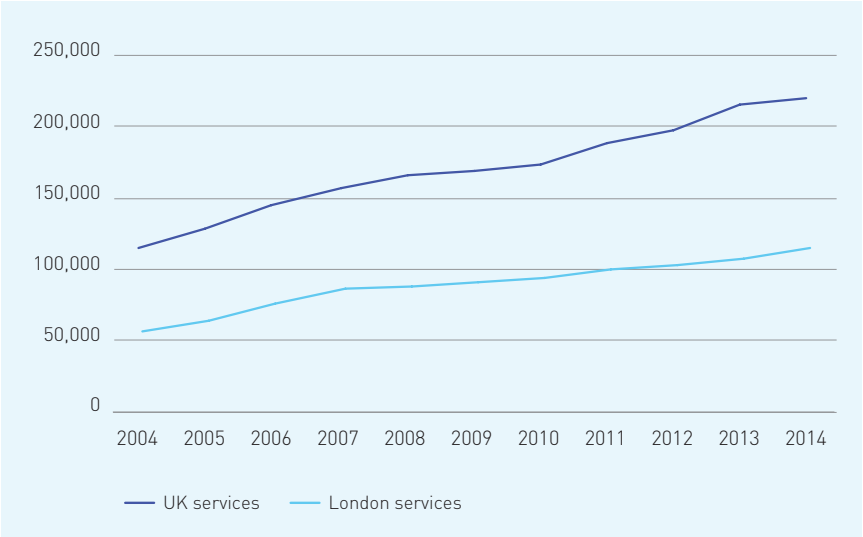
7 Airports Commission (March 2013), 'Discussion Paper 02: Aviation Connectivity and the Economy'. Available at: www.gov.uk/government/uploads/system/uploads/attachment_data/file/138162/aviation-connectivity-and-the-economy.pdf

services exports from the UK amounted to £220 billion, with London's services exports accounting for over half of this, approximately £115 billion. For the UK as a whole, services exports have increased steadily over time, from £129 billion in 2004. The majority of exports come from financial and other business services, amounting to £49.2 billion and £57.1 billion in 2014, respectively.

Given London's high level of services exports, it is essential that there are strong aviation links in place to support the city's services industries. Furthermore, as some international routes are only served by LHR, it is likely that for service-based businesses throughout the UK, without strong aviation links from London, it would be difficult for them to trade abroad.

Meanwhile, services imports have not grown as strongly over the same ten year period. In 2014, total services imports to the UK amounted to £130.6 billion, a 2% decrease on 2013. The UK consistently runs a trade surplus in services. Strong aviation links are essential to ensure that the UK's strength in this area continues.

Figure 14: London and UK services exports, £m, 2004–14



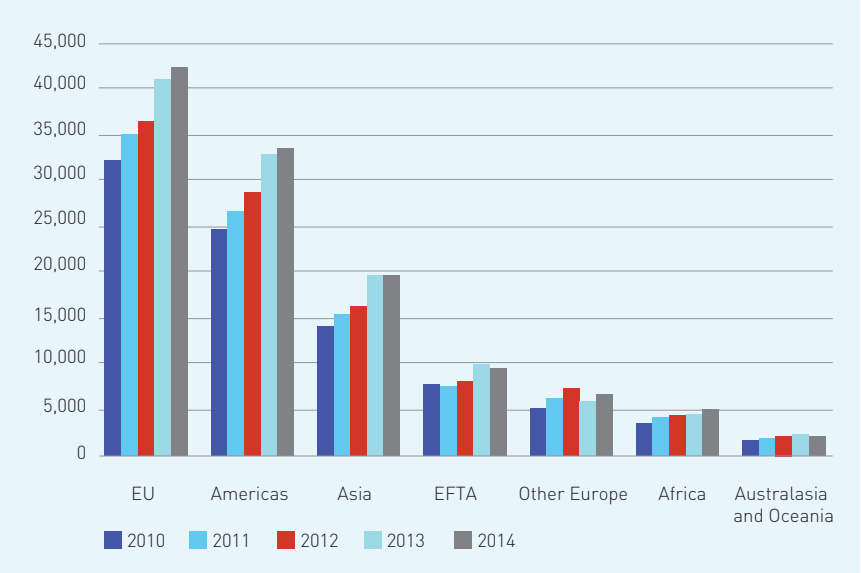
Source: ONS Pink Book, GLA Economics

According to ONS International Trade data,[8] total services exports to the USA far exceeded those to any other country in 2014. In total, services exports to the USA amounted to £27.8 billion in that year, the largest amount of services exports to an individual country. Total services exports to the EU amounted to £42.5 billion in 2014, equating to 35% of the UK total.

Figure 15 illustrates the absolute amount of UK services exports flowing to each continent and how these amounts have changed over the past five years. Over time, the proportion of services exports to each continent has remained fairly constant, with exports to the EU consistently amounting to around 35% of the total, and the Americas 28%.

8 Note that in this dataset, trade in services excludes travel, transport and banking.

Figure 15: UK services exports, by destination continent, £m



Source: ONS, Cebr analysis

Similarly to exports, the majority of services imports come from Europe, specifically the EU. Services imports from there amounted to £24.6 billion in 2014. This was followed by imports from the Americas, which amounted to £14.9 billion, with a significant portion of this comprised of the US (£12.9 billion).

2.6. Foreign direct investment

Aviation is also an important, and well-recognised, contributor to encouraging FDI. The air connections made between cities and markets can produce an important element of the infrastructure required to attract FDI. Previous research by Banno, Mutinelli & Redondi (2011)[9] suggests that FDI increases by 50% after a first direct air connection to a foreign region is established.

The link between aviation connectivity and FDI relates in large part to the requirement to move staff around the globe, thereby facilitating the transfer of knowledge. Aviation connectivity helps inward investment by creating a more favourable environment for foreign firms and their workers. A survey by the European Cities Monitor found that transport links (including predominantly by air) are an essential factor in the location decision of 52% of companies.[10] Oxford Economics (2013)[11] has also highlighted the importance to businesses of considering aviation connectivity in investment and location decisions. Increased aviation connectivity also enables UK firms to more easily invest outside of the UK.

9 Banno, M., Mutinelli, M., & Redondi, R. (2011). 'Air connectivity and Foreign Direct Investments, the economic effects of the introduction of new routes'.
10 Heathrow Airport Ltd, (2013), "Airports Commission Discussion Paper 02: Aviation Connectivity and the Economy". See www.heathrow.com/file_source/Company/Static/PDF/Companynewsandinformation/Aviation_connectivity_and_economy.pdf. The highest ranking factor is generally the availability of a highly-skilled workforce.
11 Oxford Economics, 2013, "The Economic Value of International Connectivity".

For the UK, FDI is attracted to regions such as London for reasons including the availability of a pool of skilled labour and the quality of its aviation links. It has been estimated that FDI contributes more than £52 billion each year to London's economy.[12] In 2014/15, the UK attracted 1,988 FDI projects, an increase of 12% on the previous years. This strong performance saw the UK's inward FDI stock i.e. the value of accumulated FDI in the UK, exceed £1 trillion for the first time. This is the highest amount of FDI in a single country in Europe, and the third highest in the world behind the US and China.

Statistics from UKTI show that FDI into the UK came from more than 70 countries, including emerging markets. However, the majority of the UK's inward investment continues to come from the US, with a total of 564 projects in 2014/15, followed by France and India.

The US investment position in the UK amounted to £253.0 billion in 2014, whilst the EU countries as a whole had an investment position amounting to £496 billion in the same year.

12 The Mayor of London's Response (2011), 'Developing a sustainable framework for UK aviation: scoping document'. Available at: http://content.tfl.gov.uk/developing-a-sustainable-framework-for-uk-aviation-scoping-document-full.pdf

THREE
The relationship between trade, FDI and air transport links

This section of the report presents the findings of our econometric analysis which aimed to establish the relationship between aviation connectivity, trade and investment flows in the UK. We begin by detailing the approach taken to the analysis before presenting the results.

3.1. Mature vs. emerging markets

In developing our econometric model to assess the relationship between aviation connectivity, trade and investment flows, we drew on a number of different data sources. We relied on HMRC to obtain UK goods trade data, Eurostat's Balance of Payments database for trade in services data, and the Civil Aviation Authority (CAA) for data on flights, passengers and routes. The CAA data spans a ten-year period from 2002 to 2012, the time period that this part of our study examines. Although the period of analysis is limited, there are good reasons for choosing one that ends in 2012. These are:

- *The 'dither clock'*: The analysis in this section leads ultimately to the 'dither' clock developed in Section 5. This imagines trade growth being spread smoothly and continuously through time, and considers what is potentially being lost in trade terms by delaying the runway capacity decision. The Airports Commission was established in 2012, and this represents the start date of the dither clock – the year the Government decided to create a lengthy commission rather than reach a decision itself.
- *Minimising distortions of the relationships*: with LHR operating at capacity, LGW close to capacity, and the fact that new routes tend to push others out, it made sense to go back in time a little to minimise the potential for routes dropping in and out to distort the relationships we are endeavouring to establish.

In developing the econometric model, we considered the number of routes, flights and passengers travelling between the

UK and two groups of ten partner countries, referred to in this report as the 'mature-trade' markets and the 'emerging markets' (see Table 4 for the list of countries included in each). The former group refers to the ten partner countries with which the UK has the most mature trading relationships in goods and services. This was identified through an examination of historic trends in trade between the UK and its partner countries. The latter group refers to ten economies that are among the fastest growing in the world, and according to the IMF's and Cebr's own forecasts, are expected to contribute an increasing proportion of the world's economic growth over the next 5 years.

Table 4: UK trade partner countries, defined as 'mature-trade' markets or 'emerging markets'

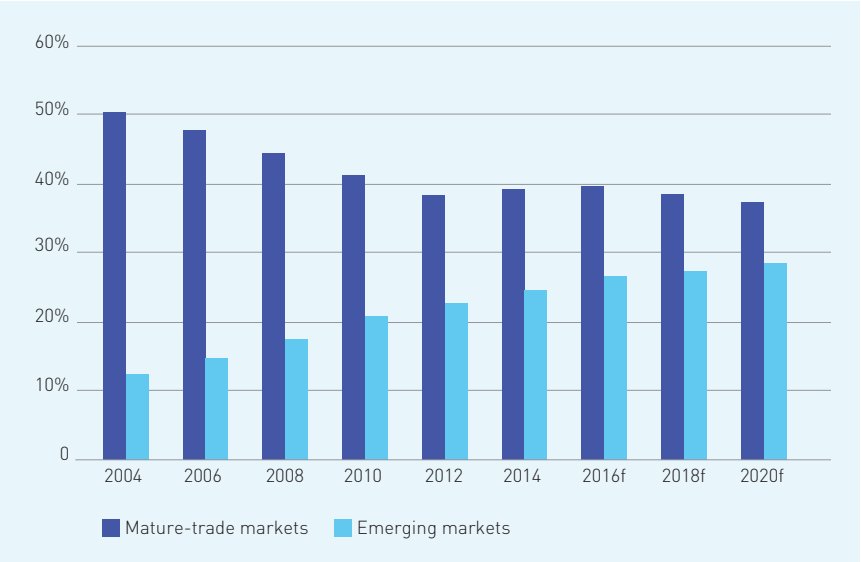
Mature-trade markets	Emerging markets
Belgium	**Poland**
France	**Turkey**
Germany	**South Africa**
Ireland	**Nigeria**
Italy	**Mexico**
Netherlands	**Brazil**
Spain	**India**
Switzerland	**China**
USA	**Malaysia**
Hong Kong	**Thailand**

Source: Cebr analysis

3.2. The growing importance of aviation links to emerging markets

It is increasingly important for the UK to be well connected with emerging markets. In 2014, the mature-trade markets accounted for almost two-fifths (39%) of the world's GDP, compared with the emerging markets group, which contributed 25%. By 2020, the mature-trade markets' contribution to world GDP is expected to decline to 37% while the emerging markets' share is estimated to rise to 28% (as illustrated by Figure 16). We estimate that emerging markets' contribution to world GDP could surpass mature-trade markets' contribution to world GDP by as early as 2029.

Figure 16: Mature-trade markets' and emerging markets' share of global GDP, 2004–2020



Source: Cebr analysis

As the balance of economic strength and significance shifts away from the mature-trade markets towards the emerging markets, strong connectivity between the UK and these emerging markets will become imperative for the UK to capitalise on new export and investment opportunities.

3.3. Connections, trade and investment with mature vs. emerging markets

Trade

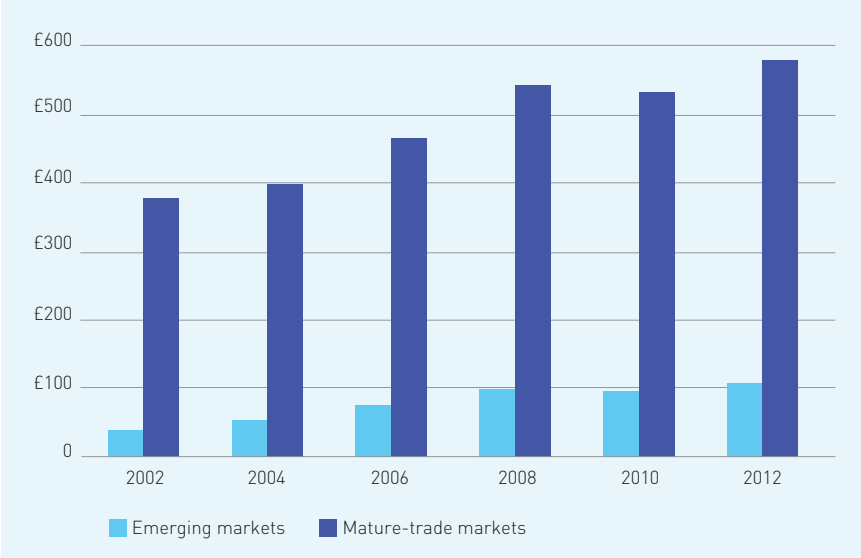
The value of trade in goods and services between the UK and the emerging markets are comparatively lower than the value of trade between the UK and the mature-trade markets (Figure 17). The total value of trade in goods and services between the UK and the mature trade markets reached approximately £580 billion in 2012, this includes exports and imports.

By comparison, the value of trade between the UK and the emerging markets was almost 5 times lower, totalling approximately £107 billion. Despite a time lag in the fall in trade following the financial crisis in 2008, by 2012 the value of UK trade between both groups of markets had surpassed 2008 levels.

Growth in trade between the UK and countries such as South Africa and India (93% and 88% respectively between 2002 and 2012) has driven trade with the emerging markets group. Such high growth rates are a reflection of the low base from which UK trade with these countries is increasing from. By comparison, while trade growth between the UK and mature-trade economies is comparatively low, this is a reflection of the much

higher base from which it is increasing and the maturity of the trade relationships involved.

Figure 17: Total trade (exports and imports) in goods and services between the UK and the emerging markets group and the mature-trade markets group, (£ billions), 2002–2012



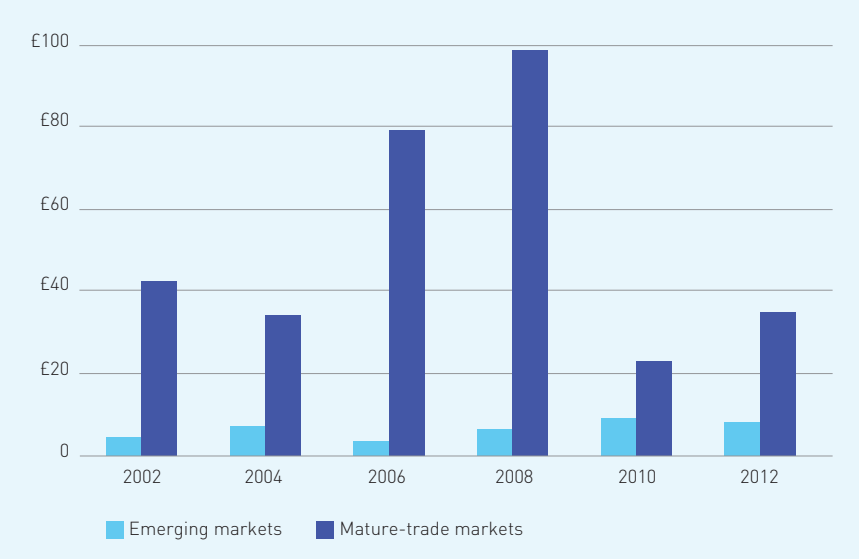
Source: HMRC, Eurostat, Cebr analysis

Foreign direct investment

In 2012, the value of total (inward and outward) FDI flows between the UK and the mature-trade markets was approximately £34.9 billion (Figure 18). By comparison, in the same year, the value of total investment between the UK and the emerging markets was almost 4 times lower, at £8.0 billion. Similarly to the value of trade between the UK and mature-trade markets, by 2012 the value of total investment flows had yet to reach the levels experienced in 2008. In contrast, the value of total investment flows between the UK and emerging markets in 2012 had exceeded pre-financial crisis levels.

Furthermore, the value of investment flows between the UK and the mature markets declined by almost 77% between 2008 and 2010. Over the same time period, investment between the UK and the emerging markets increased by 40%, and only declined relative to 2010 levels in 2012. This trend could be indicative of the UK's shifting focus of investment opportunities away from the mature-trade economies and towards the emerging markets, in particular after the financial crisis, which arguably affected Europe and the US more immediately than it affected the emerging markets.

Figure 18: Total (inward and outward) FDI flows between the UK and emerging markets and mature-trade markets each, (£ billions) 2002–2012



Source: OECD, Cebr analysis

Aviation connections

In 2012, approximately 83,000 flights travelled between the UK and the emerging markets. By contrast, in the same year almost 11 times more flights (904,000) travelled between the UK and the mature-trade economies. Figure 19 illustrates the higher number of connections between the UK and the mature economies and the emerging markets, respectively.

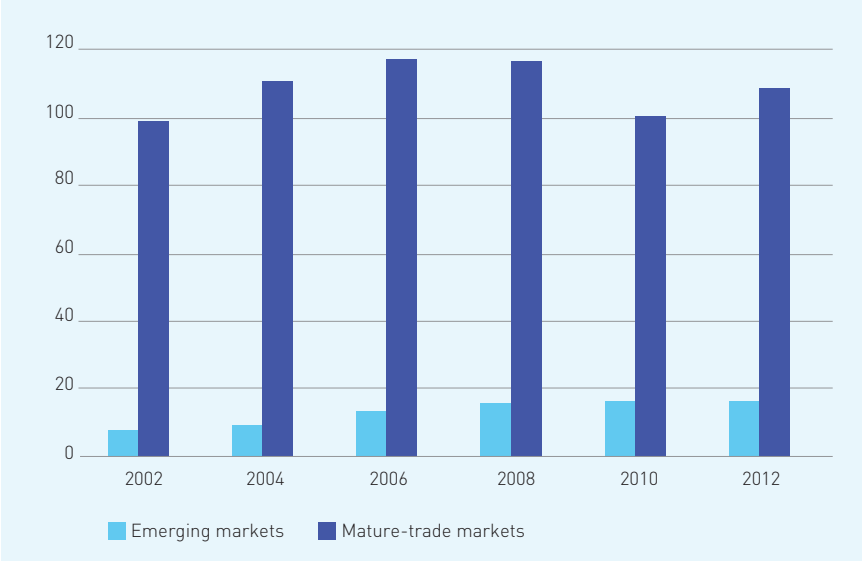
Figure 19: Total flights between the UK and emerging markets and mature-trade markets each, (thousands) 2002–2012

Source: CAA, Cebr analysis

Between 2002 and 2012, connections between the UK and both groups of markets followed a similar pattern to that of the associated levels of trade and investment. The number of flights travelling between the UK and both mature-trade and emerging groups fell following the financial crisis, and by 2012, levels had yet to reach those experienced before the global economic slowdown in 2008.

The numbers of passengers travelling between the emerging and mature-trade economies followed a similar trend to that of the number of flights between 2002 and 2012 (Figure 20). However while the number of passengers travelling between the UK and mature-trade economies peaked in 2006 (117 million), the number of passengers travelling between the emerging markets and the UK has increased steadily since 2002.

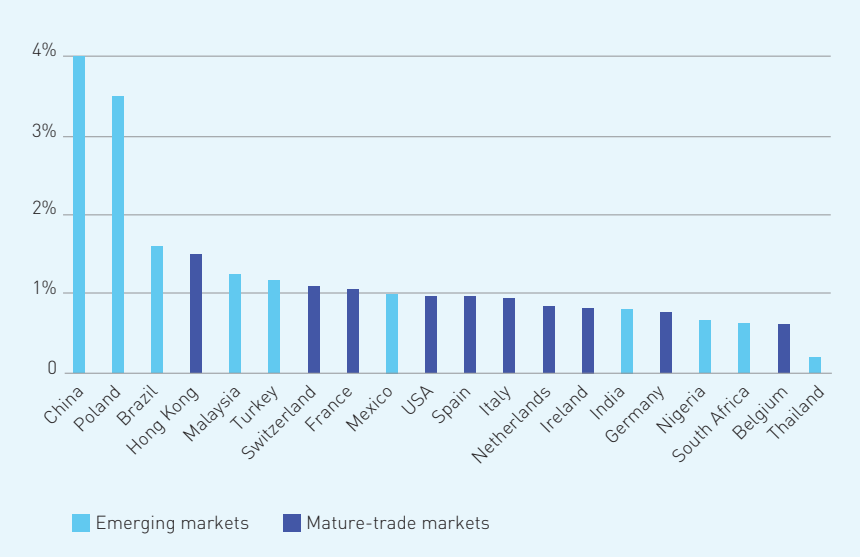
Figure 20: Total passengers travelling between the UK and emerging markets and mature-trade markets, (millions) 2002–2012



Source: CAA, Cebr analysis

Figure 21 illustrates the growth in the number of new routes between the UK and the emerging markets and mature-trade economies. Following the trajectory of China's economic and export strength, the number of new routes between China and the UK expanded by 4.0% between 2010 and 2012. Several emerging markets feature at the top end of the scale, such as Poland and Brazil, where the number of new routes to the UK grew by 3.5% and 1.6% respectively.

Figure 21: Percentage growth in the number of routes between the UK and emerging markets and mature-trade markets between 2010 and 2012



Source: CAA, Cebr analysis

3.4. The relationship between aviation connectedness and trade and investment

In undertaking the analysis, we chose to use a panel data econometric modelling approach.[13] This enabled us to capture trends in the relationship between air links, and trade and investment across both time and between countries. By analysing the data, we identified a strongly statistically significant relationship between total trade and an 'aviation connectedness' variable constructed as the product of routes, flights and passengers. We also identified a statistically significant relationship between this variable and total Foreign Direct Investment (FDI) flows.[14]

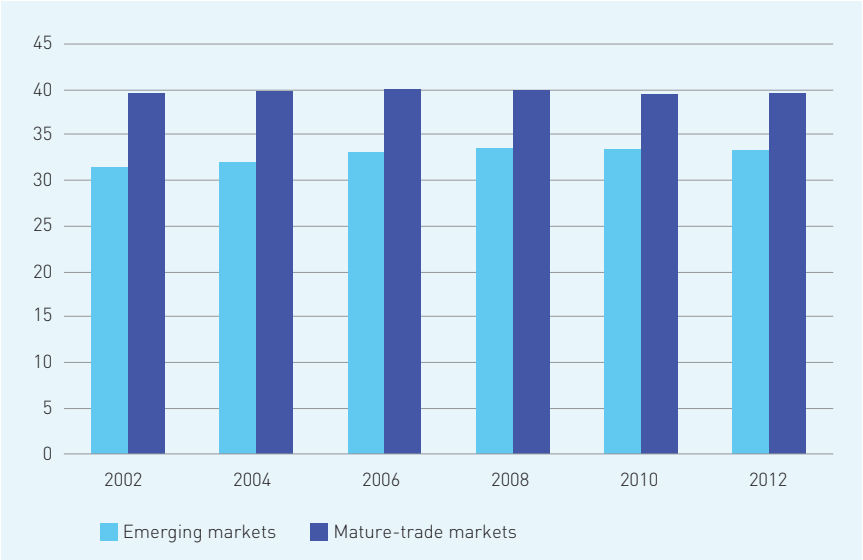
Our econometric analysis of the data identifies a statistically significant relationship between the number of flights and the level of total trade, and the number of flights and the level of total FDI. We estimate that a 10% increase in the number of flights between the UK and the mature-trade economies is each associated with a 1.2% increase in UK trade in goods and services, and a 0.7% increase in FDI (all other factors remaining constant).

The number of flights, passengers and routes between the UK and the emerging markets and the mature-trade markets is illustrated in Figure 22.[15] While in absolute terms the level of connectedness between the UK and the mature-trade markets remains significantly higher than between the UK and the

13 Details on the econometric approach used in this study can be found in the Appendix.
14 FDI flows denote the new investment made during the year, and capture equity capital, reinvested earnings and the borrowing and lending of funds.
15 Throughout the remainder of this report we refer to the product of the number of flights and the number of passengers (effectively all passengers) and routes as a measure of connectedness.

emerging markets, Figure 22 suggests that this trend may not continue in the coming years. This presents our connectedness variable on a logarithmic scale, and illustrates the narrowing of the gap in the UK's connectedness with the emerging markets group and the mature trade markets group.

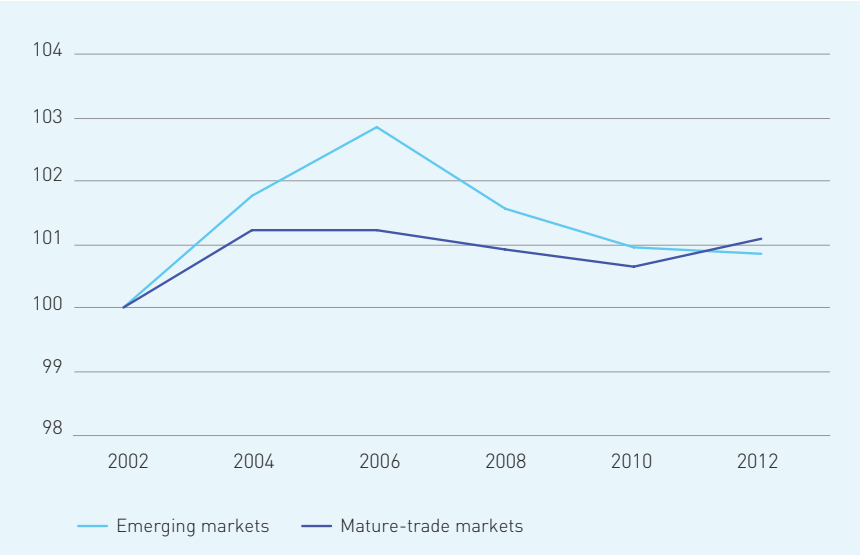
Figure 22: The logarithm of the number of flights, passengers and routes between the UK and emerging markets and mature-trade markets respectively, 2002–2012



Source: CAA, Cebr analysis

Figure 23 illustrates that between 2002 and 2012, growth in the level of connectedness between the UK and the emerging markets was, on average, higher than the average growth between the UK and mature-trade markets, as illustrated in Figure 22. The low growth rates in connectedness with the mature-trade markets reflect, as noted earlier, the high base of existing air links from which they are growing. This is in contrast to the connectedness with emerging markets, where the higher growth rates reflect the fact that each additional air link represents a larger proportion of the much lower base of existing connections.

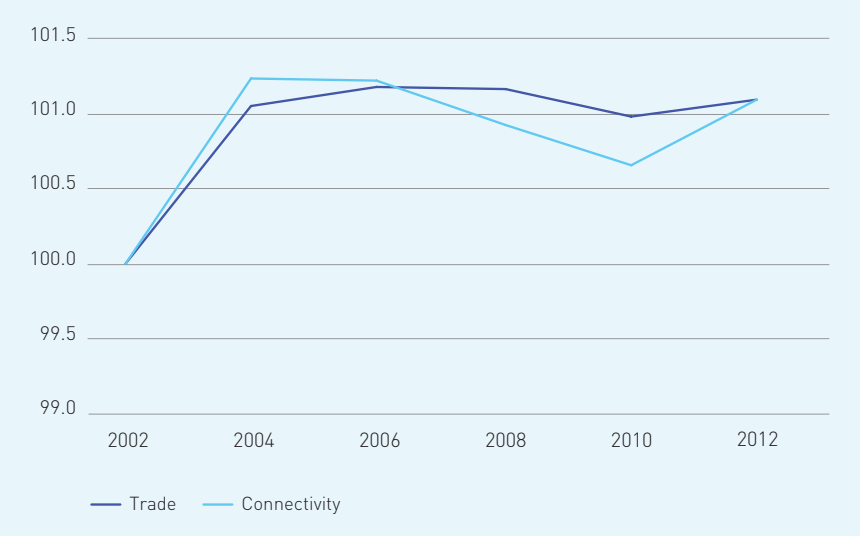
Figure 23: Growth of flights, passengers and routes between the UK and emerging markets and mature-trade markets respectively, (index = 2002), 2002–2012



Source: CAA, Cebr analysis

While bi-lateral trade is driven by a range of factors such as each country's economic growth, labour costs, historical ties and proximity, a highly positive relationship between UK trade with the mature-trade markets and connectedness with those markets is illustrated in Figure 24.

Figure 24: Growth in total UK trade with mature-trade markets and growth of total flights, passengers and routes, (2002 = 100)

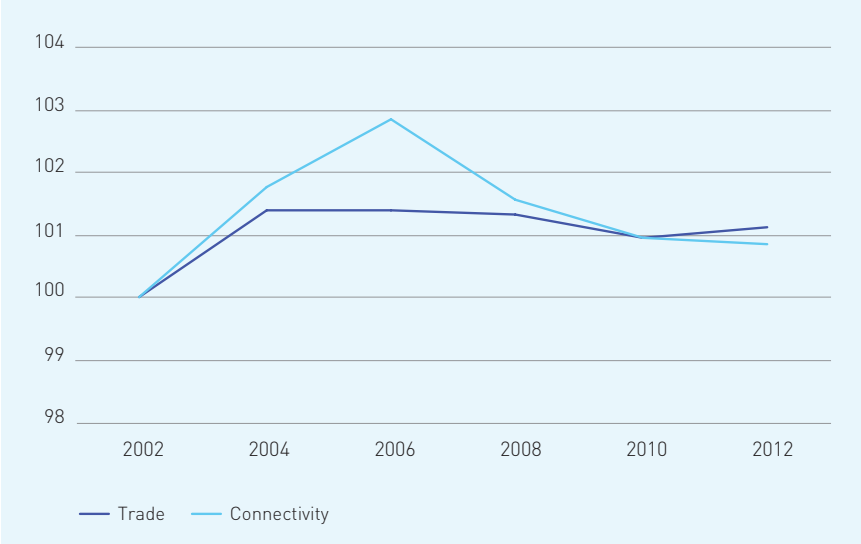


Source: HMRC, CAA, Eurostat, Cebr analysis

A positive relationship between the UK trade with the emerging markets and connectedness with those markets can be observed in Figure 25. Growth in trade and connectedness between the UK and the mature trade markets appear relativity stable, reflecting

the established relationship between the UK and individual mature-trade partners (Figure 24). By comparison, growth in connectedness and growth in trade between the UK and the emerging markets appears to be slightly more volatile (Figure 25).

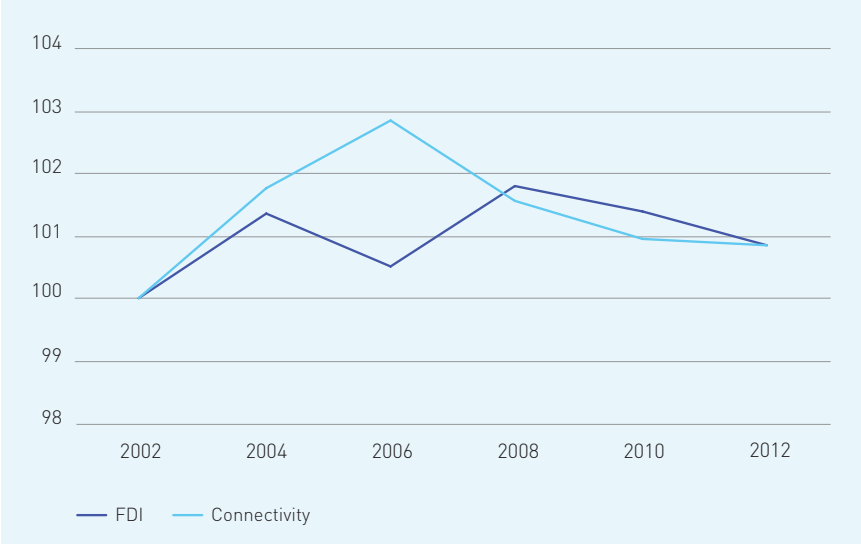
Figure 25: Growth in total UK trade with emerging markets and growth of total flights, passengers and routes, (2002 = 100)



Source: HMRC, CAA, Eurostat, Cebr analysis

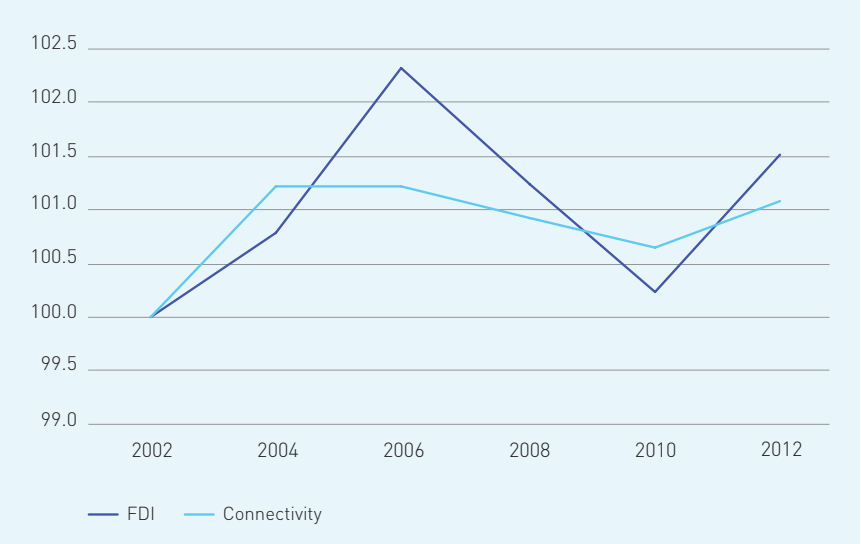
The relationship between total UK FDI and connectedness, as illustrated by Figure 26 and Figure 27 for each of the emerging markets and mature-trade markets, is not as clear as the association between trade and connectedness. This is to be expected and is a reflection of the volatile nature of FDI, which is driven by a range of factors such as market concentration and regulatory and institutional frameworks.

Figure 26: Growth in total UK FDI flows between emerging markets and growth of total flights, passengers and routes, (2002 = 100)



Source: CAA, OECD, Cebr analysis

Figure 27: Growth in total UK FDI flows between mature-trade markets and growth of total flights, passengers and routes, (2002=100)



Source: CAA, OECD, Cebr analysis

FOUR
Growth potential and the cost of delaying the runway decision

Given the Government's focus on exports as a source of UK economic growth, it is imperative that the Government supports UK businesses in moving beyond domestic markets and developing connections with high-growth and new emerging markets. However, for this to happen, the required airport infrastructure needs to be in place. At present, the runway capacity constraint in London and the South East risk seriously impacting the UK's ability to grow new routes, establish these business relationships and serve new markets.

In this section, we consider the impact on UK trade and investment opportunities if there were an increase in the number of air links to the ten fastest growing economies under a range of scenarios.

We assume that, as LHR is operating at capacity and is also the principal freight airport in the London system (and in the UK as a whole), the trade impacts we identify here can be equated with what could be lost as a result of not having a new runway in place in the London area. In the current circumstances, in order to create new air links, old links would have to be sacrificed, resulting in losses elsewhere.

4.1. Estimated potential boost to UK trade in goods and services

As in the 2011 Frontier Economics report for Heathrow Airport,[16] we first present the results suggested by our econometric modelling. We use these results to calculate a number of benchmarks around potential trade growth that could arise with various types of increase in the number of air links to the ten fast-growing economies (our emerging markets group). These benchmarks are comparable in magnitude to those produced by CBI in its 2013 report.[17] However, at the aggregate level, there are a range of factors requiring consideration that are beyond what a statistical model can take into account, such as political institutions, historic links and so forth, that make it easier or harder to trade with

16 Frontier Economics (2011), "Connecting for Growth: the role of Britain's hub airport in economic recovery", report prepared for Heathrow, September, London.
17 CBI (2013), "Trading places: Unlocking export opportunities through better air links to new markets", London.

these countries. By accounting for these factors we calculate a lower bound estimate of the trade that could be sacrificed by not having additional runway capacity. In reality, the true impact is likely to lie somewhere in the range of this lower bound and the upper bound suggested by the unadulterated statistical model.

From our econometric analysis of the data, we estimate that in any given year, a 10% increase in our measure of aviation connectedness with the mature-trade markets can be linked with an increase in UK trade with those markets of 1.2%. This result was highly statistically significant, thus confirming the positive correlation between air links and trade. We used this relationship to quantify and examine the potential impacts on UK trade under various scenarios that boost the UK's connectedness with the emerging markets group, all other factors remaining equal.

In 2012 the UK traded £107 billion with the ten emerging countries examined in this study. Based on the statistical relationships established above, our analysis suggests that an additional average flight to one of these emerging markets has the potential to boost UK trade by £57,000 (Table 5). By facilitating an additional 1,000 passengers to one emerging market, UK trade has the potential to rise by £307,000. We estimate that creating an additional route to one emerging market with existing average flight density has the ability to boost UK trade by £34.2 million. An additional route to all ten emerging markets with a daily flight on each has the potential to increase UK trade by as much as £0.4 billion.

Table 5: Potential boost to UK trade (£) from scenarios involving additional flights, passengers and routes from the UK to emerging markets

Scenario	Potential boost to UK trade
1 additional flight	**£57,000**
An additional 1,000 passengers	**£307,000**
1 additional route	**£34.2 million**
1 additional route and 1 additional flight	**£0.41 billion**
Flights-parity with mature-trade markets	**£28.2 billion**

Source: Cebr analysis

We then assume a scenario in which average levels of aviation connectedness between the UK and the emerging markets reaches the same levels as between the UK and the mature-trade economies. In this scenario, the analysis suggests that the UK could benefit from a boost to trade of approximately £28.2 billion. This assumes that the economies and trading conditions in the emerging markets continue to improve to resemble those of the

mature-trade economies. As a result, our findings do not account for the other factors that could constrain the ability to grow trade to this extent, such as institutional, regulatory and market openness issues.

In addition to conducting standard robustness tests to ensure the statistical significance of our results, we used an alternative methodology to sense-check our approach. This test involved comparing the level of UK trade with 24 emerging markets with at least one UK daily flight, with the level of UK trade with 8 emerging economies without a daily UK flight connection.[18] The discrepancy, after adjusting for the size of each emerging market's economy, provided results similar to our findings above, thus broadly confirming the robustness of these calculations.

At the aggregate level, as noted earlier, we took account of a range of factors that the statistical model cannot capture, factors that can make it easier or harder to trade with these countries. In other words, we attempt to account for the extent to which trading conditions between individual emerging markets and the UK is expected to develop over the next 15 years. This was informed by Cebr's propriety forecasts of world trade and those of other institutions like the IMF. This approach suggests a lower bound for the trade that could be lost as a result of poor connectedness to emerging fast-growing economies of £8.6 billion by 2020, growing to £10.1 billion by 2030. However, this includes exports and imports, so narrowing the focus to exports (using the current UK export-import split) gives lower bound estimates of £3.2 billion by 2020 and £3.7 billion by 2030.

4.2. Estimated potential boost to UK FDI

A similar approach to identifying the relationship between air links and trade was adopted to examine the association between air links and FDI. We estimate that in any given year, a 10% increase in the number of flights, passengers and routes across the mature-trade markets has the potential to increase total UK FDI flows by 0.7%. We used this relationship to quantify the potential impacts on UK FDI flows under several scenarios that boost connectivity between the UK and emerging markets, all other factors remaining equal.

In 2012, the value of FDI flows between the UK and the ten emerging markets examined in this study totalled approximately £8.0 billion. Our analysis suggests that an additional average flight to one emerging market could potentially boost UK FDI flows by £4,000 (Table 6). By facilitating an additional 1,000 passengers to one emerging market, the value of UK FDI flows has the potential to rise by £23,000. Alternatively, creating

18 For this test we assume an average of 5 flights per week between the UK and each emerging economy.

a new route to one emerging market with existing average flight density has the ability to boost total UK FDI flows by £2.5 million. Creating a new route to all ten emerging markets a daily flight on each route has the potential to increase UK FDI flows by as much as £29.7 million.

Once again, we assume a scenario where the average number of flights between the UK and the emerging markets reaches parity with the average number of flights between the UK and the mature-trade economies. Our analysis suggests that the UK could benefit from a boost to total FDI flows of approximately £1.7 billion. Our approach assumes that the economies and trading conditions in the emerging markets continue to improve to resemble those of the mature-trade economies. As a result, our findings do not account for the other factors that influence investment.

Table 6: Potential boost to UK FDI (£) from scenarios involving additional flights, passengers and routes from the UK to emerging markets

Scenario	Potential boost to UK FDI
1 additional flight	**£4,000**
An additional 1,000 passengers	**£23,000**
1 additional route	**£2.51 million**
1 additional route and 1 daily flight	**£29.7 million**
Flights-parity with mature-trade markets	**£1.70 billion**

Source: Cebr analysis

We have not sought to produce a lower bound figure for FDI flows as the manner of producing the estimates above (driven off existing trade with the emerging markets) has resulted in what we deem to be reasonably conservative estimates that are not inconsistent with other studies.

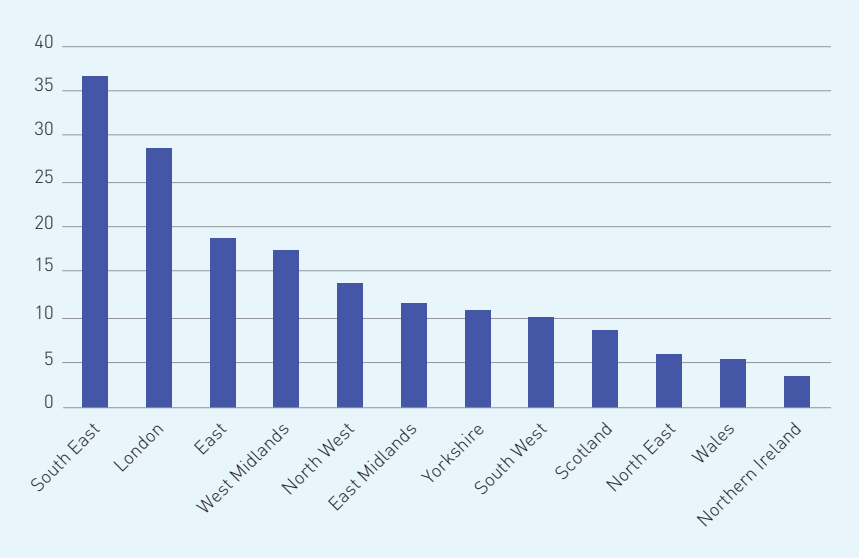
FIVE
The 'dither clock'

We use the analysis above to estimate the value of lost trade due to a lack of connectedness between the UK and the emerging markets. We consider this over the time period in which connectedness with emerging markets would grow if additional runway capacity were made available. To do this, we have calculated the value of additional trade that could be lost without new runway capacity up to 2030.

We estimate that if similar levels of connectivity could be achieved by the year 2030 at least, the total value of potential trade that the UK could gain from could reach approximately £170.6 billion (over the 18 year period, from 2012).

Given this, we estimate the total value of potential exports that the UK could gain from could reach a cumulative £63.6 billion over the 18 years to 2030. Based on current trends in regional trade, we estimate that the South East of England could be hurt the most, as the region could potentially lose out on approximately £36.6 billion of total trade over the 18 year period (Figure 28). London is also estimated to be heavily disadvantaged, losing out on roughly £28.6 billion of trade up to 2030. These, and the potential losses to the other regions of the UK, are illustrated in Figure 28 below.

Figure 28: The value of lost potential trade over the 18 year period, by region (£ billions)



Source: HMRC, Cebr analysis

To illustrate what this means by unit of time, we have produced the 'dither clock' shown in Table 7 and Table 8 below. This analysis suggests that the UK could be losing out on as much as £9.5 billion for each year that passes without runway capacity expansion. For every month that the level of air connectedness between the UK and the emerging markets remains under-developed, due to a lack of new runway capacity, the UK could be losing £790 million of trade, equivalent to approximately £182 million per week. On a daily basis, the loss is approximately £26 million worth of trade with the emerging markets group. This is equivalent to a loss of approximately £1.1 million per hour, or £18,000 per minute.

Table 7: The 'dither clock': the value of lost potential trade over time

Value of lost potential trade, £	Per unit of time
£9.5 billion	**Year**
£790 million	**Month**
£182 million	**Week**
£26 million	**Day**
£1.1 million	**Hour**
£18,000	**Minute**

Source: Cebr analysis

Narrowing the focus to exports only gives the 'dither clock' estimates shown in Table 8, which is based on the current ratio of exports to imports to the emerging markets group.

Table 8: The 'dither clock': the value of lost potential exports over time

Value of lost potential trade, £	Per unit of time
£3.5 billion	**Year**
£294 million	**Month**
£68.0 million	**Week**
£9.7 million	**Day**
£0.4 million	**Hour**
£6,700	**Minute**

Source: Cebr analysis

SIX
Conclusions

This report clearly demonstrates the links between aviation connectedness, trade and foreign direct investment. In doing so, it has provided illustrative figures on what could be sacrificed in terms of trade and FDI growth by delaying the runway capacity decision in London and the South East.

On this basis, the message is clear. The Government needs to get on with building a new runway in order not to stifle further growth in trade and FDI between the UK and the fast growing emerging market economies. Not doing so is, and will, ultimately be to the benefit of the UK's European competitors that have plenty of spare airport capacity at their key hub airports.

Without the new runway, the UK could be sacrificing a cumulative £63.6 billion in new export growth over the 18 years to 2030. This could amount to:

- An average of £3.5 billion of exports per annum;
- £294 million for every month that the UK does not have a new runway in London and the South East;
- £68.0 million for every further week of dithering; or
- £9.7 million per day.

On 7 September 2012, the Government announced its intention to create an independent commission, chaired by Sir Howard Davies, to identify and recommend options for maintaining the UK's status as a global aviation hub. In July 2015, the Airports Commission published its final report which set out its recommendations to government for expanding airport capacity in the UK. It narrowed down the potential solutions to three options at two airports - LHR and LGW - and recommended the new northwest runway option at LHR. However in December 2015 the Government delayed the decision as to whether a third runway could even be allowed at Heathrow until summer 2016, as a result of environmental concerns, following the vote to leave the EU the decision has now been further delayed until *at leas*t October 2016.

In response to political procrastination on the issue and in an attempt to help break the political deadlock, in September 2013 London First initiated the Let Britain Fly campaign. The aim of the campaign is to build cross-party political support to build new runway capacity. It is supported by a broad and wide strategic campaign coalition that includes business leaders, business organisations, trade and professional associations, trade unions, think tanks, academics and economists. This report provides objective evidence on which *Let Britain Fly* can draw to support the campaign's message.

Aviation plays a key role in facilitating international trade in both goods and services. It provides businesses with access and entry to new markets and enables them to better manage their supply chains, as well as enabling business travellers to meet new and existing clients. Given the government's initiatives around exporting for growth, aviation can provide businesses with important routes to market for their goods and services, supporting growth and employment in the UK and ensuring that the UK remains internationally competitive.

Aviation links provide businesses with a rapid, worldwide, transport network, and as such, it plays an important role in facilitating trade, particularly where speed of delivery is important. In addition, air freight is more sensitive to weight than other options of transportation, such as rail or sea. Therefore, it is smaller, lighter and higher value goods that are transported by air. To facilitate continued growth in the export of these high value goods in particular, as well as of high value-adding services, the Government must accelerate the decision-making process and get whatever site is chosen shovel-ready as soon as possible.

APPENDIX
Methodology

In undertaking the analysis presented in this report, we choose to adopt a panel data econometric modelling approach. This enabled us to account for information in our data that varies both over time and between countries. Furthermore, a panel data approach allows us to account for any relevant but unobservable or difficult to measure information in our data such as cultural links, regulatory frameworks and international agreements. Our data covers the time period 2002 to 2012 and the mature-trade economies defined in Section 3.1.

We conducted several statistical tests to confirm the relevance and robustness of our chosen model. The results of the Hausman test strongly confirmed our use a Random Effects panel data approach, in order to control for unobservable variables that vary over time but are constant between countries, and other unobservable variables that are constant over time but vary between countries. The Breusch-Pagan test confirmed the presence of random effects in our data.

In addition, several correlation tests were conducted to avoid any bias imposed by multicollinearity in the model. Due to the limited time series element of our model, autocorrelation tests were not conducted. Throughout our analysis we controlled for any presence of heteroscedasticity.

Following this, we estimate Equation 1 using STATA:

1. $$trade\ growth_{j,t} = \alpha + \beta_1\ product\ of\ routes, flights\ and\ passengers_{j,t} + u_{j,t}$$

Where $trade_{j,t}$ represents growth of total trade of goods and services between the UK and an individual mature-trade market j and time t. In addition α represents a constant over time and individual country, and β_1 represents the relationship between trade growth and our measure of connectedness between the UK and an individual mature-trade market j and time t: the product of routes, flights and passengers.

The results enable the identification of the contribution of additional flights, passengers and routes to total UK trade growth. By applying the results to observed trends in aviation connectivity between the UK and the mature-trade and emerging markets, the potential boost to UK trade from greater connectivity with emerging markets from increased airport capacity can be estimated.

We estimate that in any given year, a 10% increase in the product of flights, passengers and routes across the mature-trade

markets has the potential to increase UK trade by 1.2%. This result was highly statistically robust and thus confirmed the relationship between air links and trade. We used this relationship to quantify and examine the potential impacts on UK trade under various scenarios that boost the connectivity between UK and emerging markets, all other factors remaining equal.

Following a similar approach, using STATA, we estimate Equation 2 to identify the statistical relationship between growth in total (inward and outward) FDI flows and connectivity growth:

2. $$FDI\ flows\ growth_{j,t} = \alpha + \beta_1 product\ of\ routes, flights\ and\ passengers_{j,t} + u_{j,t}$$

We estimate that in any given year, a 10% increase in the product of flights, passengers and routes across the mature-trade markets have the potential to increase total UK FDI flows by 0.7%. We used this relationship to quantify the potential impacts to UK FDI flows under several scenarios that boost connectivity between the UK and emerging markets, all other factors remaining equal.

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The emergence of cargo airships: An opportunity for airports

Craig Neal a Post Graduate Research Student at UNSW Australia provides an overview of the potential impact of Cargo Airship Operations on Airports, and discusses the emergence of this technology in the near future and the opportunity it presents.

The Lockheed Marin P-791 demonstrator (Lockheed Martin)

An airship is an aircraft that utilises both aerodynamic and aerostatic lift (buoyancy through a lighter than air gas), the new old technology.

This technology predates traditional aircraft by 50 years and held the record for the longest single passenger flight for more than 47 years until the introduction of the Boeing 747SP in 1975.

The progression of the modern airship

When most people hear the word airship the name Hindenburg would most likely be the first thought that comes to mind, but it has now been over 80 years since the Hindenburg disaster, and airships, like other aircraft, have progressed significantly in technology. Airships may be perceived to be old technology, but the modern generation of airships employ some of the most advanced technology in the aeronautical and aerospace industries. These airships utilise modern technology such as material sciences in the form of light-weight polymers for the envelope and carbon fibre frames, vectored thrust propeller engines, and modern avionics.

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The best example of modern airship technology in operation are the Zeppelin NTs (operating with DZR and Goodyear, primarily for scenic flights and filming. Theses airships utilise modern technology to achieve a more cost effective, faster and safer operation than airships in the past, demonstrating the potential of the modern form of this mode of transportation.

Airships are unlikely to significantly challenge traditional heavier than air (HTA) aircraft for passenger operations, however they are well suited to the transportation of cargo with its reduced priority on speed and the airship's ability to offer a more cost effective service. Cargo airships are an emerging mode of freight transportation (designed specifically for the transportation and handling of freight) which have had many theorised designs and uses over the years, but now look to be finally emerging from the realms of theory into production in the near future, with Lockheed Martin's LMH-1 having signed letters of intent for 24 airships and production looking to start in early 2019 . There are many designs for cargo airships, however what has changed in recent years is that several manufacturers have now flown demonstration models and in the case of UK manufacturer Hybrid Air Vehicles the full sized demonstrator "Airlander" is currently the largest aircraft (by length) in the world.

The following Table 1, gives an idea of the scale of potential cargo airships vs one of the largest HTA cargo aircraft, the Boeing 747-8F.

Table 1- Airship designs vs B747-8F – a size comparison

Airship/Aircraft	**Zeppelin NT /Goodyear LZ N07-101**	**Aeroscraft ML866**	**Aeroscraft ML868**	**Hybrid Air Vehicles (HAV)- Airlander**	**Lockheed Martin LMH-1**	**B747-800F**
Status (Op- Operating/ Demo- Demonstrator only)	**Operational**	Demo	Design	Full size Demo	Demo	**Operational**
Length (m)	75.1	169	235	92	88.4	76.25
Width (m)	14.2	54	90	43.5	42.7	68.45

Height (m)	19.4	36.6	56	26	22	19.4
Static Lift (Kgs)	1,336	59,870	226,790	10,000	21,000	140,000
Cargo Bay Dim (M)	NA	67x12x9	115x19x14	NA	18x3x3	–
Cargo Bay Vol ()	NA	7,236	30,590	NA	162	736
Production Date	In production	Estimated 2019	Estimated 2022	Unknown	2019*	In production

* Lockheed Martin currently have letters of intent for 24 LMH-1's which should enter production in early 2019.

Why the emergence of cargo airships now?

The aviation industry is at an interesting turning point with:

- Advances in technology being integrated at a faster rate into every aspect of operations.
- The fast pace emergence of drone technology which is quickly branching out and gathering momentum in operations. Anyone can see the future of aviation is in remotely piloted and or semi/fully autonomous operations: it is a matter of time frames, not if it will happen.
- The renewed focus on the environmental impact of aviation operations due to increased awareness by companies and consumers.
- The ever continuous focus on mode efficiency (e.g. each subsequent aircraft design striving to increase fuel efficiency), however there is only so much incremental evolution that can occur before a revolutionary step change is required.
- The squeeze on infrastructure throughout the world, especially in aviation: will we be able to build airports at every desired location or will we have to consolidate

and focus on hubs and utilise secondary ports and other transport modes for further distribution of people and goods?

All these factors play into the strengths of cargo airships, as:

- Airships offer significantly more cost efficient operations (compared to both rotary and fixed wing aircraft) as the majority of their lift is provided by buoyancy as opposed to powered aerodynamic lift, therefore their fuel burn rates are significantly less.
- They have the potential ability to operate from a number of different bases (e.g. airports, sea ports, and other facilities) given their Vertical Take Off Landing (VTOL) capabilities and ability to land and operate at unprepared surfaces including on sand and water.
- Their potential to integrate effectively with other emerging technologies such as drones, to enhance the capability of both platforms and provide significantly more effective combined services such as search and rescue and disaster response and the warehousing of goods and distribution in high density areas (such as one concept proposed and patented by Amazon).
- Finally they have greater potential to undertake and for the acceptance of, remotely piloted or autonomous operations compared to traditional aircraft and to integrate further advances in environmental efficiency (e.g. integrating solar technology through spray on solar panels on the skin of an airship with batteries and electric diesel engines).

What impact will cargo airship operations have on airports?

Cargo airships will have the ability to operate from a variety of locations, however the most likely (due to regulatory concerns) initial base of operations is going to be traditional airport facilities. Most airport operators would be unfamiliar with airship operations unless they happen to be the very few with current operations such as Bodensee Airport Friedrichshafen in Southern Germany. Modern cargo airships are designed to integrate with existing airport infrastructure and will operate in a very similar way to current cargo aircraft (they will have similar ground handling requirements such as refuelling and cargo exchange) even with their VTOL capability.

The biggest challenge for airport operators will likely be apron space, especially when larger cargo airship models enter service in the next 5 -10 years. As can be seen from Table 1, the 226 tonne Aeroscraft ML868 is three times longer the Boeing 747-8F, which presents some significant apron parking issues. However like current aircraft, in order to maximise revenue generation they will need high utilisation rates and fast turnaround times, thus the time on apron will be minimised. Depending upon the design of the airship there also may be a requirement for a method to secure the airship when it is parked such as the mobile tower employed for the Zeppelin NTs, however some of the modern designs such as the Lockheed Martin LMH-1 and the Aeroscraft also employ active landing cushions, which upon landing engage with the surface to provide suction to maintain the airships position while parked.

Cargo airships, like HTA aircraft will require hangar space for maintenance and repair activities, with a similar scheduled requirement. However the glaringly obvious difference is the size of the space as can seen in Table 2 with some of the current airship hangar around the world being marvels all to themselves, due to their massive proportions and historical importance to the aviation industry.

Given the massive proportions of airship hangar it is very unlikely that new facilities will be built at major airports given the premium on space, and that new facilities (hangar and associated infrastructure) would be located at secondary airports with significantly more space and ability to integrate airship operations at the airport.

Table 2 Examples of operating airship hangars

Company	Airship	Location	Hangar Built Date	Size
Hybrid Air Vehicles	Airlander	Cardington Airfield U.K	1917	246m L x 55m W x 48m H
Lockheed Martin	LMH-1	Aridock Akron Ohio	1929	358m L x 99m W x 64m H

Aeros Corp	Aeroscraft	Tustin Marine Corps Air Station California	1942	327m L x 80m W x 59m H
DZR	Zeppelin NT	Friedrichshafen Germany		110m L x 69m W x 34m H
Goodyear	Zeppelin NT	Wingfoot Lake – Ohio	1917	244m L x 30m W x 27 H

Another notable airship hangar is the failed cargolifter hangar (Built November 2000- 360m L x 220m W x 106m H) located at the former Brand-Briesen Airfield in Germany.

Where are we likely to see cargo airship operations first?

The cost of cargo airship operations will fall somewhere in between current air and road transportation, with smaller models such as the LMH-1 being closer to traditional fixed wing air and larger models such as the Aeroscraft ML868 being closer to road transportation. What this means is that while cargo airships will still need to complete on price, they will be able to differentiate themselves based on their unique abilities (e.g. VTOL capability, ability to operated from unprepared surfaces, and much greater range than helicopters) and will likely initially target high cost operations such as those conducted for the mining, oil and gas industries. Based on reports of where the first operators (Straightline Aviation & Hybrid Air Freighters) of the Lockheed Martin LMH-1 will be deploying their airships we are likely to see them in Canada/Alaska and Africa first – this is consistent with targeting high cost operations into difficult or remote territory.

The opportunity for airport operators

Despite the likelihood of airships first emerging in specific high cost markets, there is still significant potential for cargo airships once established to transition into mainstream freight both domestically and internationally. There are designs for 500

tonne models, which would enable their operating costs to reduce significantly, approaching the cost of shipping. These much larger airships have the ability to revolutionise the way cargo is moved internationally, and potentially significantly increase the amount of cargo moved through airports to be closer to sea port volumes than traditional air cargo volumes.

For those airports where space isn't such a premium and where there are plans to develop cargo and intermodal freight facilities, the opportunity exists for these airports to plan and develop airport infrastructure to include cargo airships, and potentially their maintenance and training facilities as well.

Cargo airships are an example of one emerging aviation technology that has the potential to have a positive impact on airports via providing additional revenue through new/increased cargo volumes. Airports who have aspirations of becoming air cargo or intermodal freight hubs have the opportunity to become early advocates of this technology, and work with cargo airship operators to shape the future of this new mode of freight transportation. As this mode has the ability to compete with the other modes of road, sea and rail, as well as traditional air, it has the potential to be a cargo volume and economic multiplier for an airport through the attraction of new freight activities and associated business.

Thames Estuary 2050 Growth Commission

2050 Vision

June 2018

Thames Estuary 2050 Growth Commission

Sir John Armitt (Chair), Chairman, City & Guilds Group and National Express

Prof. Sadie Morgan (Deputy Chair), Director, dRMM Architects

Lord Norman Foster, Chairman and Founder, Foster + Partners

Prof. Alice Gast, President, Imperial College

Gregory Hodkinson, Chairman, Arup

Sir George Iacobescu, Chairman and Chief Executive, Canary Wharf Group

Sir Stuart Lipton, Partner, Lipton Rogers Developments LLP

Sir Edward Lister, Chairman, Homes England

Tony Pidgley, Group Chairman, Berkeley Group

Nick Roberts, President, Atkins

Geoffrey Spence, Infrastructure Finance Expert

Note: All figures quoted in this document are referenced in the accompanying Technical Document.

Foreword

The Thames Estuary flows from one of the world's greatest cities and passes through areas of extraordinary natural beauty. It stretches from the global financial centre at Canary Wharf past the country's busiest river crossing to world-class coastal wetlands.

The Thames Estuary area faces some real challenges, including significant pockets of deprivation. But we believe it has the potential to support growth across the country. Our vision reflects both the interconnectedness and the distinctiveness of the places that make up the Thames Estuary; a tapestry of productive places along a global river, generating an additional £190 billion GVA and 1.3 million new jobs by 2050. At least 1 million new homes will need to be delivered to support this growth.

The Thames Estuary 2050 Growth Commission was established in March 2016 to develop an ambitious vision and delivery plan for north Kent, south Essex and east London. We are honoured to have been given the opportunity to lead this vital piece of work, which began under Lord Heseltine's chairmanship.

We have carried out the work in close collaboration with our fellow Commissioners and in consultation with local partners. We ran a Call for Ideas from July to September 2016 and were overwhelmed by the response: there were over 100 respondents, including public, private and third sector organisations, and members of the public, all brimming with great ideas and ambitions for the Thames Estuary. We worked with our fellow Commissioners over the next few months to review these responses alongside supporting analysis on the area's key challenges and opportunities. From this, we began to crystallise our thinking on a 2050 Vision for the Thames Estuary, announcing our priorities in December 2017. The conclusions of this work are presented within this 2050 Vision.

Throughout this exciting journey, we took part in numerous visits to the Thames Estuary, including along the river itself, and met with a wide range of stakeholders. We would like to thank all those who have provided input and hosted visits. Your contributions have helped to bring our vision for this exciting area to life.

Sir John Armitt
Chair, Thames Estuary 2050 Growth Commission

Deputy Chair, Thames Estuary 2050 Growth Commission

The Case for Investment

The Thames Estuary is an area with great potential. It has sizeable economic power, a strong feeling of collaboration and a 'can do attitude' from London right out to the sea. The Estuary has an important brand and status, which makes a significant contribution to the UK economy and UK plc.

However, over the past few decades it has consistently been unable to deliver the same levels of economic growth as other parts of the UK. Whilst there are recent success stories, including Canary Wharf and the Thames Estuary's ports, the benefits of these pockets of growth have not necessarily been felt across the area. This has resulted in a large disparity in wealth and opportunity. The Thames Estuary partners want to work together to ensure that this is not an enduring problem.

The Thames Estuary has significant strengths: its proximity to London; international trade via its ports, strong universities, further education and research institutions; and availability of land to deliver high-quality homes. Yet, given its underperformance across a range of social and economic measures (see opposite), identifying what is needed to spread opportunity and growth is a complex task.

In order to answer this question, the Commission has interrogated what has not worked, and why. It has also sought to understand how the significant strengths in the area can be capitalised upon to make sure that economic growth is not reserved for some; rather it can have a lasting impact for existing and new businesses and residents across the area. It has done this through a detailed review of the existing context, engagement with stakeholders over the last two years and a review of existing and proposed projects.

The evidence gathered reaffirms the Commission's view that the 'business as usual' approach is not working. Without concerted action, there is a risk that the Thames Estuary will fail to achieve its potential, at huge opportunity cost to local communities and the national economy. By way of example since 2008, the Thames Estuary (outside London) grew more slowly than any of the other London corridors including, for example, the Thames Valley, London-Stansted-Cambridge corridor.

The Commission acknowledges that the area needs strong delivery and investment to make sure that, as other high growth corridors around London expand, the Thames Estuary is not left behind. The Thames Estuary has vast potential and could catch up with other London corridors that have outpaced UK growth. To do this it needs a clear vision and a focus on delivery.

This 2050 Vision sets out the key challenges and opportunities of the area, alongside future trends. It then presents a vision for the Thames Estuary and resulting recommendations and priorities which will be central to its delivery. This was informed by a review and prioritisation of existing and proposed projects. It concludes with a focus on the governance reforms and delivery models needed to realise the Commission's aspirations.

The Challenges

Scale of the area: The Thames Estuary is home to many boroughs, cities, towns and villages, which have their own distinctive characteristics. The diversity of the area, the natural barrier provided by the River Thames and the different functional economic areas mean that developing a singular 'vision' is challenging; it makes more sense to 'read' the area as a series of interconnected places.

Stimulating economic growth: The Kent and Essex parts of the area have struggled to keep pace with the scale of employment growth in east London. Between 2009 and 2016 east London employment grew by 27%, in comparison to the Thames Estuary average of 19% and the London average of 21%.

Low skills and education levels: There is a higher proportion of adults with no formal qualifications compared with the regional average across the Thames Estuary although this challenge is particularly acute in Essex. Relative to the London, South East and East regions, residents in the Thames Estuary are more likely to work in trade, sales or machine activities, which have historically been less highly skilled. This makes the area a less attractive location for employers seeking skilled and agile workers.

Entrenched deprivation: The area is characterised by a 'low wage' economy with limited connectivity to employment centres and a shortage of jobs and skills. The average weekly household income in the area is £800 before housing costs, which is below the combined average for London, South East and East of England at £885. Most settlements in the Thames Estuary therefore contain neighbourhoods with high levels of deprivation (in the top two deciles of the Index of Multiple Deprivation). The area also has higher levels of unemployment (5.3%) compared with the average for England (4.5%).

Delivering homes: The area needs to cater for population growth and demographic change. Whilst an increased number of planning permissions are being granted, this is not being reflected in delivery rates. Between 2012/2013 and 2014/2015, on average, fewer than 10,000 homes were built per annum against Local Plan targets of 19,495 per annum. Low land values, challenging site conditions and a limited number of house builders are all contributing to the delivery gap.

Limited mobility: Outside of London, the high speed railway network has been the focus of historic transport investment. Beyond this, access to affordable, high-quality public transport or active transport links is more limited between and within cities and towns. This is affecting access to jobs.

Environmental constraints: The Environment Agency estimates that the sea level will rise between 20cm and 90cm by 2100. Without intervention, this could affect up to 1.25 million people who live in the Thames tidal floodplain and 1,200 hectares of internally designated habitats. The Thames Estuary 2100 Plan is the Government's current strategy to adapt to the challenges of future sea level rise. The area also suffers from poor air quality, particularly near congested river crossing points.

Fragmented governance: There are 18 local authorities alongside the Greater London Authority, Kent and Essex County Councils and two development corporations in the area. The lack of coordinated governance structures makes strategic planning and prioritisation of interventions more difficult. This is in the context of significant funding gaps, particularly for infrastructure delivery.

The Future

Jobs: The Commission believes that up to 1.3 million new jobs could be created in the Thames Estuary by 2050. The Industrial Strategy identifies the pillars and priorities for national focus. The Thames Estuary, given its assets, is well placed to deliver against these priorities including boosting economic growth, increasing employment, skills and earning potential and delivering infrastructure to support jobs and homes. This supports the National Infrastructure Assessment which seeks to reduce congestion and carbon whilst increasing the capacity of the country's infrastructure.

Homes: A minimum of 1 million homes will be required to support economic growth in the Thames Estuary by 2050. This equates to 31,250 homes per annum. The Commission believes that the scale and pace of delivery will need to increase to meet this demand. In terms of the distribution of these homes, based on the Ministry of Housing, Communities and Local Government's standardised methodology for calculating housing need, around two thirds of these homes should be delivered in east London. The Commission believes that solely focusing on homes in London is unsustainable and that more of these homes should be provided in Kent and Essex.

Technology and innovation: Sectors and jobs could take a variety of forms in the future. The Commission believes that a skilled and agile workforce will be most able to respond to this uncertainty. Traditional sectors in the Thames Estuary, including ports, logistics and construction, must respond to automation and technical innovation by changing operating practices and the number and types of jobs required.

Economic resilience: The impacts of Brexit on economies are still uncertain and may require changes to the ports, logistics and aviation sectors. The Commission believes that the Thames Estuary can capitalise on the challenges and opportunities presented by Brexit, transforming the area and reducing pressure and reliance on London. This is reflected in the planned and on-going investment, for example, at the Port of Tilbury and London Gateway Port.

Environmental change: The Government's 25 Year Environment Plan sets out action to help the natural world regain and retain good health. It includes a number of policy areas which are relevant to the future of the Thames Estuary: using and managing land sustainably; recovering nature and enhancing landscapes; connecting people with the wider environment; and increasing resource efficiency and reducing pollution. The Commission believes the long view of the 2050 Vision provides an opportunity to embed these principles in the future of the area.

The River Thames is an iconic driver of economic activity. It has led to the rich tapestry of places, communities, landscapes and economies, which characterise the Estuary today. They contribute to the breadth of challenge and opportunity in the area.

The Opportunities

Strengthen existing sectors: The Commission believes that the area should continue to grow 'traditional' industries of freight, logistics and construction, capitalising on the five major ports and growing logistics and manufacturing sectors around them as well as the planned modular homes factories. The creative and cultural industries (spearheaded through the Thames Estuary Production Corridor) and medical sectors (e.g. medical instruments manufacturing at Southend-on-Sea) should also be supported.

Diversify sectoral mix: Locally distinctive sectors which capitalise on the area's assets should continue to be supported, whether they are existing or emerging sectors. The Commission believes this includes health, tourism, creative and cultural industries, agriculture and renewable energy and green technologies.

Utilise higher education institutions: The Commission believes that links between the South East Local Enterprise Partnership, institutions, employers and schools should be strengthened to maximise economic growth and provide pathways from school to employment. This includes building on the skills legacy from large infrastructure schemes in the area such as High Speed 1.

Prioritise infrastructure investment: There are over 327 infrastructure projects identified by local authorities to address existing constraints and/or support future growth in the area. The Commission believes that delivery of infrastructure will support delivery of homes and jobs. For example, the extension of Crossrail to Ebbsfleet could support up to 50,000 jobs and 55,000 new homes. Investment in and delivery of green infrastructure will also be key to securing good growth.

Improve intra-town connectivity: The Commission believes this should be achieved by making better use of existing capacity, and delivering currently planned road and rail infrastructure. Providing additional capacity within the transport network will reduce congestion and journey times. The delivery of transport hubs will provide opportunities for agglomeration and regeneration.

Integrate environmental assets: The Commission believes that the Thames Estuary area provides the long term solution to managing the impacts of sea level rise on London. If appropriately planned, opportunities including maximising flood attenuation and improving air quality should be pursued alongside provision of replacement habitats and improved access for recreation and leisure (as promoted by the Thames Estuary 2100 Plan).

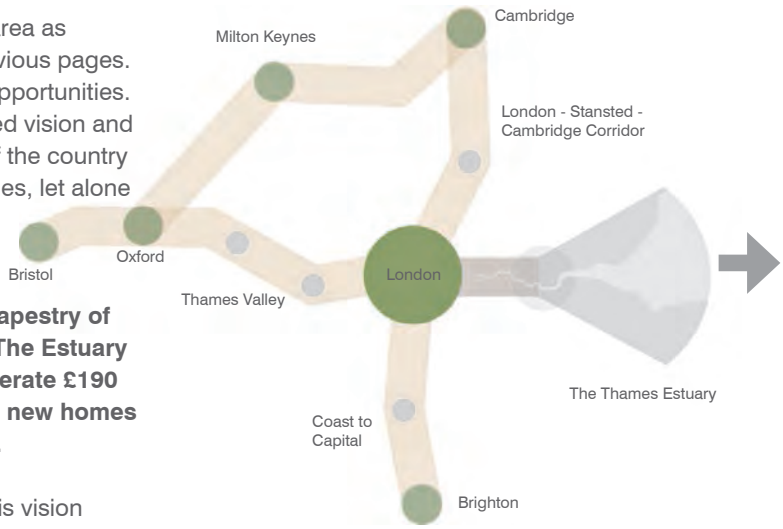
Realise planned development: There is an opportunity to deliver the homes (including affordable homes) and employment space that are needed to support demographic change and new jobs in the area. Homes and jobs should be delivered across the Thames Estuary to support the tapestry of places.

The Vision

From an underperforming river region to a tapestry of ‘productive places’ along a global river.

A lot of good work is already taking place in the Thames Estuary. Examples include public and private investment in the economy (e.g. Port of Tilbury and London Gateway Port), homes (e.g. through Ebbsfleet Development Corporation) and infrastructure (e.g. Lower Thames Crossing). The foundations to build on are strong.

There is significant latent potential in the area as illustrated through the analysis on the previous pages. There are also common challenges and opportunities. However, without a coherent and integrated vision and associated priorities, this important part of the country will not deliver ‘business as usual’ outcomes, let alone more ambitious ones.



By 2050, the Thames Estuary will be a tapestry of productive places along a global river. The Estuary will create 1.3 million new jobs and generate £190 billion additional GVA. At least 1 million new homes will be delivered to support this growth.

The Commission believes that realising this vision requires a change in thinking. The evidence shows that the Thames Estuary will not be successful when considered as a single functional economic area, single place or single community. It is a tapestry of interconnected but different economies, places and people, performing well in parts, but underperforming in others.

The Commission therefore recommends a different structure: a structure of five ‘productive places’, which are based on existing areas and their assets; with a clear vision for each area, a tight focus on priorities and stronger, streamlined governance.

In 2050, this tapestry of ‘productive places’ in the Thames Estuary will form part of the series of productive and connected places that ‘orbit’ London. Like Cambridge and Oxford, the ‘productive places’ of the Thames Estuary will be higher performing places, retaining their own distinct character and economic function.

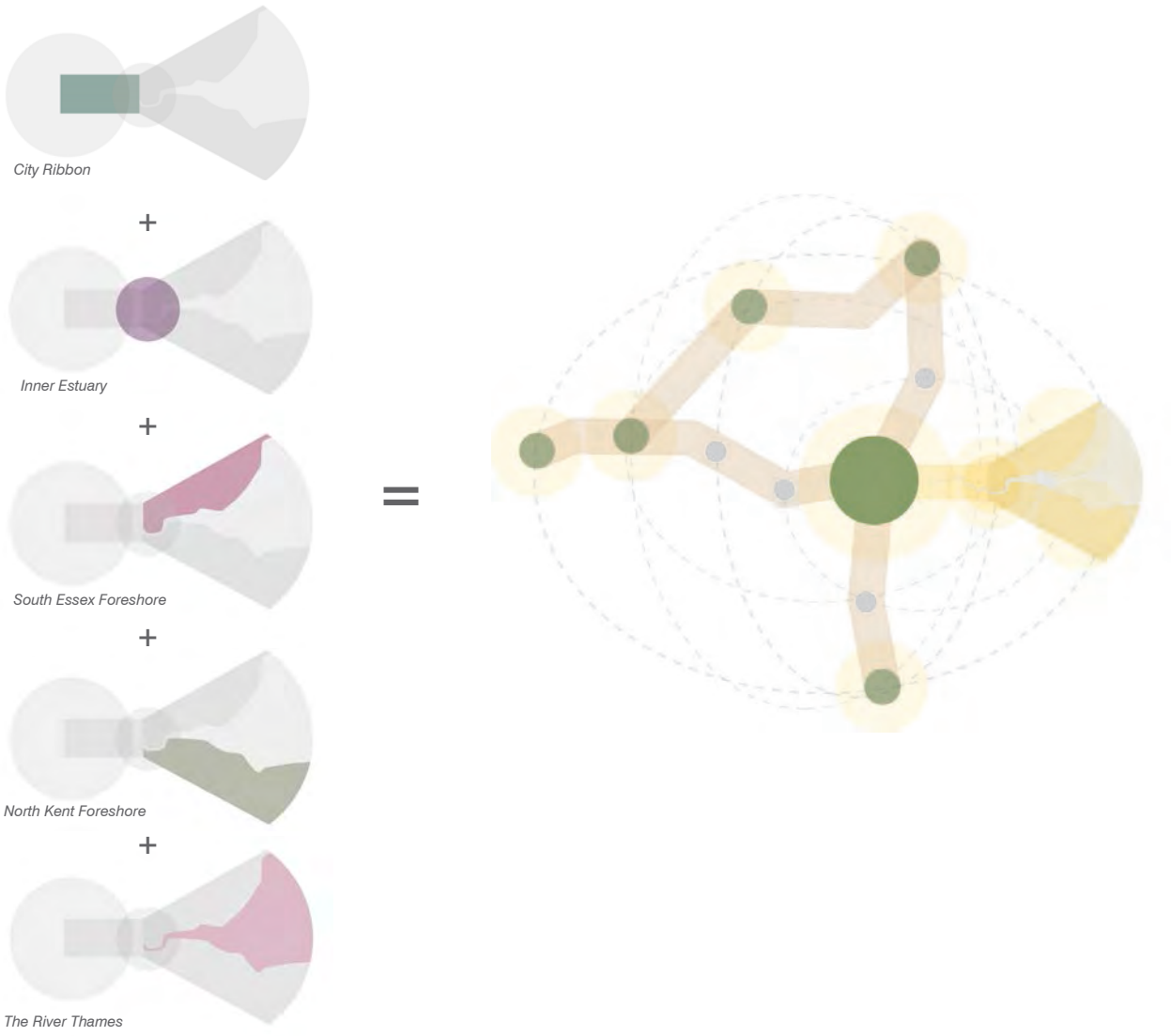
Thames Estuary Today

There is significant potential as an economic area, but there is not a clear economic or spatial framework to realise this potential in comparison to other successful corridors and cities around London like Cambridge, Oxford and Brighton. The current context is:

1.3 million jobs

£89 billion GVA

1.4 million homes



Five Productive Places

The different areas and characters of the Thames Estuary form into the proposition for five 'productive places'. Individually these places will be more productive and set up to deliver. Places will deliver the Commission's key priorities of:

Sectors

Connectivity and Communities

Delivery

Vision for Thames Estuary 2050

Each of the five places focuses on: developing strong and specific sectors, increasing skills, delivering homes and jobs at scale and pace, addressing the 'low wage economy', connecting to and enhancing natural assets and green infrastructure, and planning for long term and resilient development. This vision aims to deliver:

1.3 million new jobs

£190 billion* additional GVA

At least 1 million new homes

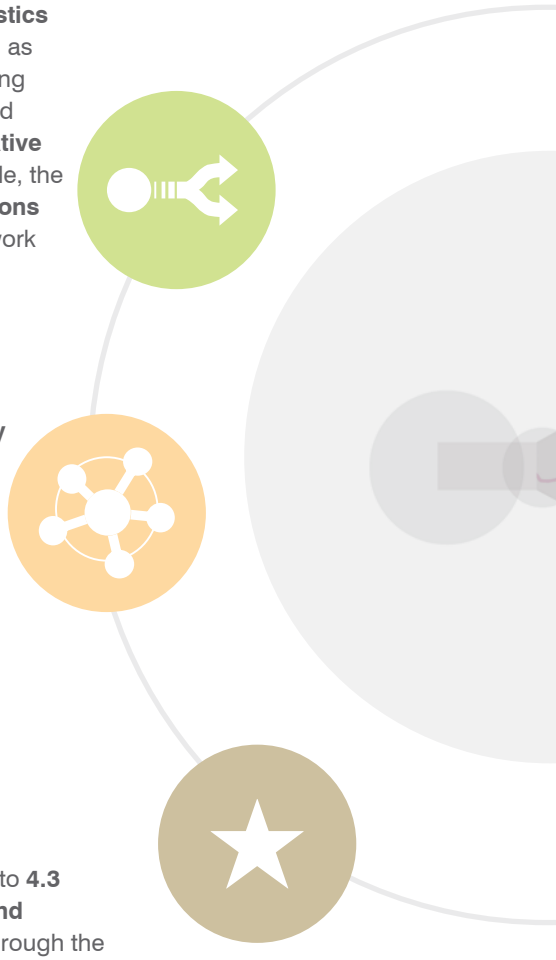
* assuming an annual average growth rate of 1.25% at current GVA per job

The Objectives

The Vision is underpinned by six objectives. They provide further direction on how the Thames Estuary can boost productivity, make a greater contribution to the UK economy and deliver a series of positive outcomes by 2050.

Productive Places

The places of the Thames Estuary will support the sustained growth of its high value, healthy wage sectors achieving up to **1.3 million new jobs by 2050**. Existing sectors will be strengthened including **freight and logistics** and **construction**, maximising opportunities from existing assets such as the **ports**. Emerging sectors will be nurtured including: **health**, reflecting the supercentre in Kent; niche heritage and wildlife **tourism** in Kent and Essex; and the Thames Estuary Production Corridor - a ribbon of **creative and cultural industries** along the River Thames. In part and as a whole, the places will harness entrepreneurial spirit, **strong educational institutions** and **unique natural assets** to create a distinctive and productive network of economies.

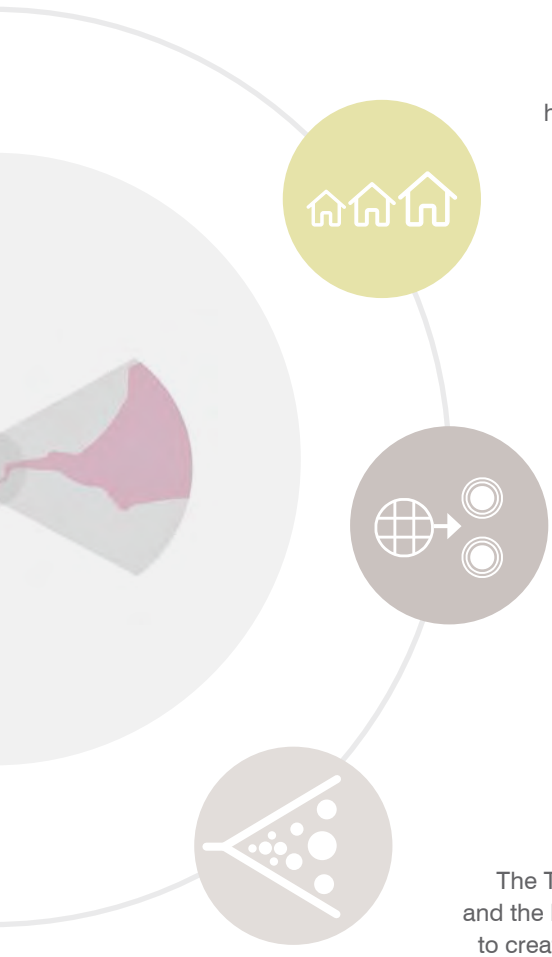


Connected Places

There will be **improved connections** between and within cities, towns, villages and industries be it for people or goods. This will support **improved productivity** through increased access to jobs and services. New and improved rail, bus, cycle and pedestrian links will reduce car dependency and increase the use of the area's **integrated public transport** systems. Completing the Thames Path will also improve connections for recreation for cyclists and pedestrians. The area will benefit from the highest level of **digital connectivity**, adopting the latest technological innovation. New **river crossings** such as the Lower Thames Crossing and Silvertown Tunnel will strengthen local and national links. New railway infrastructure including the extension of **Crossrail 1 to Ebbsfleet** and the **Thames East Line** will connect into the country's high speed network and complete the orbital railway around the Capital.

Thriving Places

The growing communities of the Thames Estuary, which will be home to **4.3 million people by 2035**, will pride themselves on their **rich cultural and economic activity**. Through **people-led projects** - in part delivered through the Thames Estuary Fund - each distinctive city, town and village will be the well-loved **heart of the community**. They will demonstrate the importance of good design and creating attractive places that work for the community. Improved **educational attainment** and **local skills** will **increase aspiration** and show that new job opportunities are for them. These thriving places will be **attractive to investors** and will celebrate their **individual sense of place** by offering bespoke opportunities to live, work, visit and play within the Thames Estuary setting.



Affordable Places

A further **1 million high-quality homes,** balanced to suit the affordable needs of the community, will be provided by 2050. They will offer a diversity of choice to all parts of the community, including **ageing populations**, and ensure that **supply keeps pace with demand**. The production of **statutory Joint Spatial Plans** will set out where these homes will be located and include tools, such as design review panels, to ensure high-quality development is delivered. **Healthy lifestyles** will be supported by the provision of new social places alongside integration with existing places and community networks. This will support **resilient communities** that respond to the needs of residents throughout their lives.

Adaptable Places

The many places and spaces in the Thames Estuary will adapt to the changing environment ensuring the people, economies and ecology of the area **thrive**. Infrastructure investment will be **integrated and multi-functional**, maximising the benefits to people, places, and ecology. This will assist in the creation of nearly **900 hectares of new habitat by 2100** to replace the 1,200 hectares lost to tidal flooding. Projects such as the completion of the Thames Path will provide **improved access to the natural environment**. The use of natural assets for recreation and economic activity will be balanced with their **protection and enhancement**.

Deliverable Places

The Thames Estuary will complete what it has started; delivering the homes and the balanced jobs it has planned, at the required **scale and pace**, in order to create thriving and affordable places. This will be achieved through robust, **locally-led governance** structures, which **build on existing** partnerships and bring together, as needed, the **18 local authorities**, plus the three upper tier authorities. The area will also be a space to try something - a place that **supports innovative models of delivery** be that through capitalising on Modern Methods of Construction (such as modular homes) or innovative models of public sector housing delivery. Across the many places of the Thames Estuary this will enable the **significant aspirations to become meaningful realities**.

City Ribbon

The area 'City Ribbon' includes the east London boroughs of Tower Hamlets, Newham, Barking and Dagenham, Havering, Lewisham, Bexley and Greenwich and the London Legacy Development Corporation.

The core strengths of this place include the **growing cultural and creative industries sector**, supported by the Mayor's Production Corridor, and significant projected **population growth**, which is collectively one of the **youngest on average in London**. This is allied to major regeneration programmes in areas including Barking Riverside and Thamesmead.

The challenges of the area include integrating and delivering **future connectivity** projects, including river crossings and the Crossrail 1 extension to Ebbsfleet, and ensuring this unlocks the delivery of **affordable housing**. The area suffers from some of the **highest levels of deprivation** in London with **high levels of unemployment** and **low skills**.

Within this context the Commission's vision for City Ribbon is:

Places which celebrate the skills and creativity of the area

City Ribbon will be a hub for production. Space will be created for start-ups and grow-on spaces for small and medium sized businesses. Communities will be connected by multiple public transport links and served by culturally rich town centres. Through the implementation of a multi-generational skills strategy, the area will connect the creative and cultural industries to a highly skilled workforce.

"Both banks of the Thames were rejuvenated. There are now large blocks of apartments where there were once derelict wharves. Shopping areas, apartments, public houses and walkways . . . The neighbourhood of the river is recovering its ancient exuberance and energy, and is reverting to its existence before the residents and houses were displaced by the building of the docks in the 19th century."

Peter Ackroyd, Sacred River

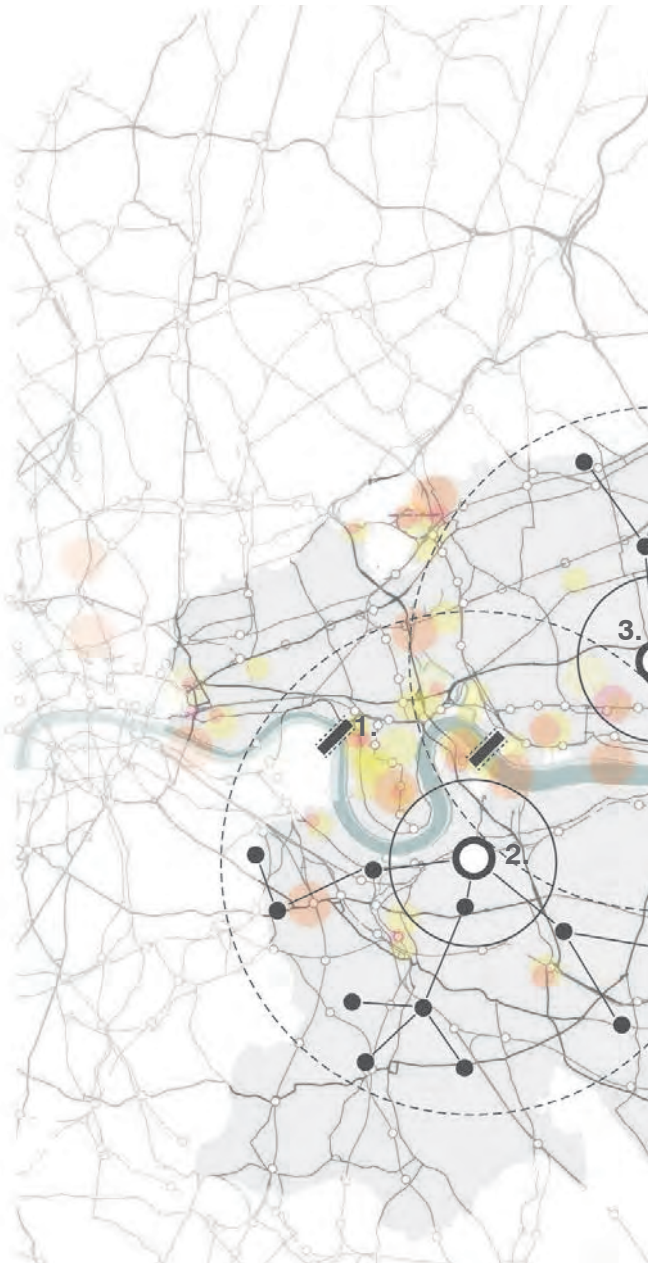
City Ribbon

Within City Ribbon, 196 infrastructure, skills and employment projects were subject to the prioritisation review. Some 139 projects were sifted out where they were either: a duplicate entry; there was insufficient information available on the project to meaningfully assess it; or because it represented 'business as usual' where it was considered that the project would not make a significant contribution to meeting the Commission's vision for the area. Of the remaining 57 projects, 88% contributed to connected places, 82% towards adaptable places and 70% to productive places. Half contributed to affordable places.

In addition, 209 large scale known and proposed employment and residential developments were identified. All the developments were categorised as 'business as usual'.

There is much already happening in City Ribbon, with existing delivery structures in place. However, the Commission believes there are opportunities to make more of what is planned to realise the aspirations for the area. The Commission's priorities are set out opposite.

Beyond these three priorities, there are other projects which the Commission supports and considers are central to its vision for City Ribbon being achieved. These include the expansion of City Airport, the continued growth of Canary Wharf, the delivery of Thamesmead which could provide up to 20,000 new homes - the largest regeneration project in Europe - and the extension of Crossrail 1 to Ebbsfleet. This project is discussed further in the Inner Estuary; within City Ribbon the project could help to accelerate delivery of 30,000 new homes in Bexley, directly unlocking 16,000 of these and support Canary Wharf's ambitious expansion, which is set to create up to 80,000 new jobs.



Commission's Priorities

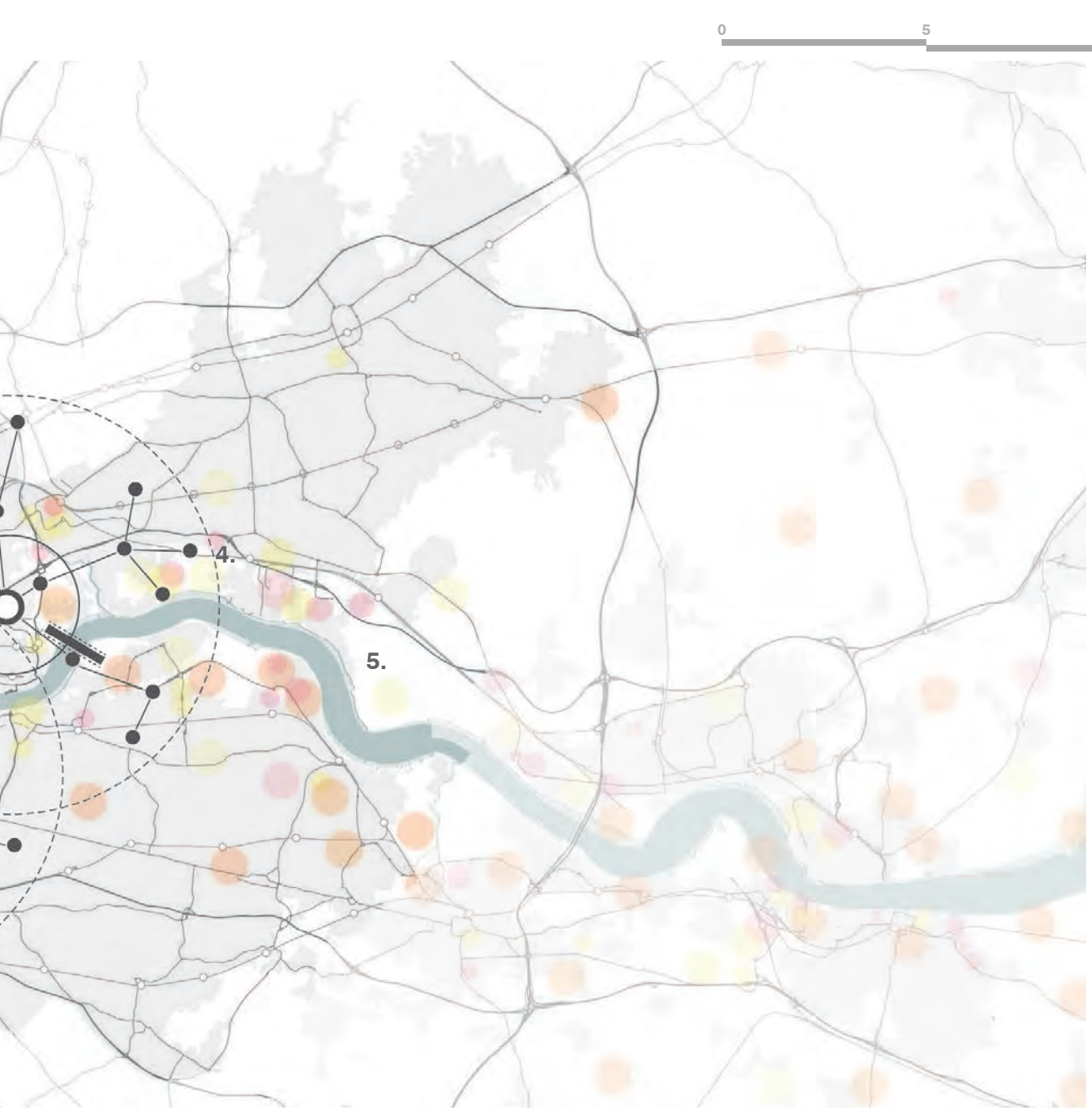
Accelerated Delivery Pilot

What: *Trial new delivery models to accelerate the scale and pace of delivery of homes and jobs in the Opportunity Areas within City Ribbon to bring forward the development stated in the London Plan by 2035. This could be done through housing delivery companies and the public sector acting as master developers.*

Why: *East London is a major focus for home and job growth. It should showcase how Government is delivering against the Industrial Strategy and need for new homes.*

How: *The Mayor of London, London boroughs and Homes England should work together to expedite delivery of jobs and homes. These organisations should make best use of existing powers, find solutions to current constraints such as borrowing caps and develop the skills and expertise to enable delivery.*

When*: Short term to bring forward stated delivery in 50% less time.*



New Thames Crossings

What: *Prioritise the planning and funding of river crossings. The Silvertown Tunnel and the DLR extension to Thamesmead should be operational by 2030. A third river crossing should be considered to facilitate homes and jobs.*

Why: *Poor accessibility limits the ability of the area to realise its full potential. New public transport and active travel crossings will unlock homes and jobs and contribute to place making.*

How: *The Mayor of London should deliver Silvertown Tunnel as quickly as possible. He should prioritise and bring forward the planning for public transport and active travel crossings.*

When*: Medium term delivery of the three crossings; short term priority planning.*

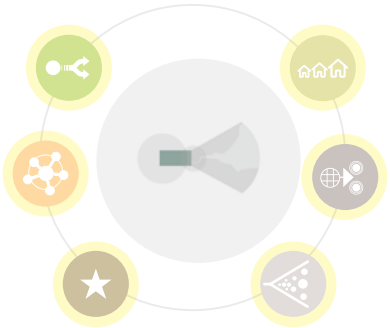
An Integrated Skills Strategy

What: *Implement a more targeted skills strategy that provides clear pathways to employment. It should support the area's existing and emerging economic sectors including the Production Corridor and the growing interest in the cultural and creative industries.*

Why: *Build on the success of the London Schools programme and be thought leaders for the Thames Estuary. The strategy should showcase how education and skills training can be used to address generational skills shortfalls and reduce levels of unemployment.*

How: *The Mayor of London should work with the boroughs, the Local Enterprise Partnership, employers and/or educational institutions to translate his Skills for Londoners strategy into a targeted plan for the area to ensure it meets current and future employer needs.*

When*: Quick win building off existing skills strategies including the Skills for Londoners Strategy and Place Making Institute.*



Inner Estuary

High performing dock infrastructure which creates opportunities for a wide range of sectors based in the surrounding community

The area 'Inner Estuary' includes Thurrock, Dartford and Gravesham Councils, and Ebbsfleet Development Corporation. The area has approximately **22km of Thames waterfront**.

The core strengths of this place are its **connectivity** (which supports a growing higher value logistics and freight sector, including the **£1 billion investment in the Port of Tilbury** and further investment in the London Gateway Port) and the planned growth of **new town centres** at Ebbsfleet, Bluewater and Lakeside. The place is also promoting innovation in construction through **Modern Methods of Construction** with a particular focus on modular housing construction.

The challenges for the area include the unresolved **approach to the Swanscombe Peninsula**, **air quality** issues as a result of congested **river crossings**, the **slow pace of delivery** at Ebbsfleet Garden City (where delivery of 15,000 planned homes has slowed and there is a lack of job creation), **poor education and skills attainment**, and the need to maximise the homes and jobs that could be unlocked through **infrastructure investment** including the Lower Thames Crossing and Crossrail 1 extension to Ebbsfleet.

Innovations in mobility and public transport will connect communities to the adjacent landscapes and diverse employment opportunities

Within this context the Commission's vision for the Inner Estuary is:

A thriving and higher value Port of Tilbury and London Gateway Port will create opportunities for an upskilled and aspirational population. Healthy town centres will be home to creative businesses and high achieving schools. The delivery of Ebbsfleet Garden City, including a new Medical Campus and integrated sustainable transport systems, will bring new homes and jobs to a unique river landscape.

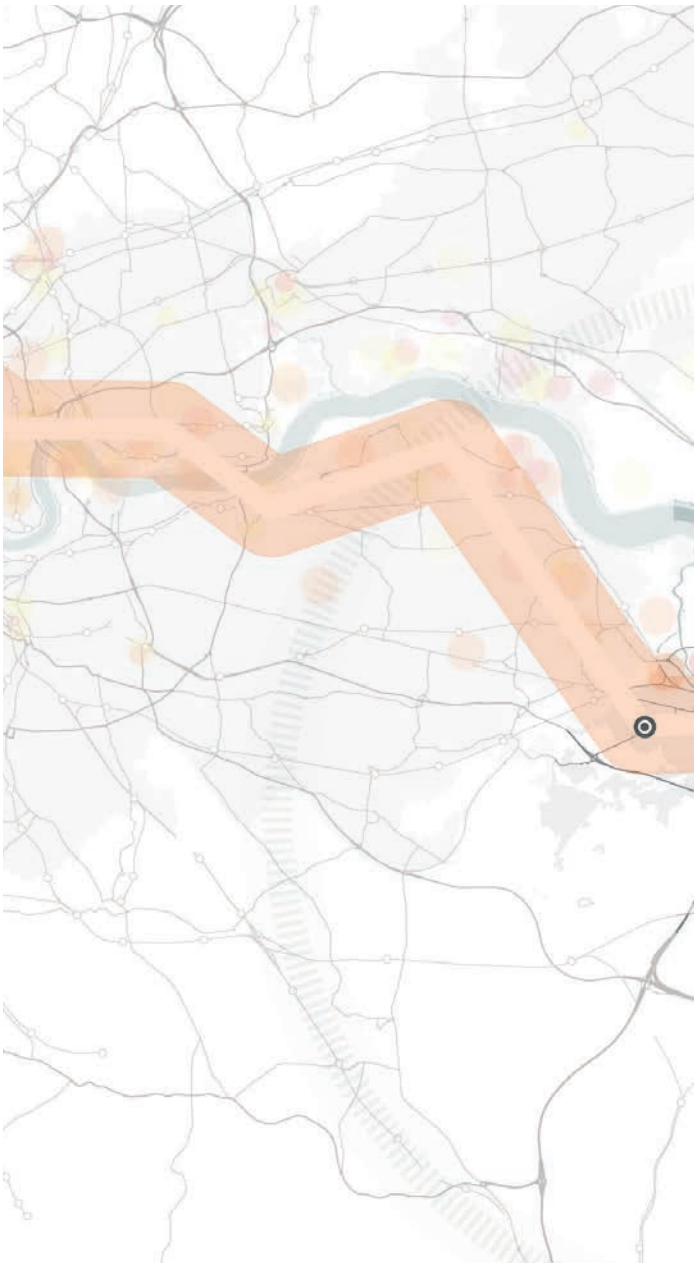
Public sector partnerships and businesses will deliver world leading technology

New skills focussed training will integrate with the work spaces to create thriving centres of medical excellence connected to open spaces that support healthy lifestyles

"A great future lies before Tilbury Docks... free of the trammels of the tide, easy of access, magnificent and desolate, they are already there, prepared to take and keep the biggest ships that float right upon the sea. They are worthy of the oldest river port in the world."

Joseph Conrad, The Mirror and the Sea

Inner Estuary



Within Inner Estuary, 109 infrastructure, skills and employment projects were subject to the prioritisation review. Some 73 projects were sifted out where they were either: a duplicate entry; there was insufficient information available on the project to meaningfully assess it; or because it represented 'business as usual' where it was considered that the project would not make a significant contribution to meeting the Commission's vision for the area. Of the remaining 369 projects, almost 64% contributed to productive places and 58% to connected places. Around a third of the projects contributed to each of the affordable, thriving and adaptable places.

In addition, 58 large scale known and proposed employment and residential developments were identified. All of the developments were categorised as 'business as usual'.

The Commission believes there is the potential to increase the scale and pace of delivery through some transformative projects; these priorities are set out opposite.

Beyond the three priorities, there are other projects which the Commission considers central to achieving its aspirations for the Inner Estuary. This includes resolving the proposals for the Swanscombe Peninsula. The Commission encourages the promoters of the London Resort to submit a Development Consent Order application for the proposal as soon as possible. Should an application not be submitted by the end of 2018, the Government should consider all the options for resolving the uncertainty this scheme is creating for the delivery of the wider Ebbsfleet Garden City.

The Commission is supportive of the proposals for the Lower Thames Crossing. However, in order to future-proof the proposed crossing, the Commission believes that the design should, as a minimum, not preclude the future delivery of infrastructure to support rail transport links and/or autonomous vehicles. Highways England should also work with the relevant local authorities to ensure that the design and location of the crossing and connector roads minimise impact on traffic flows, unlock jobs and homes growth in the surrounding area.

Commission's Priorities

Extension of Crossrail 1

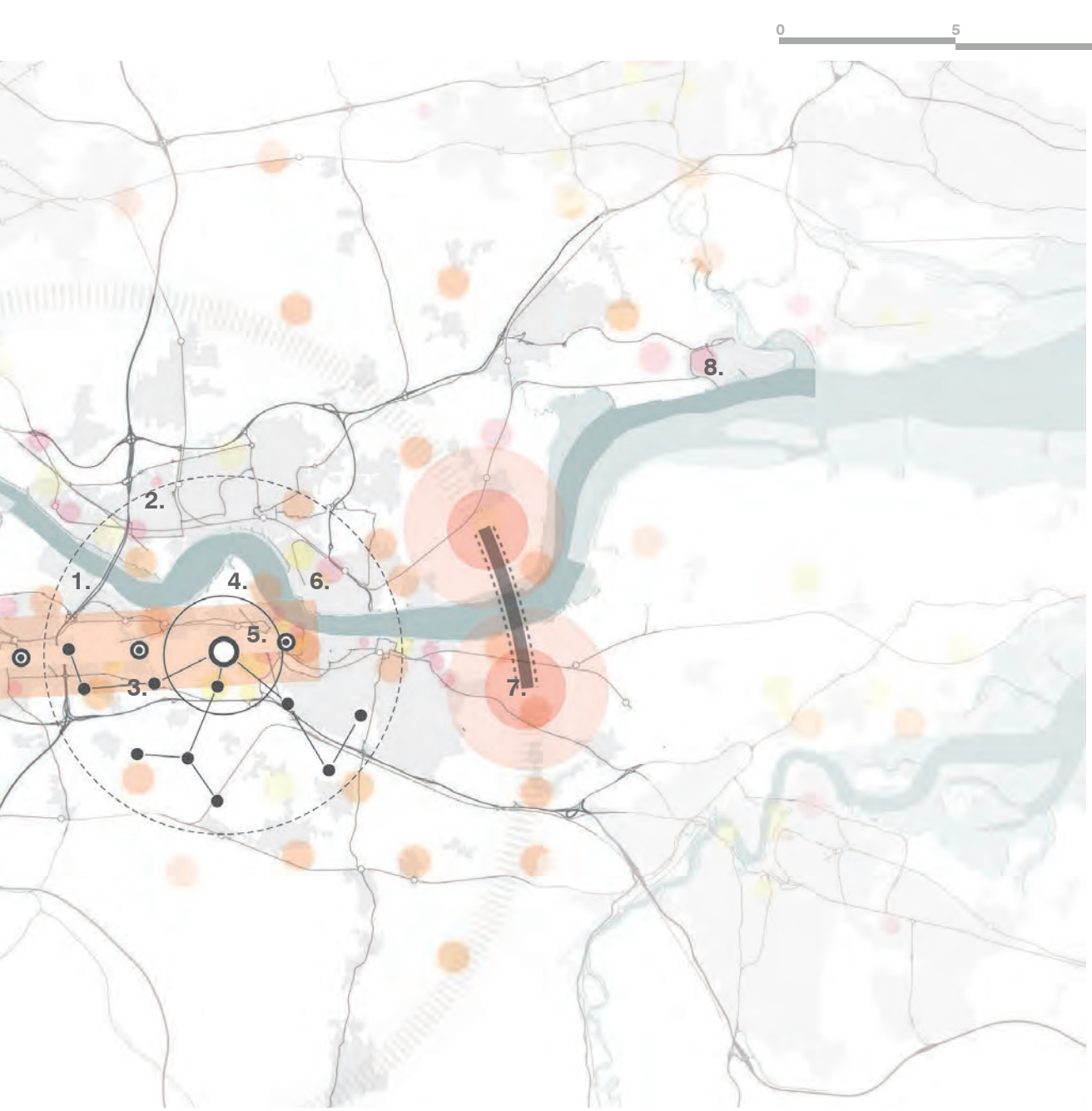
Crossrail ©

What: *Deliver an extension to Crossrail 1 from Abbey Wood to Ebbsfleet.*

Why: *The project could help to unlock 55,000 new homes, up to 50,000 new jobs and uplift skills and education by increasing rail capacity and creating new connections between economic hubs. This would need to go ahead in conjunction with upgrading supporting junctions. Key growth areas include Dartford town centre, Ebbsfleet Garden City and Swanscombe Peninsula.*

How: *Government should provide funding for the expected £20m cost of the next phase of project development. This would enable the detailed engineering, design, land and financial modelling and legal framework to be progressed.*

When*: Medium term delivery of the railway (by 2029); quick win to provide funding for the next phase of project development.*



Transport Innovation Zone

What: *Create a Transport Innovation Zone which promotes clean technology in transportation, logistics and data systems and unlocks housing opportunities with new means of public transport.*

Why: *The area forms part of the national road network for freight movements, and has a high density of tech and digital logistic usage. Also, due to the volume of traffic using its crossings and associated congestion, it suffers from significant air quality issues.*

How*: Government should incentivise research and development into sustainable travel and related digital technologies where it supports 'clean' movement.*

When: *Quick win to establish the governance arrangements and associated incentives for the Zone.*

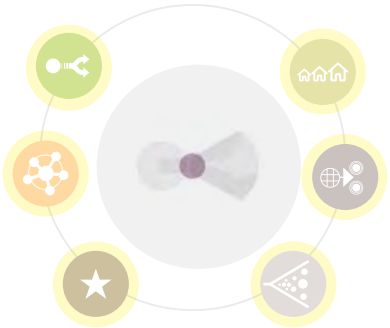
Medical Campus

What: *Expedite the delivery of the Medical Campus at Ebbsfleet.*

Why: *Delivery of jobs at Ebbsfleet Garden City has been slower than planned. To make the area more attractive to the market, the delivery of the Medical Campus will provide an anchor employment institution.*

How: *Government should work with Kings College London to deliver the Medical Campus.*

When*: Short term (delivery by 2022).*



South Essex Foreshore

The area 'South Essex Foreshore' includes Basildon, Castle Point, Southend-on-Sea and Rochford Councils. Southend-on-Sea and Basildon are the major centres of a string of towns to the north of Canvey Island and the marshes around Hadleigh Ray and Holehaven Creek.

The core strengths of this place include the established and coordinated voice of **Opportunity South Essex**, the **unique wetland habitats** of the river edge and the emerging **cultural sectors** and medical and aviation related **advanced manufacturing in Southend-on-Sea**. The challenges of the area include **poorly performing town centres**, **slow speeds of delivery** linked to limited clarity on priorities across the area, and a **skills and jobs mismatch** between the primary employers and the majority of the workforce. In the future, the threat from **sea level rise** will require major investment in integrated flood defences.

Within this context the Commission's vision for South Essex Foreshore is:

Local Investment in the public realm of High Streets including child friendly spaces

The rich patchwork of places which form the South Essex Foreshore will be celebrated. Empowered by a statutory Joint Spatial Plan the area will go beyond 'business as usual'. Locally driven town centre transformation will help create lively places that people choose to work, live, learn and play in. These policies and local initiatives will see development unlocked, post-industrial landscapes restored, and the filling of empty business spaces to create a thriving and creative economy.

Innovative delivery models for affordable housing and workspace in town centre environments

Continued support for local culture and creative enterprises

Continued support for distinctive 'Essex' architecture in housing design

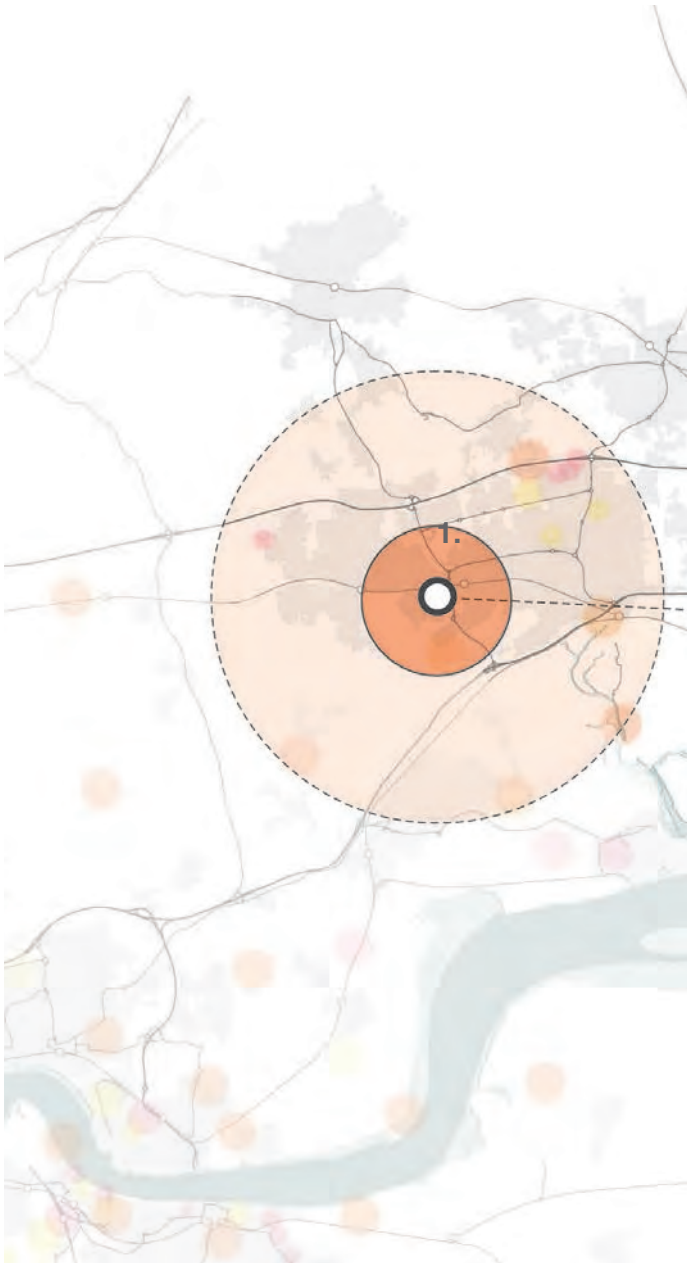
Strong connections to Southend Airport to add value / skills to local centres

Protection of, and increased access to, unique foreshore landscapes through partnership

"What we've seen over the past 10 years is this huge burgeoning of the artistic scene in Southend...You've got a lot of creative people coming out of London and looking for new, affordable spots. Southend has such an opportunity to be a thriving place for the creative industries, but you need that underlying structure to support it. This is only the starting point."

Joe Hill, Focal Point Gallery

South Essex Foreshore



Within the South Essex Foreshore area, 119 infrastructure, skills and employment projects were subject to the prioritisation review. Some 56 projects were sifted out where they were either: a duplicate entry; there was insufficient information available on the project to meaningfully assess it; or because it represented 'business as usual' where it was considered that the project would not make a significant contribution to meeting the Commission's vision for the area. Of the remaining 63 projects, around 71% contributed to productive places, with 49% contributing to connected places and 46% contributing to affordable places.

In addition, 35 large scale known and proposed employment and residential developments were identified. All of the developments were categorised as 'business as usual'.

There is a large number of identified local and strategic projects throughout South Essex Foreshore. The Commission believes that these projects can be better coordinated and prioritised to maximise their impact. The Commission therefore supports the work already being undertaken by local authorities on a Joint Spatial Plan and believes it should have a statutory footing. In completing the Plan, the local authorities should continue to work with other authorities within the Housing Market Area/neighbouring areas, Essex County Council and Opportunity South Essex to produce an integrated strategy for delivering and funding high-quality homes, employment, transport and other infrastructure. The Plan should also be ambitious - going above the minimum housing numbers set by Government - to attract substantial infrastructure investment from Government.

The Commission also supports a number of related initiatives, which are central to achieving its vision for the area. Firstly, local authorities should explore what support can be provided to SMEs, financial or otherwise, to help bring forward needed new employment space. Secondly, planned railway improvements, particularly around Southend-on-Sea and London Southend Airport, should be delivered to increase capacity. Lastly, road, rail and relevant local authorities should work together to minimise conflict between goods and people on the transport network, with the aim of increasing road capacity/number of services on existing railway lines.

Beyond these projects, the Commission has identified three other priorities.

Commission's Priorities

SE Foreshore Fund

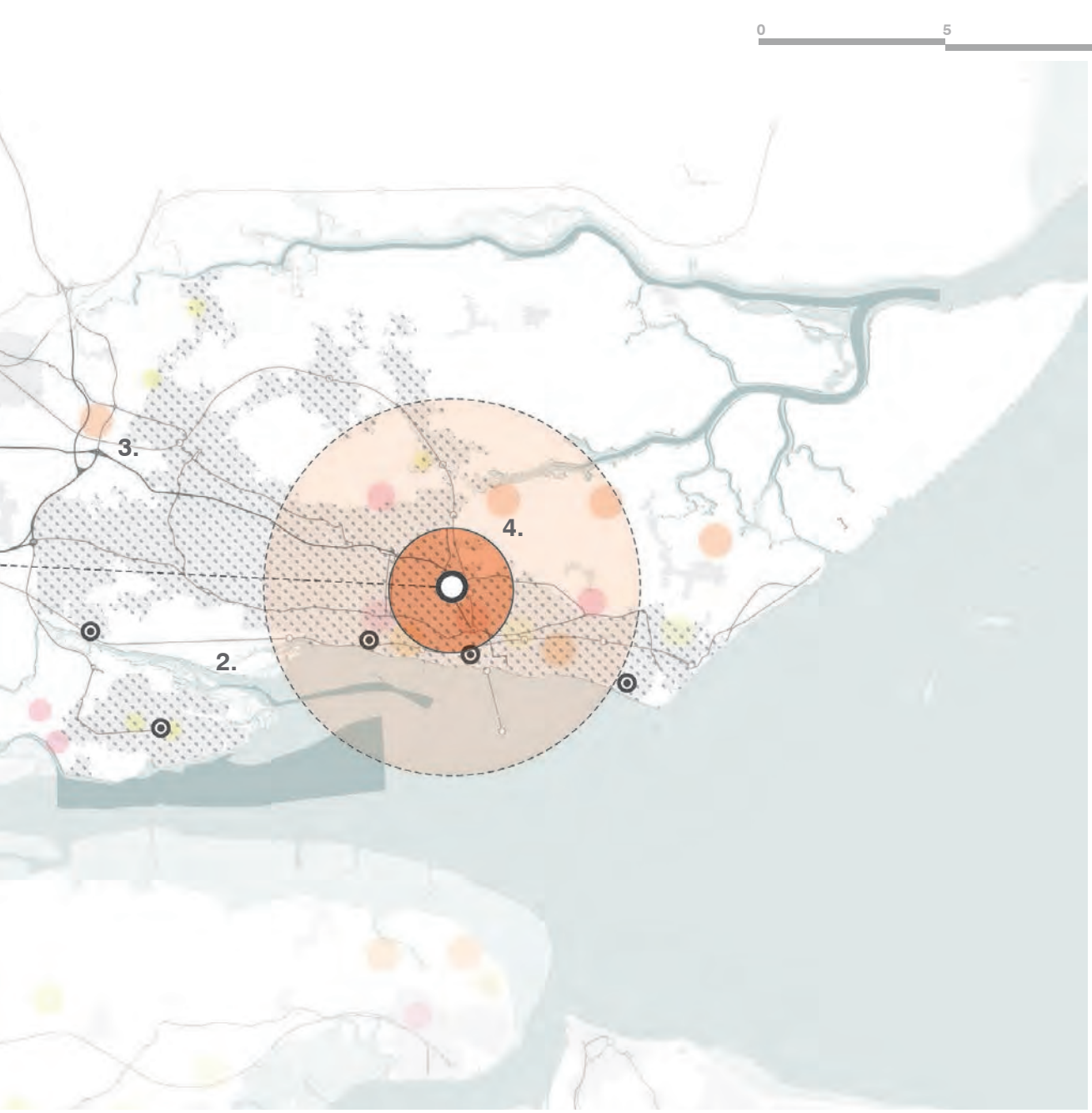
Rose Street Market ©

What: *Create a fund which local authorities and local communities can bid for. Projects should support town centre regeneration and/or community development.*

Why: *Give local communities and organisations the opportunity to direct investment where it is most needed to support local aspirations and town centre regeneration.*

How: *Government to make available a £20 million fund and provide support to the four local authorities and local communities in their funding bids.*

When*: Quick win for first raft of funding in 2019.*



SEC Relocation


South Essex College ©

What: *Expedite the relocation of the South Essex College's Nethermayne campus to Basildon town centre.*

Why: *This site is central to the Council's aspirations for redevelopment of Basildon town centre. It provides the opportunity to introduce new courses which align with the needs of local employers and sectors and address lower education and skills levels in the area across multiple generations.*

How: *Basildon Council and Essex County Council should work with South Essex College to deliver the re-location.*

When*: Short term (delivery by 2022).*

Institute for Resilient Infrastructure


Purdue University ©

What: *Establish a centre for the research, design and funding and financing of integrated infrastructure to address contemporary and future city challenges.*

Why: *The Institute needs to be up and running to ensure the Thames Estuary has the skills and knowledge needed to design and deliver key infrastructure such as the second Thames Barrier. It will also identify delivery and governance models that can enable strategic infrastructure to be funded by the private sector.*

How: *Government to approach existing institutions to identify interest. If possible, Government should explore the potential for collaboration with private sector education and technology leaders to provide teaching and skills development training space.*

When*: Short term delivery (by 2024); Quick win to approach existing institutions.*

North Kent Foreshore

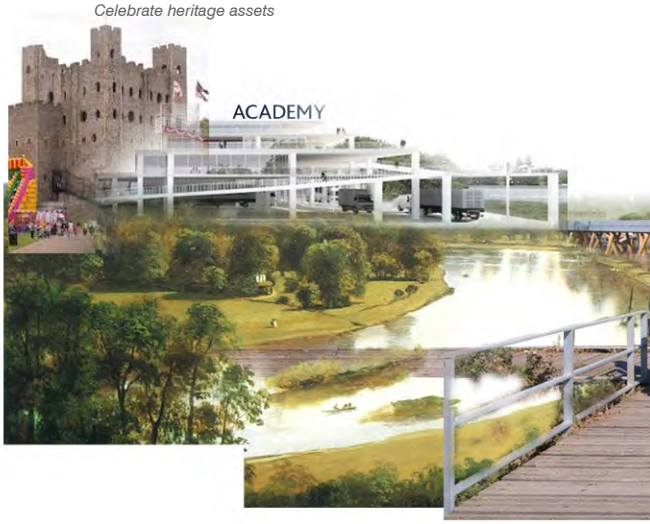
The area 'North Kent Foreshore' includes Medway, Swale, Canterbury and Thanet Councils. It is a rich and diverse area formed by the **ancient Medway Towns**, and the settlements that stretch along the Roman **'Wattling Way**' between Sittingbourne, Canterbury and the arc of distinctive coastal places between Whitstable and Ramsgate.

The strengths of this place include its **universities** which together form an emerging **medical research corridor** connecting the Francis Crick Institute through Chatham to Canterbury. The historic assets of the area's cities are matched by **productive agricultural landscapes** which spread out between them, both of which provide opportunities for continued growth of niche tourism.

The challenges of the area include the connection between the **skills** needs of employers and the education and skills training available to the community. The area also has a high level of **'digital deprivation'** which is seen to stymie start-up and SME growth in the digital industries.

Within this context the Commission's vision for North Kent Foreshore is:

Celebrate heritage assets



Improved and managed access to unique wetland landscapes

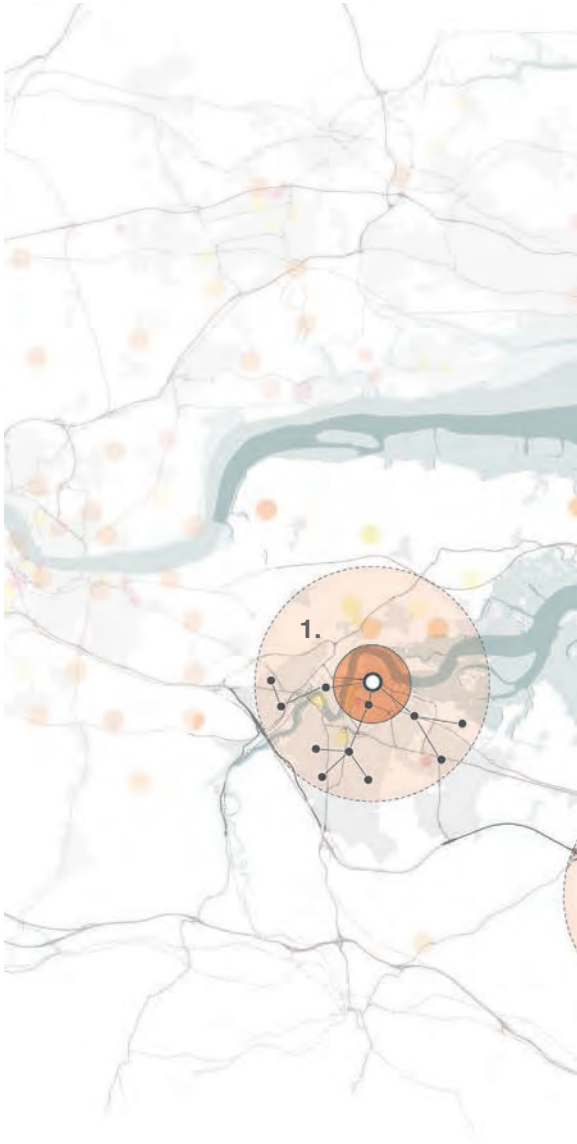
At the heart of a new medical research corridor, North Kent Foreshore will be home to a supercentre of health and wellbeing. Through a statutory Joint Spatial Plan, and strong connections between local government and business, the area will balance delivering growth in the health sector with new jobs, new homes, a renewed focus on skills, and high-quality town centres set around world-class heritage and natural assets.

Increased access to landscape as part of strong links between nature, agriculture, health innovation and wellbeing

"The Thames Estuary is an edgeland - not quite river, not quite the open sea. It is an in-between place, a place of transition, a welcoming gateway, a corridor of trade, the front line for the defence of the realm and a gradual opening into the rest of the world."

Colette Bailey, Artist Director of Metal

North Kent Foreshore



Within the North Kent Foreshore area, 152 infrastructure, skills and employment projects were subject to the prioritisation review. Some 67 projects were sifted out where they were either: a duplicate entry; there was insufficient information available on the project to meaningfully assess it; or because it represented 'business as usual' where it was considered that the project would not make a significant contribution to meeting the Commission's vision for the area. Of the remaining 85 projects around 80% contributed to productive places, 75% to connected places and 42% to affordable places.

In addition, 54 large scale known and proposed employment and residential developments were identified. All of the developments were categorised 'business as usual'.

There are significant opportunities for growth and development in North Kent Foreshore. The Commission believes that further work is needed to coordinate initiatives already underway and to propose new initiatives to optimise the potential outcomes. This should be achieved through a statutory Joint Spatial Plan led by the local authorities, with the participation of other authorities within the Housing Market Area/ neighbouring areas, Kent County Council and Thames Gateway Kent Partnership to produce an integrated strategy for delivering and funding high-quality homes, employment, transport and other infrastructure. The Plan should also be ambitious - going above the minimum housing numbers set by Government - to attract substantial infrastructure investment from Government.

The Commission also supports the following related initiatives, which are central to achieving its vision for the area: local authorities should explore what financial and other support can be provided to SMEs to help them bring forward needed employment floorspace; planned railway improvements particularly around Canterbury should be delivered to increase capacity; and road and rail authorities should work together (with local authorities where relevant) to minimise conflict between goods and people with the aim of increasing road capacity/number of services on existing railway lines.

Beyond these projects, the Commission has identified three other priorities. These are set out opposite.

Commission's Priorities

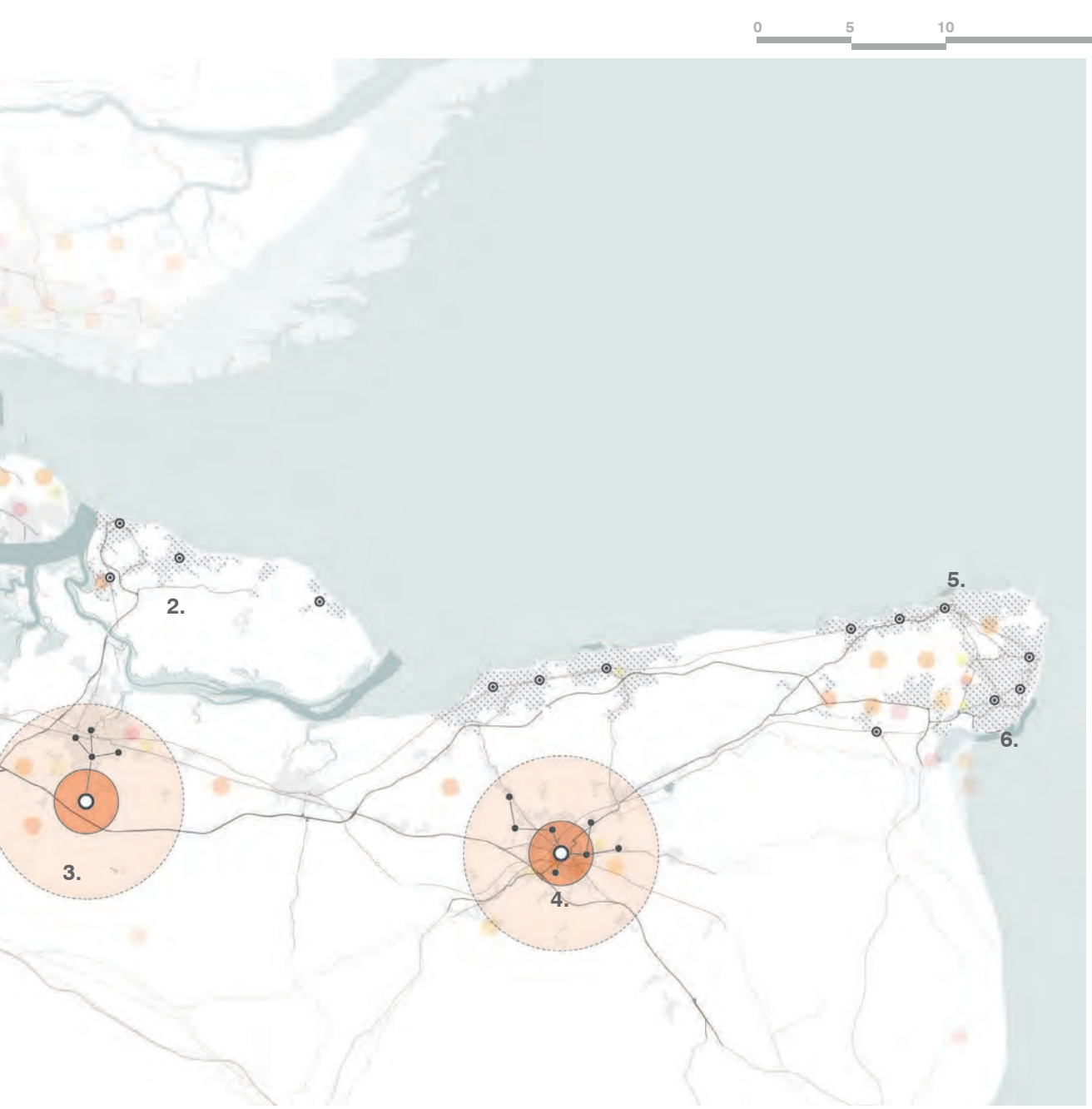
NK Foreshore Fund

What: *Create a fund which local authorities and local communities can bid for. Projects should support town centre regeneration and/or community development.*

Why: *Give local communities and organisations the opportunity to direct investment where it is most needed to support local aspirations and town centre regeneration.*

How: *Government to make available a £20 million fund and provide support to the four local authorities and local communities in their funding bids.*

When*: Quick win for first raft of funding in 2019.*



Education and Skills

What: *Implement a more targeted skills strategy with employers and educational institutions that provides clear pathways to employment that support the area's existing and growing economic sectors.*

Why: *The 30 year vision allows this project to address generational skills shortfalls. It will improve educational attainment and skills in the area, across multiple age groups, therefore reducing levels of unemployment.*

How: *Kent County Council should work with the local authorities, the Local Enterprise Partnership, employers and/or educational institutions to develop a targeted plan for the area, which meets current and future employer needs.*

When*: Quick win building off existing skills strategies in place.*

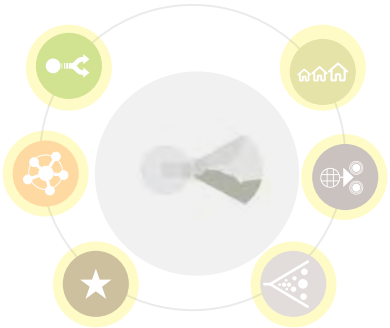
Health Supercentre

What: *Develop the new health and medical facilities at Canterbury to provide the eastern anchor to the supercentre.*

Why: *This project will act as a catalyst to the health supercentre building on the emerging health sector, cluster of academic institutions and transport connections in the area to increase productivity and jobs in the area.*

How: *Universities should be supported by Government and work closely with local communities to deliver promised facilities, to boost medical research and services while supporting workforce retention.*

When*: Short term delivery of facilities (by 2023).*



The River Thames

The River Thames is the **ancient heart** of the places of the Thames Estuary. It is a **global river** - connecting the Capital and five of the UK's largest ports to the rest of the world.

The strengths of the river remain its **strategic role** as a gateway to UK trade and industry and a vital and **flexible** component of the national infrastructure strategy. This is **balanced** by its **unique natural qualities** of ecology, habitat and landscape, which have long inspired the area's cultural and creative industries. The River Thames defines the quality of place of the cities, settlements and deep 'foreshores' which line it.

One of the challenges to the River Thames supporting the growth of the area is its **fragmented governance.** The multiple agencies (including the Environment Agency, Natural England, Port of London Authority, Marine Management Organisation) and private agendas prevent integrated solutions to some of the river's key challenges. **New crossings** will require careful integration, and the mitigation of sea level rise with **multi-functional defences**, which protect people and infrastructure from flooding will require new and innovative ways of working. Improving **water quality** and increased use of the river for **aquaculture** and **leisure** will enable the river to play a key role in the area's sustained growth.

Within this context the Commission's vision for the River Thames is:

Accessible banks / Thames Path

Innovative agriculture

A continuous Thames Path - celebrating the diversity of the River along its length

The river's ebb and flow will continue to connect the Foreshores, Inner Estuary and City Ribbon. Its multi-functionality will continue to evolve, from freight to fishing and from beach to boardroom - constantly emphasising the value of the river to its surrounding places and ensuring that the current level of flood protection is maintained. Its vital contribution to economic and social prosperity will place it at the heart of Thames Estuary 2050.

Centre for future logistics - connecting the assets of the river to local skills and local jobs

Continued investment in culture and programming of the River and its connected communities

"The River Thames is ancient; older than England, older than humanity, even older than the British Isles themselves. Its life cycle operates on a geological timescale. The river is almost a living being, writhing sinuously across its flood plain, eroding its banks and altering its channel, constantly changing."

Andrew Sargent, The Story of the Thames

The River Thames

Within the River Thames, 25 infrastructure, skills and employment projects were subject to the prioritisation review. Some 15 projects were sifted out where they were either: a duplicate entry; there was insufficient information available on the project to meaningfully assess it; or because it represented 'business as usual' where it was considered that the project would not make a significant contribution to meeting the Commission's vision for the area. Of the remaining 10 projects, 80% contributed to adaptable places and 70% contributed to connected places. This reflects that the projects largely focus on environmental improvements associated with flood defences and increasing access to the river.

No large scale known and proposed employment and residential developments were identified.

The Commission believes the River Thames can be a catalyst for growth and change in the four other 'productive places'. In order to do so it must be well used and well-loved. Three priorities have been identified to achieve this.

Commission's Priorities

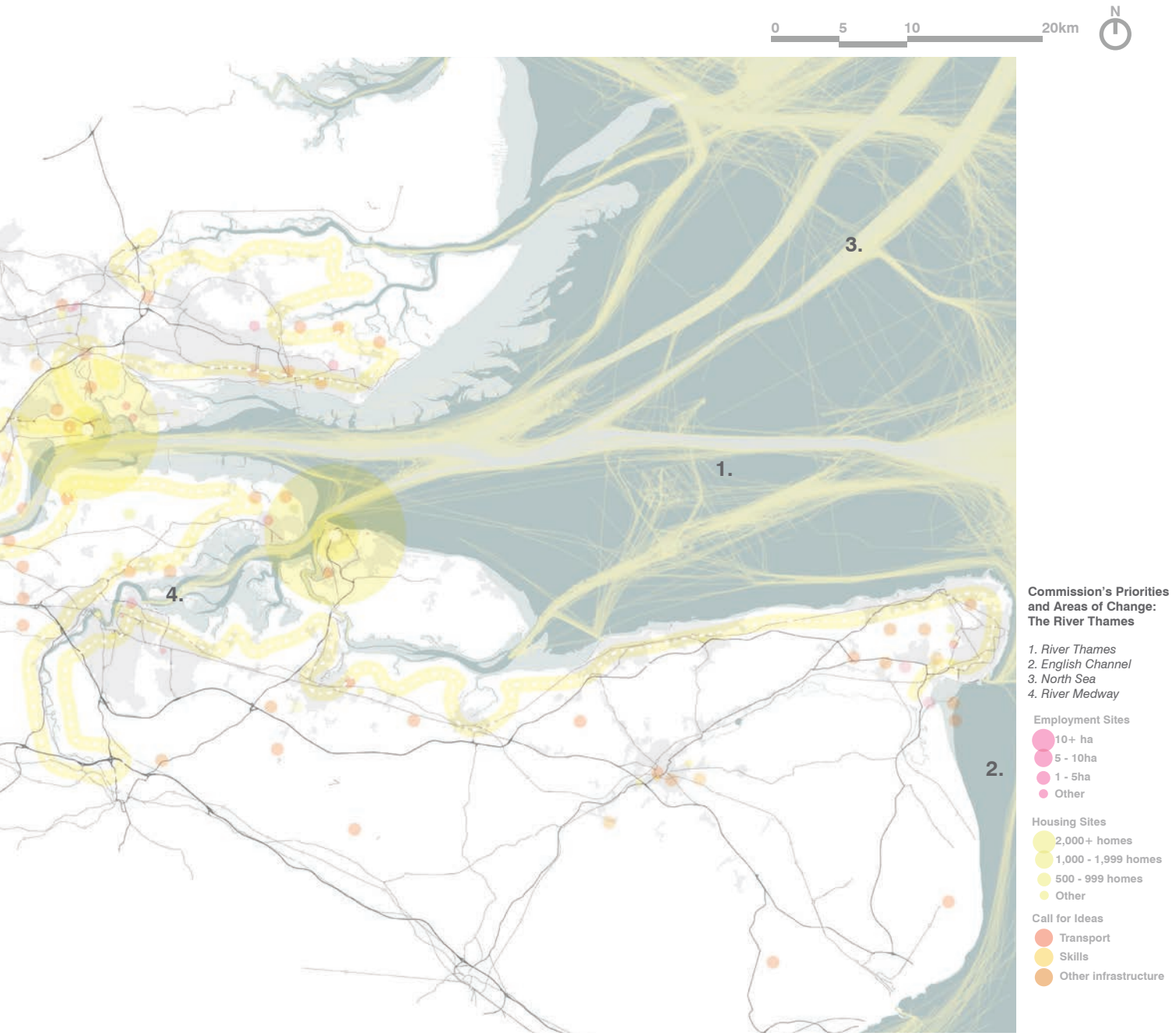
Great Thames Park

What: *Establish the Great Thames Park to celebrate and maximise the value of the area's natural assets. This should include improving access to and use of the River Thames for pedestrians and cyclists.*

Why: *It will create a 'brand' which attracts inward investment as well as residents and visitors to the area and improves connections between places.*

How: *Local authorities, environmental bodies and river regulators should prioritise investment in the Thames Path and associated projects. Government to consider the governance arrangements required to support the Great Thames Park.*

When: *Medium term with measures in the short term to put governance strategies in place. Quick win to deliver first new section of the Thames Path by 2020.*



Thames East Line

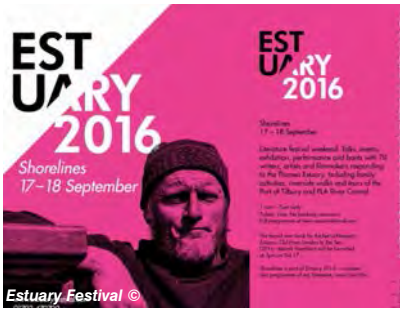
What: *Delivery of new multi-modal (including rail) crossing east of the Lower Thames Crossing combined with the second Thames Barrier. Potential interchange points could be Basildon and the Medway Towns.*

Why: *To maximise the benefits arising from a second Thames Barrier (which will provide a world-class standard of flood protection) including improved north-south connectivity, enhanced linkages with other high productivity corridors around London, agglomeration opportunities at interchanges and improved access to England's high speed railway network.*

How: *Government should consider a multi-modal crossing as part of its planning for the next Thames Barrier. This includes the financing models which could be used to deliver the project by 2050.*

When*: Long term delivery with measures in the short and medium term to commence project planning.*

Celebrate the Thames

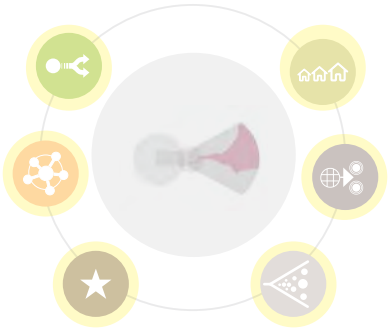


What: *Build on the success of the existing Thames Festival and the Port of London Authority's Thames Vision to create a programme of festivals, events and promotional activities.*

Why: *To celebrate the River Thames, its creative and cultural industries and to attract inward investment and visitors to the area.*

How: *A programme of events should be developed and led by the Thames Gateway Strategic Group working with local businesses and community groups.*

When*: Quick win to ensure additional funding and support for Estuary Festival 2019.*



Governance and Delivery

The Commission has an ambitious vision for the Thames Estuary, which it believes has the potential to deliver 1.3 million new jobs and £190 billion additional GVA by 2050. At least 1 million new homes will need to be delivered to support this growth, but the Commission believes there is scope for the Thames Estuary to be even more ambitious in responding to London's ever growing housing need. Realising this ambition will require a coordinated delivery plan, which will in turn be dependent on strong, streamlined governance.

The resounding message from the consultation that the Commission has undertaken is that there is ambition in the Thames Estuary to deliver high-quality development and the best economic outcomes for people. However, the Commission believes that a 'business as usual' approach will not deliver growth at scale and pace; governance reform and new delivery models are needed.

The Commission believes that Government should work closely with local partners to determine the governance reform required to drive growth in the Thames Estuary. In the first instance, the Commission recommends that a **robust, locally-led review of governance arrangements be undertaken, to be concluded within six months**. This review should bring forward proposals for strong, streamlined governance arrangements to drive growth - particularly in Kent and Essex - but encompassing the whole area. In undertaking the review, local partners should draw on lessons learned from places that have secured City, Devolution and Growth Deals, attracted major private sector investment, and delivered significant change.

It is right that local partners should, in the first instance, define the governance reform needed to drive growth in the Thames Estuary. However, if robust proposals to reform governance and drive delivery are not forthcoming from local partners within six months, a more top-down approach will be required.

The Commission has undertaken extensive engagement over the past two years and carefully considered the case for the role of governance reform in driving growth in the area. The Commission believes that the optimal governance arrangements should include the following:

A single voice for the Thames Estuary through a strengthened and streamlined Thames Gateway Strategic Group (TGSG): The TGSG as presently constituted is ill-equipped to articulate a shared vision and strategy for the area. Local authorities should strengthen it by providing capacity funding and streamlining membership, so that it may speak to Government with a single voice on key strategic, Estuary-wide issues. Government should endorse the Chair of the TGSG, who would act as a single 'champion' for the Thames Estuary to spearhead collaboration and help make the case for inward investment.

The development of statutory Joint Spatial Plans in Kent and Essex: The Commission believes that, to enable the continued prioritisation of investment, statutory Joint Spatial Plans should be produced in Kent and Essex. The precise geography should be defined by local partners in the first instance as part of the locally-led governance review, building on existing collaborations and administrative boundaries. On this basis, there is a clear case for focusing a Joint Spatial Plan on south Essex, where work is already underway. The optimal geography for a Joint Spatial Plan in north Kent is less clear, and local authorities should work

toward agreeing a preferred geography within the next six months. The Plans should build consensus around areas of focus, continue to strengthen the growth narrative for the area, and package and prioritise key projects. This will enable more effective delivery and provide a stronger focus for attracting private sector investment. If these Plans demonstrate sufficient growth ambition - going above the minimum threshold set out by Government for local housing need; and being given statutory status - **Government should reward this ambition with substantial infrastructure investment and freedoms and flexibilities**. This could take the form of a 'roof tax', or other incentive to accelerate housing delivery and support growth.

A revision of the geographical boundaries of South East Local Enterprise Partnership (LEP): Analysis undertaken by the Commission suggests that the Thames Estuary is a tapestry of productive places, requiring tailored growth strategies. Through the locally-led governance review, local partners should bring forward proposals to revise the geographical boundaries of South East LEP. South East LEP is one of the biggest LEPs in the country, second only to London in terms of population and number of local authorities. The Commission suggests that local partners consider the formation of two new LEPs within the Thames Estuary, one for Essex, Southend-on-Sea and Thurrock, and another for Kent and Medway. Aside from geography, the Government review into strengthening LEPs should consider the best organisational structure for LEPs, and whether they are adequately resourced to drive growth.

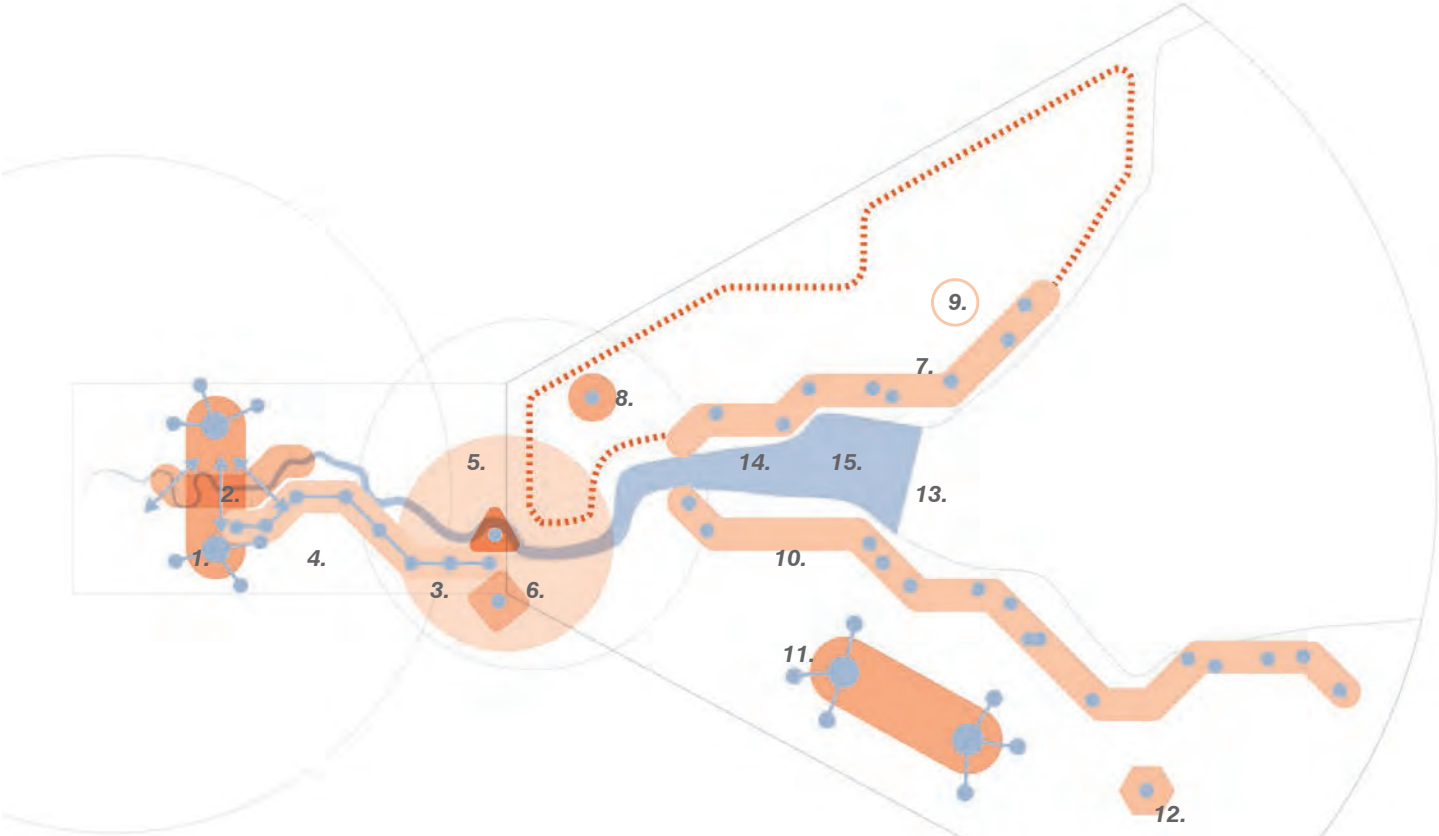
Development corporation(s) with planning, and compulsory purchase powers to drive the delivery of homes and jobs aligned to major infrastructure investment: Whether these are locally-led should be dependent on the scale of the development. In addition, local partners should consider whether Homes England's full resources and powers, including plan-making and development control powers, should be deployed to maximise the local growth benefits of major infrastructure investments like the Lower Thames Crossing. The Commission believes that development corporations, backed by substantial investment, planning powers and freedoms and flexibilities from Government, and coordinated by a strengthened and streamlined TGSG would be an effective way to drive growth in the Thames Estuary in key opportunity areas across the Thames Estuary.

Strengthened governance arrangements for the River Thames itself: The creation of a co-ordination office or lead organisation could be more effective in maximising the potential of the River Thames.

In return for strengthened and streamlined governance arrangements, the Commission would like to see **revenue raising powers and tax (or other) incentives granted to the Thames Estuary** to drive delivery of infrastructure, housing and jobs.

The Commission's Priorities

The Commission believes that the fifteen priorities identified in this document are critical to achieving its vision for the Thames Estuary by 2050. The priorities for each 'productive place' should be pursued simultaneously so that their impact is maximised and they work together to provide 'whole place' solutions.



QUICK (BY 2020)

3. An Integrated Skills Strategy

5. Transport Innovation Zone

7. SE Foreshore Fund

9. Institute for Resilient Infrastructure

10. NK Foreshore Fund

11. Education and Skills

13. Great Thames Park

15. Celebrate the Thames

SHORT (BY 2024)

1. Accelerated Delivery Pilot

6. Medical Campus

8. SEC Relocation

12. Health Supercentre

MEDIUM (BY 2030)

2. Three New Thames Crossings

4. Extension of Crossrail 1

LONG (BY 2050)

14. Thames East Line

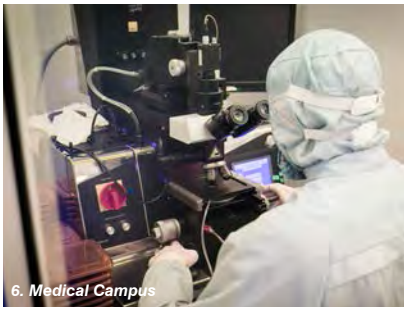

1. Accelerated Delivery Pilot


2. Three New Thames Crossings


3. An Integrated Skills Strategy


4. Extension of Crossrail 1


5. Innovation Zone


6. Medical Campus

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9. Institute for Resilient Infrastructure


10. NK Foreshore Fund


11. Education and Skills


12. Health Supercentre


13. Access to the River


14. Thames East Line

15. Celebrate the Thames

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