
Inner Thames Estuary Airport: Review of the evidence on socio- economic impacts

A report for the Airports
Commission

*Airports Commission
June 2014
Final report*

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Executive summary

In December 2013, the Airports Commission confirmed that five proposals (three from scheme sponsors, one from TfL and the sift 3 proposal from the Airports Commission) for a new airport in the inner Thames Estuary were remaining under active consideration as further phase 1 analysis was undertaken. Some similar features are contained in these proposals, including a four or three runway hub and the closure of Heathrow. They project passenger numbers on opening of between 90 million and 110 million passengers, and envisage that up to 180 million passengers could be served annually by the Estuary airport in 2050. In phase 1, the Airports Commission's sift 3 proposal set out that a new airport in the inner Thames Estuary could accommodate up to 105 million passengers in 2030 and up to 150 million passengers by 2050.

The Airports Commission commissioned PricewaterhouseCoopers LLP ("PwC") to evaluate the analysis submitted on local, sub-national and national economic and social benefits and impacts of building a new hub airport in the inner Thames Estuary. Consistent with the consultation responses for the terms of reference for this work, we have also reviewed the implications of closing down Heathrow and redeveloping the site. The report does not consider the potential impacts on London City and Southend airports in detail due to the uncertainty about their closure.

The report is based on a review of submissions made, and of other existing literature, data and available evidence rather than undertaking new analysis. The report provides detailed documentation of key documents and data sources relied upon. In addition, PwC has participated at meetings with the Airports Commission, proposers of the inner Thames Estuary airport schemes, their economic advisors and local authorities and business representatives.

Commercial assumptions for the Estuary airport

Our review suggests that the commercial assumptions required to make an inner Thames Estuary airport commercially viable would require aeronautical and non-aeronautical revenues per passenger to be significantly higher in real terms than at Heathrow and competing European hubs.

High capacity utilisation would also be required from the outset. Failure to capture sufficient passengers from Heathrow airport could push charges higher in order to remain viable, but this is likely to offer a greater competitive advantage to competing hubs in Europe and the Middle East. Available evidence suggests that these hubs will have the capacity to handle additional traffic when the Estuary airport opens. All of this means that Heathrow will need to close in order to make an inner Thames Estuary airport commercially viable.

Earning the implied non-aeronautical revenue level suggested in the analysis presented may be particularly challenging. For example, the high public transport usage envisaged will impact car-parking revenues. Similarly, the efficient passenger transfer system between flights could impact "dwell time" in the retail areas of the airport.

The various scheme proposals have presented varying approaches to project risk. For example, the capital expenditure figures presented by TfL include risk allowances noticeably lower than those suggested by the Government's Green Book and those used by the Airports Commission in its Interim Report analysis.

Our review has assessed the existing evidence in relation to the compensation that would be payable to the owners of Heathrow. The current estimate is in order of between £13.5 and £21.5 billion for Heathrow. We highlight that this indicative valuation range reflects only the value of the actual airport, i.e. inside the fence and that unforeseen market development could impact the compensation required. The evidence base around Heathrow compensation could therefore be improved.

National economic impacts

Construction phase

The resources invested in building a new airport in the inner Thames Estuary will have substantial economic impacts. However, these impacts are another way of measuring the cost of a scheme and under government appraisal guidelines (as set out in the Green Book) should be treated as a cost, not a benefit. It is also important to highlight that the activity created in the construction phase will largely be temporary because once construction is finished, they will no longer be needed.

TfL has produced estimates for the direct, indirect and induced effects associated with the construction investment. They have presented these in terms of the activity generated, which they estimate to be 143,000 jobs and GVA of £7.4 billion in 2020, the peak year of the build.

Operational phase

Operating an airport in the Thames Estuary will also have large-scale employment and GVA effects, as can be seen from around Heathrow at the moment. TfL have estimated the direct, indirect and induced effects of the operational phase of an inner Estuary hub airport to be in the region of 280,000 jobs and £20.9 billion in GVA per annum in 2030, rising to 388,000 jobs and £42.3 billion in GVA by 2050.

These estimates are critically dependent on the airport being a commercial success and achieving passenger traffic of 90 million per annum on opening in 2030, rising to 170 million passengers per annum in 2050. These forecasts are significantly higher than the Airports Commission forecasts in 2050.

These figures also do not account for the closure of Heathrow airport, which would bring about a reduction in economic activity. Estimates of the current and forecast activity at Heathrow are available, but there is no analysis at the national level on the net impact of closing and then redeveloping the site. The effects of redeveloping the Heathrow site may lead to some incremental economic value being recouped, but the scale and timing of this are uncertain.

We do not consider that the direct, indirect and induced effects are the key impacts of the inner Estuary airport but consider the catalytic impacts to be more important. Care should also be taken in using the direct, indirect and induced figures to compare different expansion options. The analysis commissioned by TfL assumes that the level of GVA and employment is proportionate to the number of passengers served. If this is the case then it is likely that other expansion options that meet the unconstrained demand forecast may deliver a similar level of total direct, indirect and induced impacts when considering the London System as a whole.

Catalytic impacts from improving the UK's connectivity

A more fundamental economic impact from aviation is the catalytic or supply side impacts from improving the UK's connectivity with the rest of the world. There is extensive academic literature capturing catalytic effects via the association between aviation connectivity and GDP, although the direction of causality in this relationship is unproven.

TfL has estimated that an Estuary airport could boost connectivity by 9% and GDP by 0.5% in 2050. This estimate compares the connectivity of the Estuary airport to that if no expansion were to occur and traffic in the London System is materially constrained.

Another key question is whether a single hub airport would deliver better connectivity than other expansion options (such as additional runways at Heathrow and/or Gatwick). The analysis carried out by the Airports Commission for its interim report on this issue suggests that a single hub may offer a small improvement in passenger connectivity relative to dispersed expansion options. This incremental benefit is noticeably smaller than the estimates by York Aviation for TfL on the number of destinations available. However, we recommend more work could be done to look at this important issue, as these studies do not specifically assess the Estuary airport.

Local economic impacts

The review of local economic impacts shows that an inner Thames Estuary proposal has the potential to generate approximately 98,000 additional jobs in 2030 across the six local authorities closest to the proposed airport, a 23.5% increase in the current baseline forecast. However, the deliverability of this employment uplift and its potential benefit to local people may be constrained by local housing availability, labour supply, availability of land and surface access. These constraints are likely to be experienced differently by individual authorities depending on their opportunities and barriers to growth.

Our review of local authority planning documents identified that house building and, linked to this, the local supply of labour were identified as notable constraints in Medway and Swale, but are identified as less prominent constraints in Tonbridge and Malling, Gravesham and Dartford.

Limited availability of employment land was identified as a potential constraint to future economic development in Maidstone, Tonbridge and Malling and Gravesham. This would need to be overcome to realise increased economic activity outside of the airport fence in these areas.

We expect that authorities in south Essex will also be affected, depending on surface connectivity to the Estuary airport.

Heathrow airport currently employs 76,600 people directly on-site, creating GVA of approximately £3.3 billion. Including indirect and induced effects it is estimated to currently provide between 114,000 and 123,000 jobs in the local area. Its total GVA contribution is estimated to be in the order of £5.3 billion to £6.2 billion. Continuing growth in passenger numbers at the airport, which is predicted in the Airports Commission forecasts, would be likely to increase GVA further in the period to 2030.

Many of these local jobs would be lost if the airport closed, although some of the Heathrow employees would find alternative work, and any redevelopment of the Heathrow site would provide further opportunities. A number of redevelopment scenarios have been put forward by TfL, which may generate local employment and help address London's housing shortage.

However, there is huge uncertainty over the scale and timing of these impacts. There are some key risks identified in the evidence around Heathrow redevelopment including an increase in out-commuting, higher numbers of local people looking for work, and the suitability of the land.

Local catalytic effects and spatial implications

TfL advocate that an inner Thames Estuary airport could spatially rebalance economic activity by catalysing the development of new business activity in East London and unlock latent development along the Thames Gateway.

In their May submission to the Airports Commission, TfL estimated that 47,000-138,000 catalytic jobs could be created in the Inner Thames Estuary as a result of the airport. This is possible, but the scale of the impact is highly uncertain. The estimate is based on benchmark evidence from other airports, many of which bear little resemblance to the specifics of the Thames Estuary scheme.

It is possible to speculate on the location, scale and type of catalytic activity that may move by looking at supply side measures (e.g. availability of business premises) and demand side measures (e.g. locational attractiveness) of different locations. But, we do not believe there is any current methodology that will enable any specific predictions to be made with confidence.

Based on our high level assessment of locational attractiveness we think that the most likely geographical impact on business would be some movement of activity from West London and the M4 corridor into Central and East London along transport corridors to the Estuary airport. The areas to the west of London would experience a decline in airport access relative to the east and central locations.

The area directly outside the airport fence is currently characterised by low levels of current employment and labour density so there are questions over how much catalytic activity would be attracted. There is very little evidence on the potential for business to move to or from the UK as a result of the changes. This may also represent an area for further study.

Any movement of catalytic activity would have significant local impacts on both the destination and the origin this activity, but it may not be desirable at a national level.

1. Introduction

1.1. Background

The Airports Commission issued the terms of reference for the “Inner Thames Estuary Feasibility Studies” in March 2014. This specified four work-streams, set out below, which the Commission has taken forward to assess the credibility of a new Estuary airport proposal. As part of its programme of work, there was a general call for evidence, which closed on 23 May 2014.

- Study 1 – Environmental / Natura 2000 impacts (study 1);
- Study 2 – Operational feasibility and attitudes to moving to a new airport (study 2);
- Study 3 – Socio-economic impacts (study 3); and
- Study 4 – Surface access impacts (study 4).

This report seeks to address Study 3 “Socio-economic impacts”. As detailed in the study’s scope of reference, the areas covered in this report are set out in table 1.1 below.

Table 1.1 Scope of assessment

Area of scope	Where is this covered in the report
The economic impacts of a new hub airport in the inner Thames Estuary	Chapter 3 - National economic impacts Chapter 4 - Local economic and social impact
Identification of the redevelopment potential of Heathrow airport, for example in construction, supply chain, foreign investment, new homes	Chapter 4 - Local economic and social impacts
Economic assessment of the impacts of closing Heathrow airport and constructing a new airport at inner Thames Estuary location	Chapter 3 - National economic impacts Chapter 4 - Local economic and social impacts
Social impacts of closing Heathrow airport, including regeneration impacts on London, north Kent and Essex as a result of building a new airport in the Estuary (direct, indirect and catalytic)	Chapter 4 - Local economic and social impacts
Potential of airport developments to drive change in the economic geography of London	Chapter 5 - Local catalytic impacts and spatial implications
Competition impacts on the aviation sector	Chapter 2 - Considers the competitive landscape with regard other hub airports Chapter 3 - National economic impacts captures some competition effects in the catalytic effects

1.2. Objectives and approach

The objective of this study is to collate and understand existing evidence and identify where there are key data gaps. The report does not undertake new analysis as this would form part of subsequent work in the event that the Estuary airport option is taken forward. To do this we have:

- Set out the key analysis submitted that is relevant to the terms of reference;
- Described and critiqued the methodologies used in estimating likely impacts, along with key assumptions and any issues with these approaches²;

¹ Terms of Reference: Inner Thames Estuary Feasibility Studies, March 2014.

² We have not had access to any of the underlying working files upon which quantitative estimates were based and we have not performed an audit of the data used or the modelling undertaken.

- Identified gaps in the existing evidence base; and
- Positioned the impacts in the context of how they are considered in government cost benefit analysis.

The study has considered the implications of the Estuary airport for other airports in the London system. The focus has been on Heathrow, with City and Southend airports considered in less detail.

We have considered four different schemes for the Estuary airport based on submissions by Foster + Partners, Metrotidal Tunnel and Thames Reach Airport Ltd (“Thames Reach Airport”), Transport for London (TfL) and the International Aviation Advisory Group (IAAG). The Airports Commission also developed a sift 3 option seeking to mitigate the adverse effects of the Grain proposals. Fuller descriptions of these schemes are included in chapter 2 and Appendix A.

Three of the schemes propose the Isle of Grain as the airport site, and one proposes nearby Cliffe. It should be emphasised that in most cases limited information has been submitted on the Cliffe location so it has not been possible to differentiate between this and the Isle of Grain. However, in most cases we would expect the results for this socio-economic study to be similar given the proximity of the two locations.

1.3. Report structure

The remainder of this report is structured as follows:

Chapter 2: **The rationale for airport closure and proposed schemes** discusses the potential implications of building an Estuary airport on the commercial viability of Heathrow airport. We also consider key commercial assumptions and risks relating to the Estuary proposals.

Chapter 3: **National economic impact** focusses on the analysis presented on the economic impact of building and operating the Estuary airport, the closure of other airports and the issues of connectivity and wider catalytic effects. We note that this chapter focusses on GDP effects and excludes consumer welfare effects (e.g. from reductions in journey times).

Chapter 4: **Local socio-economic impacts** assesses the analysis on local employment, housing and land impacts made in submissions to the Airports Commission and how this corresponds to local capacity and the plans of the local authorities affected by the Estuary airport. The local socio-economic impacts of closing Heathrow airport are also considered.

Chapter 5: **Local catalytic impacts and spatial implications** discusses the potential for an airport in the Thames Estuary to catalyse a broader rebalancing of economic activity towards East London and the Thames Estuary area.

In addition, there are four appendices that provide further detail on the documents reviewed and other supporting information:

- A. Overview of scheme proposals;
- B. Summary of key economic impact evidence;
- C. Local socio-economic baseline data sources; and
- D. Local economic risks and constraints related to an Estuary airport.

2. Rationale for airport closure and commercial considerations

Chapter summary

Commercial rationale for airport closures

In order for the Estuary airport to be commercially viable, the evidence reviewed suggests that Heathrow will need to close. The Estuary airport will require full utilisation early in its operating life in order to maintain lower airport charges and to generate sufficient revenues for the project to be commercially feasible. In order to operate as a hub, the Estuary airport will need to maximise the benefits of flight networks and transfers, and airlines will be reluctant to move to a new hub without the support of strong feeder traffic.

Submissions

The Airports Commission received a number of submissions outlining proposals for an Estuary airport, with four proposals (Foster + Partners, Thames Reach Airport, TfL and IAAG) being considered further. Submissions ranged from a four-runway option with Heathrow closing, to a three-runway option. The Airports Commission developed an option proposing a four-runway scheme with a Heathrow closure. While proposals do not envisage a transformational capacity increase for the London region when the airport becomes operational in about 2029 (circa 100 million passengers in most proposals), submissions envisage that a new airport will have capacity for up to 180 million passengers annually by 2050. The Airports Commission has taken a more conservative view on capacity at the Estuary airport in 2050, forecasting annual passenger capacity of 150 million.

Risks

Even if Heathrow closes, the Estuary airport will face competition from other airports around London and in mainland Europe. With closure of Heathrow pre-announced, operators will have years to develop alternative strategies, either moving to other hubs or increasing their presence at London's other airports.

Considerations addressed by the proposals include passenger levels, runway layout, location, employment and ground transportation plans. There are noticeable gaps in the submissions around operating financial assumptions and detailed commercial plans, both of which would need to be addressed in order to fully understand the commercial viability of the airport.

An independent analysis for TfL by EY in September 2013 assumes a real aeronautical revenue level of £30 per passenger, resulting in a marginally positive net present value for the Estuary airport project. We note that other evidence suggests significantly higher charges being required than those forecast by EY. A charge of £30 is likely to be above the 2030 level at Heathrow, currently one of the most expensive airports in the world.

Proposals for an Estuary airport also outline surface transport plans which envisage high utilisation levels for both passengers and employees. We have not identified any consideration being given to the impact that a high public transport utilisation rate could have on lucrative car-parking fees for the airport. Another risk centres on the compensation that may be payable to the owners of Heathrow airport in the event that the airport would be required to close, or is forced to operate on a scale different from today. In the case of complete closure, the current estimate is in order of between £13.5 and £21.5bn for Heathrow. We highlight that this indicative valuation range reflects only the value of the actual airport, i.e. inside the fence and that unforeseen market development could impact the compensation required. The evidence base around Heathrow compensation could therefore be improved.

2.1. Introduction

The Airports Commission has received a number of proposals outlining a vision for an Estuary airport. This report considers the four proposals that remain under active consideration by the Airports Commission. In addition, the Airports Commission developed an option in phase one, which sought to minimise the adverse impacts of all of the Grain proposals. The four proposals submitted to the Airports Commission which remain under active consideration are:

- Foster + Partners;
- Thames Reach Airport Ltd;
- Transport for London (TfL); and
- The International Aviation Advisory Group (IAAG)³.

Please see Appendix A for an overview of each of the submissions, including the scheme developed by the Airports Commission.

All but one of the proposals identify a site on the Isle of Grain, operational by approximately 2029 and with four runways. The IAAG proposal is the only proposal being considered for a new airport at Cliffe with three runways. The scheme promoters are not suggesting that significant additional air capacity will be introduced to the London System on the opening of the Estuary airport in 2029. However, over a period of phased development, they suggest that a new hub could provide capacity for up to 180 million passengers annually by 2050.

Each of the proposals makes different assumptions about the level of passenger traffic at the new airport in 2050. The highest traffic levels are proposed in the TfL scheme, which envisages an airport with capacity for 180 million passengers per annum, and handling 170 million passengers in 2050. The DfT unconstrained Heathrow demand forecast is used as a proxy for overall demand for hub capacity in the South East.

The more recent forecasts carried by the Airports Commission indicate a lower level of unconstrained demand at Heathrow in 2050, with 146 million in the ‘carbon capped’ forecast (in which carbon emissions from aviation are constrained at 2005 levels, as proposed by the Climate Change Committee) or 158 million in the ‘carbon traded’ forecasts.

The Airports Commission assessment of an inner Thames Estuary option for its Interim Report estimated 143 million passengers at a new Estuary airport in 2050. This is based on an assessment of the level of passenger capacity achievable at an airport with four closely-spaced parallel runways, and is slightly lower than the Commission’s unconstrained demand forecasts.

The remainder of this chapter considers whether the closure of Heathrow airport would be required in order to make a new inner Estuary airport commercially viable. We then consider the overall commercial viability of such an airport by reviewing the reasonableness of key financial assumptions such as revenue, profits and surface access plans in the commercial analysis carried out by EY for TfL. Finally, we consider the commercial implications of closing Heathrow.

Our consideration is based on a range of documents, including submission templates and full proposals received by the Airports Commission. All sources are quoted in the footnotes. In particular, the analysis relies upon phase 1 and call for evidence reports prepared by EY and KPMG. These form the core part of the available evidence in relation to commercial analysis of the Estuary airport. The reports are listed below.

³ We note that along with IAAG, a second proposal was submitted to the Airports Commission by London Medway Airport, also for an airport at Cliffe.

Table 2.1: Key evidence for the commercial review

Source	Comments
TfL’s proposal for a new Hub Airport, EY, 30 September 2013 (“Paper 1”)	This report considers the commercial viability, plus delivery and funding options of a potential Estuary airport.
Airports Commission, High-level Commercial and Financial Assessment of Selected Potential Schemes, 10 December 2013, KPMG (“Paper 2”)	This report contains high-level analysis of the commercial viability of a range of potential schemes specified by the Airports Commission.
Meeting with the Airports Commission, Mayor’s submission, EY, 29 April 2014 (“Paper 3”)	Hand-out provided by EY at meeting with the Airports Commission. The document provides an overview of previous work plus some additional assumptions.
Supplementary Report: Commercial and Financial Analysis of the IoG option based on KPMG’s analysis, EY, 22 May 2014 (“Paper 4”)	EY consider the Estuary airport analysis completed by the Airports Commission/KPMG, and adjust the aeronautical revenue analysis in light of market practice and precedents of regulated airports and other utilities.

Sources: As stated.

2.2. Assessment as to whether Heathrow airport would need to close from a commercial perspective

A new airport in the Thames Estuary would have a major impact on Heathrow airport for both commercial and airspace reasons. From a commercial perspective the Airports Commission concluded in phase one of their assessments that the airport would probably need to close. In this section we consider the existing evidence and rationale for closure in more depth.

2.2.1. Heathrow airport

Upon opening of the new hub airport in circa 2030, the four proposals submitted to the Airports Commission, are projecting an annual passenger level in a range of 90 million to 110 million. These levels are consistent with a complete transfer of the then estimated Heathrow capacity (90 million), with some new capacity being introduced at the higher end of the range.

TfL’s response to the Airports Commission paper on Airport Operating Models⁴ proposes that if a new hub is not to be undermined by Heathrow’s existing position and brand, a significant reduction in Heathrow’s scale and scope would be required. They suggest some non-closure options (such as restrictions on operating hours, limited aircraft size and destinations), but also make clear in their July submission to the Airports Commission that closing Heathrow is an assumption for opening a new airport.

If Heathrow was to remain fully or partially operational it would be in competition with a new Estuary airport. In this case we would expect the Estuary airport to incentivise airlines to move. Market tactics used in the industry to attract traffic include price and other airport incentives⁵.

Price: A new airport could potentially attract traffic by offering lower landing charges than those offered at Heathrow. Heathrow aeronautical revenue per passenger is expected to be £19.10 (in 2013 prices) in 2018, which is the end of the current quinquennial regulatory review⁶.

Rather than a lower charge, however, EY’s analysis assumes aeronautical revenue of £30.00 per passenger (2012 prices) at the proposed Estuary airport. Their analysis indicates that charging such

⁴ *The Mayor of London’s response: The Evidence Base to the Airports Commission discussion paper on Airport Operational Models, July 2013.*

⁵ *International Transport Forum, Expanding Airport Capacity in Large Urban Areas, OECD, 2014, page 161.*

⁶ *6th quinquennial review of Heathrow charges - <http://www.caa.co.uk/docs/33/CAP1138%20Heathrow.pdf>.*

an amount would achieve a marginally positive return on the capital invested, assuming that surface access would be funded by government. There would therefore be little or no scope to reduce it.

With Heathrow charges planned to fall in real terms to 2018, its charges are unlikely to reach £30 by 2030. This suggests the new airport will not be in an obvious position to attract traffic from a continuing Heathrow based on pricing alone.

This indicates that with Heathrow continuing to operate, there would be significant risk that the Estuary airport could fall substantially short of attracting the traffic levels projected. To broadly illustrate the effects of this, we have considered a high-level scenario in which the new hub airport only attracts 80% of a projected 100 million passengers (mid-point of proposals for 2030). In practice, it may not even be able to attract this level of traffic if Heathrow charges remain lower than those at the Estuary airport. To cover the revenue shortfall in this scenario, aeronautical charges would need to increase for the airport to remain viable. Assuming that non-aeronautical charges remain fixed at £16 per passenger and that costs are largely fixed at the new airport, there would be a required increase in aeronautical revenue per passenger to £39. This is significantly above levels currently charged at Heathrow (see table 2.3 below). Given the lack of a precedent for this aeronautical charge level, it is difficult to believe any airline could viably support it given the tight margins on which airlines already operate.

The proposed aeronautical charges level for the Estuary airport could offer hubs at Amsterdam, Paris Charles de Gaulle, Frankfurt and in the Gulf area (Dubai, Abu Dhabi and Qatar) a clear competitive advantage for attracting airlines. We discuss the potential reaction of mainland European and Gulf hubs in more detail in the second part of this Chapter.

For illustrative purposes, we have shown in table 2.2 below how the implied aeronautical charges would vary under different levels of passenger transfer from Heathrow.

Table 2.2: Comparison of aeronautical charges

Airport (£/passenger)	2018	2030 (2012 prices)
Estuary per TfL (50% transfer of passengers from Heathrow)	n/a	62
Estuary per TfL (80% transfer of passengers from Heathrow)	n/a	39
Estuary per TfL (full transfer of passengers from Heathrow)	n/a	30
Heathrow	19.10	n/a

Source: PwC analysis, Ernst and Young and 2012 Annual reports of HAL.

Other incentives: Typical incentives to induce airline switching might include office space, lounge access and advertising space under favourable terms. However, we do not consider that the Estuary airport would have enough financial flexibility to offer sufficient incentives to attract traffic away from Heathrow.

2.2.2. Key strengths of Heathrow airport

In the event of Heathrow airport remaining open, it is conceivable that it would remain attractive to both airlines and passengers. For example, BA is the key network airline at Heathrow accounting for 48% of traffic⁷. BA's stance in July 2013 was that spreading one airline or alliance operation over multiple London airports would not be successful, citing its dual-hub strategy in the 1990s⁸.

⁷ Sabre.

⁸ British Airways' submission to the Airports Commission, *Airport Operational Models*, July 2013, page 9.

In addition, the Airports Commission has identified a number of potential reasons as to why none of the alliances present at Heathrow has moved its network or services to another London airport⁹. These include:

- **High yields:** Heathrow is likely to be more attractive to airlines than other airports due to the high yields achievable, i.e. ticket prices to Heathrow command high prices.
- **Location:** Heathrow's location to the west of London places it close to a high density of affluent travellers. In addition, we note that Heathrow is circa 15 miles from Central London while the proposed airport site on the Isle of Grain is over 30 miles from Central London.
- **Strong brand:** Heathrow is the UK's best known airport, so overseas visitors might be prepared to pay more to fly into Heathrow than into other UK airports.
- **Costs:** The one-off costs of switching airport are likely to be high (relocating staff, negotiating slots and drawing up new schedules). The responses from airlines to the call for evidence show that they are particularly concerned about this.

2.2.3. Case studies

A review of previous case studies highlights the risk of building a new airport without closing the original airport, as shown by the examples below.

- **Montreal Mirabel:** The Canadian national government forced intercontinental carriers to use Mirabel airport, while leaving Dorval airport to cater for domestic carriers only. International flights were banned from Dorval between 1975 and 1997. This policy deprived the intercontinental carriers of the possibility of easy onward domestic connections and gave them the incentive to relocate flights to Toronto. International operations quickly fell away after the ban was lifted in 1997, and by 2000 the underutilisation of Mirabel airport drove the decision to relocate all services back to Dorval airport.
- **Milan Malpensa and Linate:** As Milan's small Linate airport neared capacity, the government built the larger Malpensa airport more than 30 miles outside the city which became Alitalia's main hub in 1998. The plan was to close Linate and develop Malpensa as Alitalia's intercontinental hub, drawing traffic from the region and connecting flights from across Italy. But in 1999, Italian officials backtracked on their plans to shut Linate, leaving Alitalia's Milan traffic split between two airports¹⁰. According to the airline, by 2008 the result had been that 62% of passengers originating from Milan and 92% of passengers originating from the wider northern Italy region did not use Malpensa as their departure airport for intercontinental flights. Instead they used Linate to connect at other European hubs, such as Frankfurt and Paris¹¹. In spite of this, by 2007 passenger numbers at Malpensa had reached 24 million, climbing from only 6 million in 1998. However, in 2008 Alitalia decided to move its hub operations back to Rome-Fiumicino, with the result that passenger numbers at Malpensa declined significantly (circa 18 million passengers in 2009). The situation was not helped by the fact that with the conveniently located Linate not being shut, many airlines particularly flag-carriers have continued to service the airport (served 9 million passengers served in 2012)¹².
- **Tokyo Haneda and Narita:** All international traffic was moved from the more centrally located Haneda to Narita in 1978. This segregation of traffic led to a loss of efficiency for international-domestic transfers, benefitting other nearby Asian hubs such as Seoul Incheon. After focusing on domestic routes for over three decades, Haneda resumed scheduled international flights in 2010 after a hiatus of 32 years¹³. Haneda, with its close proximity to the city centre, has proved an

⁹ Airports Commission, *Discussion Paper 4: Airport Operational Models*, May 2013, page 52.

¹⁰ *Rome is a hub of Alitalia's woes*, *Wall Street Journal*, October 2013.

¹¹ *Alitalia's Milan decision could destabilise sale process*, *Flight Global*, February 2008.

¹² CAPA Centre for Aviation.

¹³ *Haneda expansion a travel game-changer*, *The Japan Times*, March 2014.

attractive option for airlines as they can attract a yield premium (particularly on regional services). British Airways, Lufthansa and Air France have all introduced services to Haneda in recent years. All Nippon Airways' main hub is currently at Haneda and going forward it reportedly plans to focus operations in a single hub in Tokyo, as part of its long-term goal¹⁴.

- *Bangkok*: We also note that recent attempts to use Don Mueang airport as Bangkok's second international airport in parallel with Suvarnabhumi has not proved popular with airlines. One alliance stated that it is not interested in using Don Mueang due to the loss of flight connectivity that it would suffer, even though for this particular alliance only 25% of flight connections are made with other alliance members¹⁵.

In addition, a recent OECD report on aviation states that closing the old airport when opening a new one has proven to be successful and cites cases in Denver, Kuala Lumpur and Hong Kong¹⁶.

Heathrow conclusions

Heathrow's location and established brand name would likely allow it to continue being an attractive option to passengers even if a new airport were to open.

This suggests that the Estuary airport would need to incentivise airlines to switch, either by offering lower charges, or through other incentives. However, TfL's assumed £30 charge suggests little scope for competing on charges, and there is little evidence of other incentives that could be offered. This would suggest airlines switching would be most unlikely, but even if the Estuary airport attracted 80% of Heathrow's traffic, it would still struggle to operate commercially. To break even it would have to increase rates, exacerbating its lack of competitiveness.

In addition, a review of international precedents suggests that the existing airport has to close in order to make a success of the new airport. However, it is also noted that those that have been successful are not directly comparable to the London System in terms of geography and planning. For example, the UK operates a commercially driven, privately led airport market whereas other countries do not.

On balance, the literature and our analysis would suggest that Heathrow is likely to have to close fully in order to make an Estuary airport a commercially viable proposition.

2.3. Estuary airport assumptions and risks

This section considers some of the key assumptions underpinning the commercial case for an Estuary airport, principally as put forward in the September 2013 Ernst and Young report for TfL. In particular, we consider the underlying financing assumptions.

We compare to industry benchmarks and in some cases present PwC estimates and valuations. It is important to highlight that the proposed Estuary airport is unprecedented in size so some caution is needed in making comparisons with other airports.

We review the key risks that we have identified in the evidence. The assessment of assumptions is based principally on four papers as listed in table 2.1 above. These will be referred to throughout the commentary.

The section follows the following structure:

- Aeronautical revenues (benchmarks, transfer traffic, capacity at competing hubs and associated capital expenditure);
- Non-aeronautical revenues;

¹⁴ All Nippon Airways to focus operations in a single hub in Tokyo, CAPA Centre for Aviation, June 2014.

¹⁵ IATA response – Discussion Paper 4: Airport Operational Models, November 2013, Page 4.

¹⁶ International Transport Forum, Expanding Airport Capacity in Large Urban Areas, OECD, 2014, page 161.

- EBITDA margin;
- Ground access strategy; and
- Compensation to owners of Heathrow airport.

2.3.1. Aeronautical revenues

EY initially assessed the commercial viability of the Estuary airport for TfL, assuming aeronautical revenue of £30 per passenger (2012 prices)¹⁷. Applying such a level to passenger forecasts over the economic life of the project resulted in a marginally positive net present value (“NPV”) of £0.6 billion¹⁸. This NPV did not include surface access costs.

Heathrow’s aeronautical revenue per passenger is expected to be £19.10 (2013 prices) in 2018. Although we cannot predict what Heathrow’s equivalent figure would be in 2030, it is likely that £30 (2012 prices) will represent an increase. Other evidence received by the Airports Commission includes a letter from Mark Reckless, MP for Rochester and Strood. This letter claims that landing charges of at least 2.5 to 3 times those charged at Heathrow will be required in order to make a return on the investment made in an Estuary airport¹⁹.

We note that Heathrow’s aeronautical revenue per passenger is already above that of its direct peer group with Amsterdam, Paris and Frankfurt in a range of circa £7 to £15 per passenger²⁰. These values are shown in table 2.3. It should be noted that these are the average realised aeronautical charge, including discounts, and will vary compared to published aeronautical charges. Additionally, we note that Dubai International also claims to have amongst the lowest airport charges in the world²¹.

An estimated aeronautical revenue value of £30 could favour European and Gulf hub airports that offer lower charges, impacting the competitiveness of the Estuary airport and making it challenging for passenger and ATM targets to be met. However, the 2014 OECD paper on aviation states that beyond a certain hub size diseconomies can exist as spokes are added²².

Table 2.3: Aeronautical revenue comparison table

Airport (£/passenger)	Historic data points	Future
Estuary per TfL	n/a	30 (proposed pricing in 2030 in 2012 prices)
Heathrow	15	19 (proposed pricing in 2018 in 2013 prices)
Charles de Gaulle (Paris)	15	
Schiphol (Amsterdam)	12	n/a
Frankfurt	7	

Source: Leigh Fisher, EY report September 2013.

The Airports Commission’s Interim Report (based on analysis by KPMG) stated that if all costs associated with the new airport were incorporated into the analysis, and if passenger charges were not indexed over time, to fund the construction of an inner Estuary airport and all surface access construction, aeronautical charges would need to increase 3.4x over the 2018-19 CAA sixth quinquennium aeronautical charge for Heathrow.

¹⁷ TfL’s proposal for a new Hub Airport, EY, 30 September 2013, page 26.

¹⁸ TfL’s proposal for a new Hub Airport, EY, 30 September 2013, page 27.

¹⁹ Mark Reckless, MP for Rochester and Strood, letter to the Airports Commission dated 23 May 2014.

²⁰ Aeroports de Paris annual report 2012 and Schiphol Group annual report 2012.

²¹ Dubai Airports Yearbook.

²² International Transport Forum, Expanding Airport Capacity in Large Urban Areas, OECD, 2014, page 20.

KPMG carried out a similar analysis for the Airports Commission across a range of potential schemes, with the objective of reviewing their comparative financial viability on a consistent basis. In its modelling KPMG also considered the implications of excluding surface access costs and indexing charges to 2050.

In a report for TfL, EY expressed some concerns about KPMG’s approach and attempted to replicate their work at a high level²³. They also assessed the KPMG/AC analysis against available evidence, and modelled some adjustments. These adjustments included a longer debt repayment period, a much smaller contribution to surface access costs, adjustment to Heathrow’s acquisition cost, and indexation of aeronautical charges at the hub post-operation, in line with regulated companies.

We reviewed EY’s suggested adjustments. We agree with EY that in principle airports and utilities typically increase user charges over time to allow for either recovery of capital costs or inflationary pressures on capital expenditure. Heathrow’s allowable increase during the fourth quinquennium (2004-08) and fifth quinquennium (2009-13) was RPI+6.5% to RPI+7.5% per year respectively, as the airport recouped its investment in Terminal 5, but then fell to RPI-1.5% for 2014-18. Without the underlying data it is not possible to assess the reasonableness of the downward adjustments to the aeronautical charge, but if the TfL adjustments are accurate, the implied aeronautical charge equates to 1.4x Heathrow Q6, or about £29 (2012 prices).

Both approaches taken by the Airports Commission and TfL are reasonable, but present different methodologies, with different underlying assumptions about the inclusion of surface access, the debt repayment period, Heathrow’s acquisition cost and indexation. Our view is that the difference lies in the level of risk associated with a project of such scale and magnitude, which is unprecedented in the UK to date.

2.3.2. Transfer traffic

The transfer passenger market is a contestable market. Transfer passengers do not have any particular preference at which hub they connect flights. Price and convenience are more important. Therefore, any hub charging above-market fees, which are likely to be reflected in ticket prices, risks losing market share. Significantly Dubai’s low charges could allow it to continue increasing its share of the UK transfer market in the years ahead.

The table below demonstrates the material impact that Dubai as a global hub has had on the relative number of UK origin and destination passengers connecting through both Heathrow and other European hubs since 2002. Dubai has increased its share of the market from 10% to 28%. All other hubs, including Heathrow, have lost market share over the period.

Table 2.4: Transfer traffic

Airport	2002	2004	2006	2008	2010	2012
Heathrow	36%	37%	32%	30%	30%	30%
Amsterdam	28%	23%	27%	28%	24%	23%
Paris CDG	14%	12%	10%	11%	9%	9%
Frankfurt	13%	13%	13%	9%	8%	9%
Dubai	10%	15%	18%	23%	29%	28%

Source: Sabre, CAA, PwC analysis.

Furthermore continuing competitive pressures in the airline industry could make it challenging for airlines to support charges at this increased level (thin margins) and shift the competitive dynamic further in favour of airlines that decide against launching services from the Estuary airport. Other UK airports could also benefit, with London Gatwick, for example, potentially capturing low-cost and other point-to-point traffic.

²³ Supplementary Report: Commercial and Financial Analysis of the IoG option based on KPMG’s analysis, EY, 22 May 2014, page 14.

2.3.3. Capacity at competing hubs

Previous PwC analysis for the Airports Commission²⁴ suggests that competing hubs will have spare capacity based on future expansion plans when the Estuary airport is proposed to open in 2029. So they may be able to attract UK transfer traffic at low marginal cost. A brief capacity overview of each airport is given below. At some of the airports, some capital expenditure will be required in relation to terminal and apron expansion. However, we assume that this will be significantly less than the Estuary airport cost and thus any aeronautical charge increase will not be significant enough to affect their relative price competitiveness.

Amsterdam: It is estimated that passenger demand will reach capacity of 85 million at the airport by 2039. However, this is beyond the master planning period and it seems reasonable to assume that there would be incremental terminal expansion to enable further growth. Runway utilisation is currently limited to 510,000 movements, but from 2020, a ‘noise envelope’ approach will allow the benefits from future aircraft noise reduction to be shared between local communities and the airport, providing some scope for further capacity growth.

Paris CDG: Charles de Gaulle has a vast amount of airport land enabling expansion. It is understood that CDG has submitted requests for planning permission for additional runway capacity, so it is assumed that there is potential for capacity to expand further. It could also be assumed that terminal capacity increases incrementally as required.

Dubai: Dubai International is nearing capacity; however, Dubai World Central airport is due to open in the next decade, which will relieve the pressure from the current main airport.

Frankfurt: Given the current site size, there is limited scope for further runway expansion at Frankfurt; however, with the recently built runway the airport will have capacity of up to 700,000 air traffic movements. Activity at Frankfurt is not expected to reach this by 2050. Lufthansa also has a two hub system, so some transfer capacity could be shifted between Frankfurt and Munich, with Berlin Brandenburg airport also due to capture some transfer traffic.

Overall, it is expected that the key competing hubs are likely to continue to be able to cater for future air traffic demand, representing competition for the UK transfer market.

2.3.4. Capital expenditure

We highlight that the marginally positive project NPV (£0.6 billion) in the EY analysis to assess the commercial viability of a hub (Paper 1) is based on a real aeronautical per passenger assumption of £30. The analysis assumes a real capital expenditure level for the airport over the period 2019 to 2050 of £37.2 billion post-risk²⁵. Furthermore, the analysis indicates that for aeronautical charges to be in line with today’s levels (around £20 per passenger at Heathrow), the real level of capital expenditure would need to fall to £27.3 billion .

Table 2.5: Airport capital expenditure (real) (2019 to 2050)

	£ billion (real)
EY analysis: £30 aero charge; Project NPV of £0.6 billion	37.2
EY analysis: £20 aero charge; Project NPV of £0.6 billion	27.3

Source: EY report for TfL September 2013.

The Airports Commission’s interpretation of the TfL proposal estimates the airport cost at £29.8 billion²⁶. However, we note this estimate is unadjusted for risk and optimism bias and includes the cost of land.

²⁴ Hub Airport Capacity - International Competition, PwC, December 2013.

²⁵ TfL’s proposal for a new Hub Airport, EY, 30 September 2013, page 68.

²⁶ TfL sift template provided on the Airports Commission website.

We note that EY applied a 15% premium to capital expenditure to reflect risks²⁷. This is lower than the allowances suggested in the Treasury Green Book supplementary guidance on optimism bias²⁸. This indicates levels for optimism bias for construction projects ranging from 24-51 per cent for buildings and 44 to 66 per cent for civil engineering, at the outline business case stage.

As part of its independent cost assessment of the TfL scheme, the Airports Commission applied both a 40% risk factor and a 50% allowance for optimism bias²⁹. Adjusting the Airports Commission's airport cost estimate for these risk items indicates a total airport and land cost for the Airports Commission's interpretation of the TfL scheme of £63 billion. See workings in table 2.6 below.

Table 2.6: Airports Commission independent cost assessment of TfL scheme

	£ billion (real)
Airport cost (including land)	29.8
Risk at 40%	11.9
Optimism bias at 50%	20.9
Total cost estimate post risk and optimism bias	62.6

Source: Airports Commission.

2.3.5. Non-aeronautical revenues

TfL forecasts non-aeronautical revenue of £16.00 per passenger (2012 prices) at the Estuary airport³⁰. This compares to Heathrow current non-aeronautical revenue of circa £13.50 per passenger³¹. TfL's assumption therefore represents a real increase in this measure.

We have summarised the key benchmarks for non-aeronautical revenue per passenger in the table below. We note that Heathrow's non-aeronautical revenue per passenger is already above that of its direct peer group with Amsterdam, Paris and Frankfurt in a range of circa £7 to £13 per passenger. The relative increase is less than that forecast for aeronautical revenues, but is still challenging given specific features of the surface access strategy of most proposals and efficiencies for transfer passengers.

Table 2.7: Non-aeronautical revenue comparison table

Airport (£/passenger)	2010	2012	2030 (2012 prices)
Estuary per TfL	n/a	n/a	16
Heathrow	13	13	n/a
Charles de Gaulle (Paris)	7	n/a	n/a
Schiphol (Amsterdam)	5	n/a	n/a
Frankfurt	4	n/a	n/a

Source: Leigh Fisher, EY report September 2013.

The surface access strategy makes non-aeronautical revenue targets more challenging because of the high passenger usage of public transport that is envisaged. As a result a proportion of car parking revenues will likely be foregone at the Estuary airport. This suggests that to increase non-aeronautical revenues in real terms to £16 per passenger, the Estuary airport would be reliant on strong retail

²⁷ TfL's proposal for a new Hub Airport, EY, 30 September 2013, page 47.

²⁸ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/191507/Optimism_bias.pdf.

²⁹ TfL sift template provided on the Airports Commission website.

³⁰ TfL's proposal for a new Hub Airport, EY, 30 September 2013, page 26.

³¹ Leigh Fisher, 2012/13 UK Airports Performance Indicators report.

performance (both consumer products and food and beverage) at the airport. However, with many proposals highlighting the efficiency of the new facility which should allow for fast transfer times and coordination of flight schedules in a wave-system structure, which Heathrow cannot do optimally at present due to capacity constraints, there is a risk that there will not be sufficient “dwell time” in the shopping area to meet required spend per passenger levels. Traditionally hub airports have benefited from retail spend by transfer passengers as they wait to connect to their next flight.

2.3.6. EBITDA margin

TfL has estimated an EBITDA margin level of 59% at the new Estuary airport³². This compares to a level of 57% at Heathrow in 2013³³, which in turn is again higher than Paris at a margin of 37% in 2012³⁴. Furthermore, we have not observed a major European hub approaching a 60% EBITDA margin level.

As shown in the table below, the EBITDA margin achieved in 2013 was a 6-year high for Heathrow and that the targeted margin level for the Estuary airport is at a 2 percentage point premium to this level at 59%.

Table 2.8: Heathrow airport limited (EBITDA margins – 2008 to 2013)

	2008	2009	2010	2011	2012	2013	2030 (Hub target)
HAL EBITDA margin	40%	45%	47%	51%	52%	57%	59%

Source: HAL annual reports.

Sydney and Auckland airports operate on EBITDA margins in excess of 70%³⁵, but they are less regulated and so face less competition. This is not comparable to Europe where hubs are competing with each other and with Dubai. In addition, Sydney faces limited competition from surface transport.

We accept that construction of the Estuary airport facility will allow for the most modern operational cost efficiencies to be implemented. But given the unprecedented size of the proposed facility, the extent to which efficiencies of scale can be generated above a 100 million passenger level is unclear and would require further analysis. In light of Heathrow's current EBITDA margin level and the recent upward trend in this metric, we consider that the EY assumption may represent a reasonable target level. However, the EBITDA margin is sensitive to traffic volume and will clearly vary over time, as observed for Heathrow. We have summarised the key benchmarks for EBITDA margins in the table below.

Table 2.9: EBITDA comparison table

Airport	2013	2030
Estuary	n/a	59%
Heathrow	57%	n/a
Aeroports de Paris	38%	n/a
Schiphol Group (Amsterdam)	39%	n/a
Fraport (Frankfurt)	33%	n/a
Auckland	75%	n/a
Sydney	80%	n/a

Source: Annual reports, Capital IQ, EY report for TfL September 2013.

³² TfL's proposal for a new Hub Airport, EY, 30 September 2013, page 26.

³³ Heathrow airport Holdings Limited, Annual Report 2013.

³⁴ Capital IQ.

³⁵ Capital IQ.

2.3.7. Airport compensation

Two approaches were used by EY (Paper 3) to estimate a compensation figure for Heathrow; EBITDA multiple and Regulatory Asset Base (“RAB”)³⁶ approaches. Given Heathrow’s regulated asset nature we believe a prospective investor would place greater emphasis on the RAB approach compared to other valuation approaches. However, it is important to consider a multiples approach also for the purpose of assessing reasonableness and for providing an indicative valuation range.

We believe that operating both Heathrow and an Estuary airport in parallel is not economically viable, as discussed at the beginning of this chapter. Heathrow operations would be in direct competition with the new hub and airlines would have limited incentive to move to another airport in the London area. Hence it is assumed that Heathrow would cease to operate. Any funding solution therefore needs to provide for a solution for the closure of Heathrow.

The EY analysis for TfL’s proposal (Paper 3) assumes that the government will purchase the equity of Heathrow airport at market value in 2019 for £6.2 billion (EY assumes that debt of £11.3 billion will remain in place and continue to be serviced by the cash flows generated by Heathrow)³⁷. However, there is a risk that this underestimates the price that will have to be paid as a result of future unforeseen market developments. This introduces the possibility of a legal challenge to the amount of compensation offered.

We highlight that the indicative valuation range we provide does not reflect compensation that may potentially be payable with regard to aviation specific property not owned by HAL in the airport vicinity. Some submissions to the Airports Commission, notably that made by Mark Reckless MP, have also argued that broader compensation would be required in the areas surrounding the airport; we have not attempted to assess this issue, but note that if this were the case, the costs associated with the airport’s closure would rise further.

Recent transactions in Heathrow have been estimated at between 11.6x and 14.7x EV/EBITDA³⁸. The 12x to 15x range applied in the EY/TfL April 2014 analysis therefore appears reasonable³⁹. To derive a real equity price in 2020 the EY report (Paper 3) has assumed a 70% gearing level based on gearing levels as at 2012. In our view this is not an unreasonable approach for estimating the 2020 gearing level.

The multiples applied are consistent with our view that based on current market evidence across the airport sector, larger more mature airports can be expected to transact in a range of 10 to 14 times EV/EBITDA. Typically we would only expect higher growth regional airports to transact within a higher range of 14 to 18 times EV/EBITDA. Prior to the financial crash in 2008, a number of airports transacted at upwards of 25x EV/EBITDA. While this was largely confined to airports of a regional nature, renewed investor interest in the airport sector could inflate the transaction multiples for both large, mature airports and for smaller regional targets once again.

Applying a 14x to 18x sensitivity range to Heathrow EBITDA as indicated in the EY analysis, with all other assumptions unchanged, implies a real equity value range of £5.4 billion to £7.7 billion (see table 2.11). This compares to a real equity value range of £4.7 billion to £6.5 billion based on a 12x to 15x EBITDA multiples range applied by EY (see table 2.10). We highlight that the ultimate cost of acquiring Heathrow will be the enterprise value range as both debt holders and equity holders will have to be compensated. Overall, our review of the EY analysis indicates an enterprise value range of £13.5 billion to £21.5 billion. Tables 2.10 – 2.13 below provide a summary of the key reference data and how this range has been derived. Table 2.10 shows the EY valuation output.

³⁶ RAB: A measure of the asset value of Heathrow used in Heathrow’s regulatory dealings with the CAA and in its financing arrangements.

³⁷ TfL’s proposal for a new Hub Airport, EY, 30 September 2013, page 64.

³⁸ “Ferrovial sells Heathrow stake to UK pension fund”, *Financial Times*, 22 October 2013, and Heathrow company accounts.

³⁹ Meeting with the Airports Commission, Mayor’s submission, EY, 29 April 2014, page 10.

Table 2.10: Heathrow indicative equity valuation table: Multiples approach

	EY (£m) multiples approach ⁴⁰	
	Low	High
EBITDA	1,297	1,434
Multiple range	12x	15x
Enterprise value	15,567	21,507
Gearing	70%	70%
Implied equity value	4,670	6,452

Source: Meeting with the Airports Commission, Mayor's submission, EY, 29 April 2014.

Table 2.11 shows the valuation output sensitised for a higher multiple range of 14x to 18x.

Table 2.11: Heathrow indicative equity valuation table: Multiples approach sensitivity

	Sensitivity (£m)	
	Low	High
EBITDA	1,297	1,434
Multiple range	14x	18x
Enterprise value	18,158	25,812
Gearing	70%	70%
Implied equity value	5,447	7,744
Increase in equity value	+17%	+20%

Source: Table 2.10 and PwC analysis.

The alternative approach to assessing the commercial value of Heathrow would be a RAB based approach. The EY report (Paper 3) states that an analysis of RAB premiums for airports and utility companies transactions show that companies are typically valued at 1.0x and 1.3x over RAB⁴¹. The deal in October 2013 with the UK Universities Superannuation Scheme implied an enterprise value for Heathrow that represented a 13 per cent premium to the airport's regulated asset base⁴². In the table below, we have set out the EY valuation based on the RAB approach.

The analysis in table 2.12 indicates an implied equity valuation range of £4.1 billion to £5.3 billion, i.e. slightly lower than the £4.7 billion to £6.5 billion derived using EY's EBITDA multiple range. This implies a total amount payable to holders of both debt and equity in Heathrow at between £13.5 billion and £17.6 billion.

Table 2.12: Heathrow indicative equity valuation table: RAB approach

	EY (£m) RAB approach	
RAB	13,525	13,525
RAB premium	1.0x	1.3x
Estimated EV	13,525	17,583

⁴⁰ Meeting with the Airports Commission, Mayor's submission, EY, 29 April 2014, page 10.

⁴¹ Meeting with the Airports Commission, Mayor's submission, EY, 29 April 2014, page 10.

⁴² "Ferrovial sells Heathrow stake to UK pension fund", Financial Times, 22 October 2013, and Heathrow company accounts.

	EY (£m) RAB approach	
Gearing	70%	70%
Implied equity value	4,058	5,275

Source: Meeting with the Airports Commission, Mayor's submission, EY, 29 April 2014.

Table 2.13 below summarises the equity valuation ranges for Heathrow.

Table 2.13: Heathrow summary of enterprise valuation approaches

£m	Low	High
Multiples approach (12x to 15x)	15,567	21,507
RAB approach (1.0x to 1.3x)	13,525	17,583
Full range of indicative enterprise values	13,525	21,507

Source: Tables 2.10, 2.11 and 2.12; PwC analysis.

The indicative enterprise values range from £13.5 billion to £21.5 billion. The valuation ranges cited in the EY analysis (Paper 3) do not seem unreasonable as an estimate for Heathrow airport's value based on current available evidence. However, we repeat that the indicative valuation range does not reflect any compensation payable to owners of aero specific property assets at Heathrow and that unforeseen market developments could impact the compensation required.

2.3.8. London City and Southend airports

In its Interim Report, the Airports Commission stated, based on advice from NATS, that it was likely that the operation of an inner Estuary airport would entail the closure for airspace reasons of London City and Southend airports. NATS have subsequently provided further advice to the Airports Commission on this issue, which seeks to take account of the potential for future technological improvements to mitigate these effects. NATS conclusion is that even with such improvements, the full operation of an Estuary airport would have a significant effect on London City and Southend, preventing them operating in an unrestricted manner. NATS do not reach a firm view on whether those operating restrictions would be sufficiently severe to make one or both of those airports commercially unviable.

Given the uncertainty in this area, we have not included any assessment of the commercial implications of closing these airports in this report. Similarly, any economic impacts arising have not been discussed in detail in the subsequent chapters.

3. National economic impacts

Chapter summary

This chapter focuses on the national impacts of building and operating an Estuary airport. The following chapters consider the local impacts.

Construction phase

The resources invested in building a new airport in the Thames Estuary will have significant national and local economic impacts. However, these impacts are another way of measuring the cost of a scheme and under government appraisal guidelines (set out in the Green Book) would be treated as a cost, not a benefit at a national level.

TfL have produced estimates for the direct, indirect and induced effects associated with this investment. They have presented these in terms of the activity generated, which they estimate to be 143,000 jobs and GVA of £7.4 billion in 2020, the peak year of the build⁴³. It is also important to highlight that the activity created in the construction phase will largely be temporary, lasting during the build phase only.

Operational phase

TfL have also assessed the direct, indirect and induced effects of the operational phase of the airport. They estimate that operating the Estuary airport will support 280,000 jobs and £20.9 billion in GVA per annum in 2030, rising to 388,000 jobs and £42.3 billion in GVA by 2050.

This is the gross impact of operating the airport and does not account for the jobs lost at the airports which would be closed, such as Heathrow.

TfL have estimated that through direct, indirect and induced effects Heathrow would support 225,000 jobs and £17.9 billion in GVA per annum in 2030, rising to 245,000 jobs and £28.3 billion in GVA per annum in 2050. These figures assume no additional runways are built at Heathrow.

The effects of closure may be mitigated to some degree by redevelopment of the sites. However, existing research from Oxford Economics, Ramboll and Jones Lang Lasalle have not presented any comparable evidence on this at a national level, which could be an area for further research. Moreover, there is significant uncertainty over redevelopment, in particular what form it could take and whether it would deliver significant mitigating effects at a national level.

The impact of operating the Thames Estuary airport is also critically dependent on the airport being a commercial success and achieving the passenger traffic forecasts that are set out (90 million per annum on opening in 2030, rising to 170 million passengers per annum in 2050). Chapter 2 identifies several risks to the commercial viability of an Estuary airport.

We also note that if these economic effects are broadly proportionate to demand then it may be possible to see similar GDP and employment impacts from operating airports in the London System through other expansion options that provide capacity to meet unconstrained demand forecasts. In addition, these effects are not the most important reason why additional airport capacity is desirable at a national level, we believe the wider economic effects facilitated by increased connectivity could be more important.

Catalytic impacts

There is an extensive academic literature capturing catalytic effects through the association between aviation connectivity and GDP, although the direction of causality is unproven.

⁴³ All monetary values in this summary are in constant 2013 prices.

TfL have estimated that the Estuary airport could boost connectivity by 9% and GDP by 0.5% in 2050. This analysis compares the implications of building the Estuary airport against no airport expansion (a “Do Minimum” scenario). Increases in connectivity could also be achieved through other airport expansion options within the London System that allow the unconstrained forecast to be met.

We have also looked at the available evidence on whether building a single large hub airport in the Thames Estuary would boost connectivity relative to alternative expansion options. Further analysis is required to answer this question, but the initial evidence, including modelling conducted by the Airports Commission, suggests that a single hub may offer greater connectivity, but that the impact may be less than the 9% figure used for comparing the Estuary airport with no expansion.

Any connectivity boost from a single hub relies on the Estuary airport attracting interchange passengers. The proposed landing fees (which are 50% higher than those at Heathrow) would be a risk to the airport’s ability to attract such traffic.

3.1. Introduction

In this chapter we review the evidence that has been presented on the potential national economic impacts of building a new airport in the Thames Estuary. As elsewhere in this report we consider the four Estuary proposals currently under consideration.

These proposals present a vision of a major hub airport in the Thames Estuary that could serve up to 170 million passengers by 2050 (Heathrow currently serves 70 million). The new airport is expected to support employment and economic activity during its construction and operation. It also may spur wider catalytic effects by enhancing the UK’s connectivity with the rest of the world.

This chapter describes and evaluates the evidence on these impacts. It is also accompanied by a detailed description of the key documents reviewed in Appendix B.

The majority of the evidence considers the impact of the Estuary airport expansion relative to a “Do Minimum” scenario. A Do Minimum scenario typically assumes that all existing infrastructure is simply maintained at its current level and no improvement occurs. In this case the Do Minimum scenario would entail continued operations at Heathrow airport and no expansion of airport capacity in the London System.

The Estuary development would have impacts on other airports and, further to the discussion in Chapter 2, we assume that Heathrow would have to close when making this assessment.

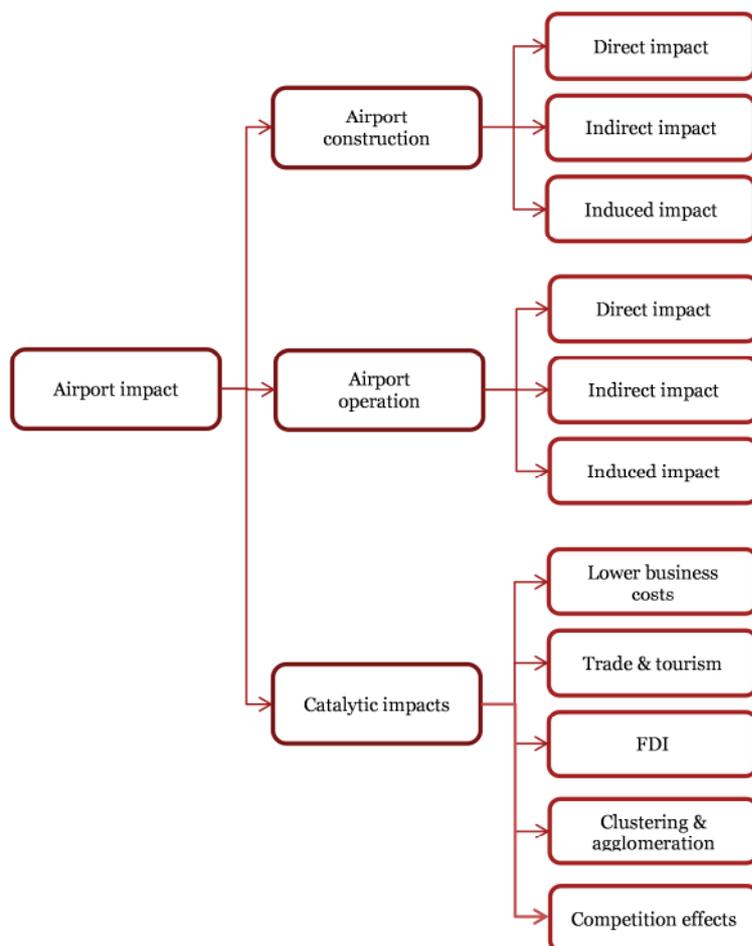
We structure the remainder of this chapter based on the type of evidence presented:

- **The direct, indirect and induced effects** - which reviews the evidence on economic effects of building and operating the airport; and
- **Catalytic effects** - which considers how changes to airport provision may affect the economy through supply side effects and enabling other economic activity to occur⁴⁴.

These impacts are illustrated in figure 3.1 below.

⁴⁴ The focus of the analysis is GDP effects. We do not assess changes to consumer surplus that may result from changes in travel times.

Figure 3.1: Illustration of types of national economic impacts



Source: PwC.

The measures of “direct, indirect and induced” effects aim to assess the GDP impacts of building and operating a new airport in the Thames Estuary. Whilst it is common to present such data for major projects it is also important to contextualise them adequately. These types of impact represent, for the most part, the economic *costs* of providing air transport services, rather than the benefits, because they represent resources that are diverted from other potential uses in order to support air transportation⁴⁵.

The direct, indirect and induced effects do not, therefore, necessarily equate to the fundamental benefit of air transportation and hub airports. Such gains arise from “supply side” effects from greater connectivity, lower costs to business, reduced travel times and the facilitation of trade, competition and investment. These are considered in the section on catalytic impacts.

It is also the case that the government transport appraisal techniques focus on the unique benefits of transport (e.g. travel time savings and increased accessibility to firms, markets and workers) rather than the direct, indirect and induced effects. We recognise that airport development differs somewhat from other transport improvements but in our view the fundamental impacts of enhanced airport capacity are the catalytic effects and the welfare and journey time impacts (although the latter are not considered in this report).

⁴⁵ As noted by Appold and Kasada (2009).

3.2. Direct, indirect and induced effects

This section discusses estimates of the direct, indirect and induced effects of building and operating a new airport in the Thames Estuary. It also considers the impact of the closure of Heathrow.

Several studies submitted quantified **direct**, **indirect** and **induced** effects. This terminology is commonly used in economic impact analysis and the terms can be defined as follows:

1. **Direct impacts** quantify the economic effect of a business directly involved in a given project or industry. In this case they relate to the employment and GDP generated by firms which will build and operate the airport and transport links (e.g. airlines, baggage handling, on-site retail and restaurants).
2. **Indirect effects** measure the economic impact in the supply-chain as firms directly involved in building and operating the airport purchase goods and services from UK-based suppliers, in turn generating economic output and employment among suppliers.
3. **Induced effects** arise because the direct and indirect effects mean wages are paid to workers, some of which are used to purchase goods and services for their own consumption. For example, this would include airline employees' spending money on grocery shopping (provided it is not at the airport). This spending supports additional output and jobs in the industries that supply these purchases.

Indirect and induced effects are also termed “multiplier” effects, as they are typically quantified as a multiple of direct impacts. These impacts are commonly expressed in terms of the number of jobs supported, or the amount of Gross Value Added (“GVA”) generated.

3.2.1. Construction impacts

Construction of an airport in the Thames Estuary would be a major civil engineering project that would entail significant construction costs. Several of the scheme proposers have highlighted that this spending will result in construction employment and associated GVA.

As stated in the opening of this chapter, the context of these estimates is as important as the figures. The scheme proposers highlight the construction impacts as an advantage of the Estuary airport. This is the opposite treatment to standard government cost benefit analysis as set out in the Green Book. The value spent on building a project (and on-going operational costs) are treated as costs and are set against the benefits when computing the benefit cost ratio (“BCR”).

The cost estimates for the four different Estuary airport schemes and the Airports Commission’s scenario are shown in the table below. The Airports Commission estimates are materially higher than the others because they have included further allowances for surface transport costs and risk and optimism bias.

Table 3.1: Construction cost estimates for Estuary airport schemes

Scheme	Cost estimate (Airports Commission)	Cost estimate (scheme proposer)	Notes
TfL Isle of Grain	£85.6 billion	£68.3 billion	Includes £9.2 billion for surface access improvements and an additional risk allowance of £16.3 billion
Foster + Partners Thames Hub Airport	£68.9 billion	£24 billion (first phase only)	Excludes surface transport improvements
IAAG Cliffe Airport	£66.4 billion	None provided	Including all supporting infrastructure (£9.2 billion on surface access)
Thames Reach	£71.4 billion	£28 billion	Including the cost of the Metrotidal

Scheme	Cost estimate (Airports Commission)	Cost estimate (scheme proposer)	Notes
Airport			Tunnel
Airports Commission scenario	£93 billion-£125 billion	NA	Including £25 billion-£34 billion of surface access costs, £18 billion-24 billion of risk allowance and £31 billion-42 billion of optimism bias

Source: Airports Commission, note we have taken the independent cost assessments from the sift documents as well as the figures provided by the scheme proposers to aid comparability between figures. The costs for the Airports Commission scenario were prepared as part of a later sift stage so are based on a fuller analysis.

Only TfL have provided detailed estimates of the construction employment and GVA associated with building and maintaining the airport and surface access infrastructure⁴⁶. Estimates are given for peak construction activity in 2020, which would deliver GVA of £7.4 billion and employment of 143,000, as shown in table 3.2 below. It is also important to highlight that the activity created in the construction phase will largely be temporary, lasting during the build phase only⁴⁷.

Table 3.2: Estimated construction impacts, peak year 2020

Scheme	Direct impact	Indirect impact	Induced impact	Total
TfL Isle of Grain	Employment 50,000 GVA £2.5 billion	Employment 58,300 GVA £3.1 billion	Employment 34,800 GVA £1.8 billion	Employment 143,000 GVA £7.4 billion

Source: Oxford Economics and Ramboll, 2013 constant prices.

We have reviewed the methodology described to produce these estimates and it appears to follow a reasonable approach⁴⁸. The analysis uses estimates from Atkins (an engineering firm) on the cost of building and maintaining the airport and associated infrastructure. The Oxford Economics and Ramboll report then derives direct GVA and employment estimates based on sector level ratios of GVA per unit of turnover, and productivity (GVA per employee). Multipliers are then applied to estimate the national indirect and induced effects⁴⁹.

Under the approach used the economic impact of the scheme is proportionate to the cost (i.e. the more expensive the scheme, the greater the impact). The cost estimates for the schemes produced by the Commission imply that construction costs may be materially higher than expected by the scheme proposers (by 50-150%). Use of the Commission's estimates would therefore give a higher construction impact.

A further issue related to this estimate that is not considered is that the commitment of large quantities of public and/or private funds to the Estuary scheme may displace or crowd-out other investment opportunities that could also have delivered some economic impact.

Given the scale of the scheme and the major impact it would have on resources in the UK construction sector, the approach could potentially be extended using a Computable General Equilibrium model. This could account for the impact on wages and input costs in the construction sector from a scheme of this size which is not accounted for in the current analysis.

⁴⁶ "Impacts upon the local and national economy", Oxford Economics and Ramboll, 2013.

⁴⁷ It can be more appropriate to present temporary impacts like these using a net present value that allows the impacts to be combined over a number of years, whilst also accounting for time preference.

⁴⁸ See Appendix B for more detail.

⁴⁹ The type I multiplier used is 2.2 and the type II multiplier is 2.9 for both GVA and employment.

3.2.2. Operational impacts

A range of estimates have been produced that assess the direct, indirect and induced economic activity associated with operating the Thames Estuary and Heathrow airports. An idea of the net effect of the Estuary airport (i.e. opening it and closing Heathrow) can be obtained by weighing these estimates against each other. Proponents of the Thames Estuary airport point out that there may be some additional economic gains from redeveloping the Heathrow site. However, no national estimates on this impact have been produced that are comparable with the estimated impact of operating the airports.

It is also important to highlight the significant risk and uncertainty around what redevelopment effects would actually occur, when they may happen, and whether the benefits would be material at a national level.

The remainder of this sub-section reviews the analysis submitted to the Airports Commission on these issues.

Several of the scheme proposers have provided evidence to the Commission on the direct, indirect and induced impact of operating the new Estuary airport:

- TfL commissioned Oxford Economics and Ramboll to consider this impact. They estimated that the airport would support 116,000 direct jobs, 144,000 indirect jobs and 129,000 induced jobs in 2050. This is equivalent to £42.3 billion of annual GVA (in 2013 prices);
- Foster + Partners estimate that the airport would support 100,000 direct on-site and 100,000 direct and indirect off-site jobs. They also estimate an economic benefit of £75 billion;
- The International Aviation Advisory Group's proposal for an airport at Cliffe did not provide quantitative estimates, although a similar scheme, also based at Cliffe, estimated the airport would support 100,000 on-site jobs and a further 100,000 in the region⁵⁰; and
- The Thames Reach Airport documents did not provide specific figures for these impacts.

A detailed methodology describing the TfL figures is provided in the report published by Oxford Economics and Ramboll⁵¹. Their approach estimates the level of direct employment and GVA at the Estuary airport by benchmarking productivity levels to Heathrow (measured as employment and GVA per passenger). Total values are then estimated based on projections for passenger numbers. Indirect and induced economic and employment effects are estimated using economic multipliers.

The key aspects of the methodology that drive these estimates are:

- The Heathrow productivity benchmark;
- The assumptions made by TfL about passenger number forecasts at the Estuary airport; and
- The multipliers that are applied to estimate indirect and induced effects.

We consider that using Heathrow as a productivity benchmark is a reasonable assumption although we believe there are some risks to this. It might be expected that a new build airport would be more efficiently designed than Heathrow, in which case it would support fewer workers per million passengers. Other factors may also affect efficiency, such as scale, and the time taken to transition existing staff (from Heathrow) and train new employees.

The benchmark data is sourced from the Heathrow employment survey which only includes on-airport direct jobs. A small proportion of direct airport employment does occur off-site, so the direct employment estimates are therefore conservative. This data source reports total employment, rather

⁵⁰ Based on the London Medway Airport "London Medway Airport: Evidence to the Airports Commission", July 2013.

⁵¹ "Impacts upon the local and national economy", Oxford Economics and Ramboll, 2013.

than full-time equivalent employment. The employment estimates for the Estuary airport are likely to be on the same basis although this is not clear in the report.

The second key assumption is the number of passengers using a new Estuary airport. Demand assumptions for each of the schemes are presented in table 3.3 below. Under the TfL methodology the estimated employment and GVA impacts are proportional to the number of passengers. The estimates for the TfL scheme in 2050 are 19% higher than the Airports Commission estimate. Similarly the Thames Reach Airport estimates are 26% higher. This represents a significant risk to the estimates as any shortfall in passenger numbers would lead to a proportionate decrease in the economic contribution and employment of the airport. We also note that if these economic effects are broadly proportionate to demand then it may be possible to see similar total GDP and employment impacts from operating airports in the London System through other expansion options that provide capacity to meet unconstrained demand forecasts

Table 3.3: Passenger demand assumptions at different Estuary airport schemes, million passengers per annum

Estuary scheme	Passenger numbers 2030	Passenger numbers 2050	Percentage difference from Airports Commission assessment in 2050
TfL	90	170	+19%
Foster + Partners	110	150	+5%
IAAG Cliffe Airport*	100	140	-2%
Thames Reach Airport	100 (stated as below 100)	180	+26%
Airports Commission scenario*	105	143	NA

Source: Proposal submission documents.

*Note: These are sourced from Sift documents 47 and 67.

The final part of the approach is the multiplier effects. The multipliers are not directly stated, but they can be inferred from the values provided for direct, indirect and induced impacts. Type I multipliers are calculated by dividing the sum of the direct and indirect impacts by the direct impact, while the Type II multipliers are calculated by dividing the sum of the direct, indirect and induced impacts by the direct impact. The implicit multipliers from the Oxford Economics paper are shown in table 3.4 alongside benchmarks from the assessment of other airports. On this basis the multipliers used appear to be reasonable as they are broadly similar to the benchmarks, although the type I and type II employment multipliers are higher than the limited number of comparators shown.

Table 3.4: National economic multipliers

Airport	Source	Indirect (type I) multiplier	Indirect and Induced (type II) multiplier
Estuary airport	Oxford Economics	GVA 1.9 Employment 2.2	GVA 2.6 Employment 3.4
Heathrow	Optimal Economics	Employment 1.6	Employment 2.6
Heathrow	Frontier Economics	Employment 1.6	Employment 2.3
Phoenix		n/a	GVA 4.0
Houston	Australian Department for Infrastructure and Transport survey	n/a	GVA 3.0
Dubai		n/a	GVA 3.5
New Delhi		n/a	GVA 2.5

Airport	Source	Indirect (type I) multiplier	Indirect and Induced (type II) multiplier
Average of 14 Airports		n/a	GVA 3.4

Source: compiled by PwC from various sources, principally “Economic and Social analysis of potential airport sites”, Australian Department for Infrastructure and Transport, 2012. Where multipliers are not directly stated they have been inferred using the GVA and Employment data reported.

The Foster + Partners and London Medway schemes provided no explanation of the basis for the employment and GDP estimates they provided. It is also unclear to which period the values pertain and how they map to the direct, indirect and induced framework. If we assume that Foster + Partners employment figures are for an airport opening in 2030 and cover direct and indirect impacts only, then they are broadly consistent with the TfL figures, who estimated that the airport would support 190,000 direct and indirect jobs in 2030.

There is a separate GVA estimate from Foster + Partners of a £75 billion benefit of the airport. However, it is also unclear how this has been derived or the time period or type of impacts to which it refers.

3.2.3. The impact of airport closures – Heathrow

The above estimates consider the gross impact of operating the Estuary airport, but unlike the other proposals for additional runway capacity (i.e. at Heathrow and Gatwick), the operation of a new airport in the Thames Estuary would require the closure of Heathrow. Therefore the lost economic contribution as a result of that closure also needs to be considered in the assessment.

Estimates for the national direct, indirect and induced impacts of Heathrow’s closure were submitted to the Commission. The key evidence received is summarised below⁵²:

- Optimal Economics estimated that Heathrow supported 84,300 direct, 44,400 indirect and 77,200 induced employees in 2010⁵³. The equivalent annual GVA contribution was estimated to be £9.7 billion (2010 prices).
- Oxford Economics considered different scenarios for Heathrow’s closure and estimated that it would have a gross national impact of 76,000 direct, 93,000 indirect and 76,000 induced job losses in 2050. The equivalent total GVA contribution is estimated to be £28.3 billion in 2050 (2013 prices). These forecasts are based on Heathrow serving 82 million passengers in 2030 and 93 million in 2050.

These estimates imply that there will be fewer direct jobs at Heathrow in the future than currently. In part this is due to the inclusion of off-airport direct jobs in the Optimal Economics estimate. Without this methodological difference the numbers are broadly in-line for 2010 and 2050 as Oxford Economics assume that greater labour productivity offsets the impact of rising passenger numbers over time.

We have provided a detailed description of these approaches in Appendix B. There are significant methodological differences in the approaches, especially the multipliers used, and we consider that the Oxford Economics estimates for the gross national impacts of Heathrow are the most appropriate. These are also directly comparable to the Oxford Economics and Ramboll estimates for the Estuary airport.

One factor that has not been considered in detail in the evidence we have reviewed is the transition of Heathrow to closure. The above estimates effectively assume that Heathrow would be operating at full capacity and fully productively up to the day of closure. In practice, once closure is confirmed the

⁵² A more detailed description can be found in the Appendix B.

⁵³ “Heathrow Employment Study”, Optimal Economics, 2011.

operations may not just continue as usual. It may be that closure plans lead to reduced investment and maintenance, impacts on staff morale, and many other factors that could affect its operation.

Several of the scheme proposers have pointed out that the lost activity at Heathrow may be mitigated by the redevelopment of the site. The Heathrow site is relatively close to the centre of London and has strong transport links. Few other locations offer such a large quantity of land with these attributes.

Quantified estimates of the local effects of redevelopment have been produced by Oxford Economics⁵⁴. Their research considers the implications of closing Heathrow under two scenarios: first where Heathrow is not redeveloped and second where it is redeveloped as a predominantly residential site. The analysis considers that after closing Heathrow some of the people living locally will find alternative employment by going to work at the Estuary airport or finding alternative employment in the Heathrow area or elsewhere. The analysis also looks at the jobs that might be created by redeveloping the site (e.g. construction jobs) and the associated residential employment to serve the additional population once the redevelopment is complete (e.g. convenience stores, dry cleaners etc.).

The study only assesses the local effects of redevelopment on the local authorities surrounding Heathrow. These local estimates cannot be compared to the national effects at the Isle of Grain as many of the offsetting jobs considered may be displaced from elsewhere leading to negative local impacts outside of the narrow study area that would need to be included in a national assessment. For example, the associated residential employment (the main source of jobs in the redevelopment scenario) would occur wherever that population is based (i.e. moving people from somewhere else to new homes in Heathrow will just displace these jobs from wherever the people previously lived) – this is not a national benefit.

The only comparable national figures provided in this study are the loss of 245,000 jobs by 2050 from closing Heathrow as described above. Subtracting this from the impact of the Estuary airport would assume no offsetting impacts from redeveloping Heathrow. Whilst this might give an excessively conservative estimate of the net benefit of the Estuary airport, in the absence of comparable evidence of the national redevelopment effects, no figures on the mitigating effects can be presented. This evidence would be required in order to assess fully the net benefit of the Estuary airport.

The Jones Lang Lasalle study on Heathrow redevelopment also estimates potential local GVA and employment effects⁵⁵. As with the Oxford Economics study, this report does not provide any comparable national level estimates⁵⁶.

Overall, we believe that there is significant risk and uncertainty around what redevelopment effects may actually occur, when they may happen, and whether the benefits would be material at a national level.

As noted in the previous chapter, it is also likely that the operation of an inner Estuary airport would restrict operations at London City and Southend airports and could potentially require the closure of one or other site. While this is less certain than the requirement to close Heathrow, it would entail a further economic cost, though of a far smaller scale.

3.2.4. Summary of operational impacts

We provide a summary of the evidence presented on the gross national operational impacts of the different airports in table 3.5. It is clear that compared to a Do Minimum scenario (i.e. where there is no change in airport capacity from the current level) the operation of the Estuary airport would have incremental economic effects. It is materially larger than a two-runway Heathrow and, depending on the design, would provide enough capacity to meet all or the vast majority of the unconstrained passenger demand for capacity in the London System up to 2050.

⁵⁴ “Impacts of closing Heathrow airport and initial analysis of redevelopment impacts”, Oxford Economics, 2013.

⁵⁵ “Heathrow airport Redevelopment Scenarios”, Jones Lang Lasalle, February 2014.

⁵⁶ This study is discussed in more depth in Chapter 4.

However, it should be noted that these impacts may not be unique to the Estuary proposition. If you consider the total direct, indirect and induced impacts of operating airports in the London System (i.e. summing the effects of all of the airports in the system), the total impact under an Estuary scenario may be similar to an alternative expansion scenario that meets the unconstrained demand forecasts. This is because the scale of these impacts is likely to be broadly proportionate to the level of traffic accommodated.

Moreover, as we discussed in the introduction to this chapter, these effects are not the key reason why airport capacity is desirable at a national level. We consider that the ability of connectivity to facilitate wider economic effects is more important. The direct, indirect and induced effects capture the scale of resources invested in building and operating the airport, but commitment of large quantities of public and/or private funds to the Estuary scheme may displace or crowd-out other investment opportunities that could also have delivered some economic impact.

There are also significant risks to the estimates of the impact of the Estuary airport. In particular, the passenger forecast numbers may not be realised, and there may be delays to opening the airport and transferring activity from Heathrow, meaning that benefits would be realised later and be more heavily discounted. In addition, the local areas may not have sufficient workforce capacity to support operations.

Table 3.5: Annual operational impacts of airports, gross national impacts, 2030

Scheme and evidence	Direct impact	Indirect impact	Induced impact	Total
Estuary airport gross benefit (Oxford Economics)	Employment 85,600 GVA £8.0 billion	Employment 104,500 GVA £7.3 billion	Employment 89,900 GVA £5.6 billion	Employment 280,000 GVA £20.9 billion
Heathrow gross closure (Oxford Economics)	Employment 71,200 GVA £6.9 billion	Employment 85,800 GVA £6.1 billion	Employment 68,100 GVA £4.8 billion	Employment 225,100 GVA £17.9 billion

Sources: As stated. Monetary values are in 2013 constant prices.

In 2030, the gross national effects of operating the Estuary airport are estimated to be over 15% greater than Heathrow, with GVA of £20.9 billion, compared to £17.9 billion. By 2050 the gap is expected to increase, as these figures assume that the Estuary airport would increase to 170 million passengers, whilst due to capacity constraints Heathrow would record limited growth. These values are shown in table 3.6 below.

Table 3.6: Annual operational impacts of airports, gross national impacts, 2050

Scheme and evidence	Direct impact	Indirect impact	Induced impact	Total
Estuary airport gross benefit (Oxford Economics)	Employment 116,100 GVA £16.3 billion	Employment 143,500 GVA £14.7 billion	Employment 128,500 GVA £11.3 billion	Employment 388,200 GVA £42.3 billion
Heathrow Gross closure (Oxford Economics)	Employment 76,100 GVA £11.0 billion	Employment 92,600 GVA £9.7 billion	Employment 76,100 GVA £7.6 billion	Employment 244,800 GVA £28.3 billion

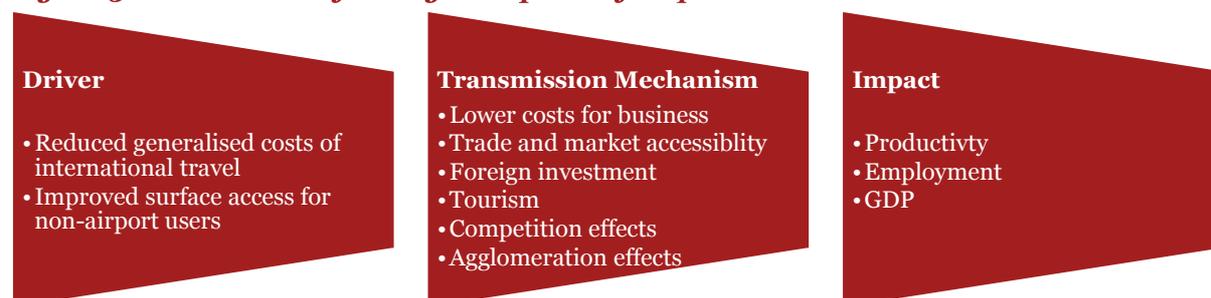
Source: As stated. Monetary values are in 2013 constant prices.

3.3. National catalytic impacts

Catalytic economic effects can be defined as the ability of airports to facilitate economic activity beyond the immediate supply chain. These are distinct from, and additional to, the direct, indirect and

induced effects. These catalytic effects arise from the use of aviation services by other sectors of the economy, as illustrated in the schematic below.

Figure 3.2: Schematic of catalytic impacts of airports



Source: PwC.

The key driver of catalytic effects in the context of an airport is derived from the fundamental benefit of air travel – the potential saving in generalised costs in carrying out work-related and other journeys – leading to improved connectivity. A reduction in generalised costs will be derived from reductions in travel times, financial costs, improvements in reliability, and reductions in the time taken to access a given range of destinations due to an increase in the alternative destinations available from a hub.

Reductions in travel times imply an increase in the accessibility of ‘markets’ as broadly defined. These ‘markets’ are sources of inputs and destinations for outputs for all types of economic agent. These include markets for firms’ factors of production (workers, intermediate goods and services, knowledge and information); and places of consumption of goods and leisure activities for workers and markets in which they can sell their labour.

This effect would impact the economy through several transmission mechanisms. When air transport is a direct input into production through business travel or freight transportation, reductions in costs are likely to lead to improvements in productivity – in the sense of more output from the same resources, or the same output from fewer resources. There are also direct consumer benefits from reductions in the generalised cost of leisure travel, which would boost consumer surplus but would not affect the GVA measures we are considering.

There may also be more general gains from trade due to reductions in trade costs across countries (allowing a more efficient allocation of production in line with comparative advantages). There are potential selection effects from market access which stem from changes in exposure to competition through trade. Exposure to competition may lead to the exit of inefficient firms and survival of more efficient firms, with resulting improvements in aggregate efficiency⁵⁷.

3.3.1. Connectivity and economic performance

Several of the scheme proposers have submitted evidence on the link between connectivity and the economy, and this evidence is discussed in the remainder of this sub-section. In summary, there is an extensive academic literature capturing catalytic effects through the association between aviation connectivity and GDP. However there are outstanding issues around the direction of causality between these two factors (i.e. will increases in connectivity bring about an increase in GDP, or are they simply correlated?). We also believe there is a gap in the analysis regarding the extent to which connectivity differs between a single hub in the Thames Estuary and alternative expansion options in the London System (e.g the addition of runways at Heathrow and Gatwick).

The majority of evidence submitted to the Airports Commission and academic literature considers catalytic impacts in the round by linking changes in aviation connectivity to a measure of economic impact such as GDP. These approaches, which are described in more detail below, should capture all of the net catalytic effects as they assess relatively high level indicators like national GDP and national

⁵⁷ See Melitz 2003 for a more detailed description.

aviation connectivity. These studies should also capture the implications of connectivity on GDP via competition effects and other transmission mechanisms.

The academic literature looks at the national linkages between aviation connectivity and either the transmission mechanisms or economic impacts above. We have focused on the latter since looking at a single transmission mechanism in isolation is not always informative and may not capture the net effects in the round. A focus on GDP provides a more systematic assessment and aids comparability with other figures presented in this report.

For example, we categorise international trade as a transmission mechanism, not an output. An increase in trade does not lead to a 1:1 increase in GDP. GDP is computed through the addition of exports and subtraction of imports. In the short-run the net effect on GDP will depend on how aviation connectivity affects the balance of exports and imports, which may add to or subtract from GDP. There will also be longer term supply side effects as greater trade is generally considered to boost long-run GDP, through spurring improvements in productivity via greater competition and economies of scale and scope. We have summarised selected research in this area in table 3.7 below.

These papers use a number of different measures of connectivity. The IATA connectivity measure is based on the number and importance of destinations served, frequency of service and the number of onward connections. Other studies tend to use simpler volume-based figures such as seat capacity, number of passengers or volume of freight. These measures are likely to be less effective at capturing the economic importance of different routes.

Table 3.7: Selected research on the link between connectivity and economic performance

Reference	Elasticity	Connectivity measure	Impact area
<i>IATA, Aviation Economic Benefits, 2007</i>	10% rise in air connectivity boosts GDP by 0.07%	IATA's connectivity indicator (the number and importance of destinations served, frequency of service and number of onward connections)	Increased labour productivity
<i>OEF, The Economic Contribution of the Aviation Industry in the UK, 2006</i>	10% increase in business air usage raises GDP by 0.6%	Business air usage – number of business passengers plus tonnes of cargo freight loaded and unloaded – referred to as “Work Load Units”	Total factor productivity within each industry
<i>IATA, Airline network benefits, 2006</i>	10% rise in air connectivity feeds through to an increase in GDP of 1.1%	IATA's connectivity indicator (see above)	Increased in business investment (0.6%) and increased total factor productivity (0.9%)
<i>OEF, The economic catalytic effects of air transport in Europe, 2005</i>	10% rise in air connectivity boosts GDP by 1.9%	Overall air usage – total passengers (business + leisure) plus total freight, where 10 passengers = 1 metric tonne of freight	Increased business investment (1.6%) and increased total factor productivity (1.9%)
<i>PwC, Econometric analysis to develop evidence on the links between aviation and the economy, 2013</i>	10% rise in air connectivity is associated with 1% rise in GDP	Direct seat capacity	Direct relationship between GDP and connectivity
<i>Oxford Economics, Impacts on the UK economy through the provision of international connectivity, 2013</i>	10% increase in business air usage raises GDP by 0.5%	Business air usage – number of business passengers plus tonnes of cargo freight loaded and unloaded – referred to as “Work Load Units”	Total factor productivity within each industry

Sources: As stated.

The evidence shows a link between aviation connectivity and economic output that has been estimated over a range of different connectivity measures and economic variables. However, there is significant divergence in the estimated scale of this link, with the highest estimates more than an order of magnitude above than the lowest.

There are also several important caveats and limitations associated with this analysis:

- **Causality and endogeneity:** The results show an association or correlation between aviation connectivity and economic performance, but they do not prove that better connectivity drives improved economic performance⁵⁸. For example, if a country invests heavily in tourist infrastructure and experiences more tourist arrivals it may be that the provision of infrastructure encouraged tourists to visit, but it is equally plausible that the need for such investment was driven by an increase in tourist arrivals.
- **Geographical granularity:** Most connectivity measures are not location or country specific and the effects will differ between destinations connected. For example, an increase in short-haul leisure services to destinations such as Ibiza or Crete will have very different implications to additional long haul routes to Shanghai.
- **Differentiation between airports:** The studies look at connectivity at the national level which effectively treats airports as having uniform characteristics. In practice, connectivity provided from the Estuary airport may have different implications than connectivity provided by Heathrow.

These limitations were also raised in the academic peer review of econometric models linking connectivity to GDP that was produced by the Airports Commission for its interim report⁵⁹.

3.3.2. Submissions on connectivity

The scheme proposers have commissioned and cited several studies on the link between connectivity and the economy for consideration by the Commission.

- The Foster + Partners proposal for the Thames Hub airport cites a CBI estimate of a £1 billion trade boost from improved connectivity⁶⁰.
- For the Isle of Grain Airport, TfL commissioned Oxford Economic and Ramboll to assess the implications of changes to air connectivity. At a UK level they estimate that the Estuary airport would deliver a 9% boost in connectivity (relative to a Do Minimum scenario) which would permanently boost UK GDP by 0.5% by 2050, equivalent to £6.9 billion a year (in 2013 prices).
- The Thames Reach and IAAG Cliffe proposals do not cite any specific estimates on the link between connectivity and GDP.

3.3.2.1. Foster + Partners proposal for the Thames Hub Airport

The Foster + Partners scheme cites a CBI report which links the level of aviation connectivity and trade. The study estimated that the provision of eight additional daily flights from the UK, one to each of the World's eight high growth economies, could boost trade (imports plus exports) by £1 billion per year.

This study has used econometric analysis to link the level of trade between two countries to the number of flights between them. They state that the modelling controls for other factors which may

⁵⁸ There are a small number of studies which have established causality between air connectivity and economic growth, but it is unclear whether any of them are transferable to the Inner Estuary scenario. For example, Blonigen & Cristea (Airports and urban growth: evidence from a quasi-natural policy experiment, 2012) find that a 4.6% increase in air passenger growth rate leads to a 0.2% increase in the annual rate of income per capita growth of the surrounding region on average. However, this finding is unlikely to be transferable as it is based on the US economy and is a local, rather than national, measure.

⁵⁹ "Airports Commission: Interim Report Technical Appendix 3", December 2013, see paragraph 2.38.

⁶⁰ Based on "Trading Places: Unlocking Export Opportunities through better air links to new markets", CBI.

influence trade such as proximity, historic and cultural ties, and the size of the respective economies. No details are given regarding the specific functional form of the model, level of significance of the results or any statistical tests undertaken to assess the validity of the model results⁶¹.

As discussed above, these results also correspond to an economic transmission mechanism and should not be compared to a GDP impact. The implications for GDP will depend on the movement of exports and imports which could lead to positive or negative impacts in the short run. In the longer term we would expect greater trade to boost GDP. These impacts should already be captured in the literature that links aviation connectivity with GDP. It is also unclear whether the connectivity boost from the eight additional daily flights is an appropriate value to use in comparing the connectivity offered by the Estuary airport to either a Do Minimum (no expansion) case or other expansion scenarios.

The Foster + Partners study also refers to a paper by the Civil Engineering Contractors Association (CECA) which points to a £90 billion annual GDP cost of failing to enhance infrastructure⁶². The figure is not specific to airports. It seeks to encompass all infrastructure in the UK, of which airports are only a small part. There is also very limited information in the paper on how the £90 billion value is derived, or whether it aims to capture a demand-side or supply-side impact. If it is seeking to capture the demand side (direct, indirect and induced effects), then the measures discussed in the “direct, indirect and induced effects” section of this chapter provide more specific and transparent estimates. If it seeks to cover the supply side then the connectivity measures discussed in this section are more appropriate.

The recent Foster + Partners submission of 23 May also cites the connectivity estimates produced by Oxford Economics, which we discuss in more detail below⁶³.

3.3.2.2. TfL Isle of Grain Airport

The TfL proposal is based on evidence which looks at the link between connectivity and GDP, and then seeks to estimate how the Estuary airport may affect connectivity. The former is based on a recent study by Oxford Economics⁶⁴. A regression analysis was performed to link total factor productivity of different sectors of the economy with their aviation usage. It was found that more productive sectors (e.g. finance and business services) tend to use aviation more than less productive sectors. This relationship is used to estimate that a 10% increase in UK connectivity would boost productivity and so GDP by 0.5%.

The study combined this elasticity with the DfT’s forecasts for constrained and unconstrained passenger and freight growth, from which a connectivity difference of 9% was estimated in 2050. Hence a GDP effect of 0.45% or £6.9 billion in 2050 is estimated. However, we do not believe the study attempts to address the key issue of causality which is a key risk to the estimate. The analysis assumes that using more air transport makes a sector more productive, however it is equally possible that more productive sectors just happen to use more air transport. If the latter is the case then the estimated benefits may not be realised. This estimate also relies on the airport delivering a given increase in passengers, and as previously identified there are risks to achieving these passenger numbers. The issues around causality and expected passenger volumes therefore represent risks to achieving the estimated increase in connectivity.

The study estimates the 9% connectivity boost by comparing the 2013 DfT projections for constrained and unconstrained passenger demand at a UK level. Table 3.8 below presents the passenger demand only, which shows a boost of 7.9% by 2050 and we compare this to the more recent forecasts from the Airports Commission. This data suggests that any impact from enhanced connectivity is likely to be minimal immediately after opening a hub airport in 2030, and then grow over time. By 2050 the

⁶¹ For example, tests for outliers, endogeneity, heteroskedasticity or omitted variables.

⁶² “Securing Our Economy: the case for infrastructure”, CECA, May 2013.

⁶³ “Inner Thames Hub Estuary Feasibility Studies”, Foster + Partners, May 2014.

⁶⁴ Oxford Economics, *Impacts on the UK economy through the provision of international connectivity*, 2013.

connectivity boost used by Oxford Economics appears to be conservative relative to the more recent Airports Commission estimates.

Table 3.8: Passenger forecasts at the UK level, million passengers per annum

Reference	2030 Constrained	2030 Unconstrained	Percentage difference in 2030	2050 Constrained	2050 Unconstrained	Percentage difference in 2050
Department for transport, 2013	315	320	1.6%	445	480	7.9%
Airports Commission (carbon trading scenario)	299	not reported	not reported	400	450	12.5%

Source: Department for Transport figures as reported by Oxford Economics; Airports Commission Interim Report, technical appendix 3, section 6.

By comparing the constrained and unconstrained forecasts, this approach assesses the connectivity effects of the Estuary airport relative to a Do Minimum scenario, where there is no expansion in airport capacity from the current level. The approach focuses on total capacity and alternative expansion options that provide sufficient capacity to meet the unconstrained forecast could potentially deliver similar benefits. An alternative question that may help in comparing different expansion options is whether having a single large hub would provide incremental connectivity relative to other expansion options in the London System (e.g. additional runways at Heathrow and Gatwick).

Several of the scheme proposers have argued that more routes and traffic could be served by a single four runway hub than by a number of smaller airports with the same overall capacity. A single hub may be better able to attract interchange traffic which would tip the balance on the viability of certain routes. Table 3.9 below presents existing estimates that look at this issue.

Table 3.9: Connectivity measures under different expansion options

Reference	Option	2030 (London System)	2050 (London System)	2030 (UK)	2050 (UK)
Airports Commission (destinations served)	Dispersed hubs	211	248	322	389
	Concentrated hub	217	249	328	383
	Percentage difference	2.8%	0.4%	1.9%	-1.5%
Airports Commission (passenger numbers, millions)	Dispersed hubs	149	205	224	326
	Concentrated hub	164	223	237	340
	Percentage difference	10.1%	8.8%	5.7%	4.4%
York Aviation (destinations served)	Single Hub	n/a	435	n/a	n/a
	2-2-2 option (with Gatwick and Stansted expanded)	n/a	358	n/a	n/a
	Percentage difference	n/a	21.5%	n/a	n/a

Source: Airports Commission, technical appendix 3 table 7.1 – Carbon traded option; York Aviation, as reported on page 128 of the Airports Commission Interim report; UK level estimates were provided to us separately by the Commission.

Note: These figures include scheduled flights only. The totals are therefore lower and not comparable with those in table 3.8, which also includes less frequent services (e.g. charter flights).

The Airports Commission's estimates modelled the impact of removing all capacity constraints at UK airports with the exception of Heathrow and London City airport (dispersed hub option), and compared this to the impact if only Heathrow had no capacity constraints (concentrated hub option). The data in the table suggests that connectivity could rise in the London System by varying amounts depending on the measure used – the number of destinations served could increase by 0.4% and the number of passengers by 8.8%, although the effects appeared to decline over time with the difference in 2050 being less than in 2030.

This issue was also considered in work carried out by York Aviation for TfL. On a destinations served basis, this estimated that connectivity in the London System could rise by 21.5% by 2050. This compared a single 4-runway hub to a dispersed capacity option with additional runways provided at Gatwick and Stansted⁶⁵.

The economic growth elasticities are estimated at the national level, so it is appropriate to consider them against the national connectivity impact. On a passenger number basis, the data suggests that the hub has the potential to boost connectivity by 5.7% in 2030 and 4.4% in 2050 nationally.

However, on a destinations served basis the impact is minimal, with a slight increase in connectivity in 2030 and a reduction by 2050 under a concentrated hub scenario. It should also be highlighted that the Oxford Economics study includes the connectivity impact of freight.

The York aviation estimate is only for the London System so it should not be considered with a national level elasticity. This study used a complex demand modelling approach to arrive at these estimates. We are not able to comment on the reliability of these estimates as we have not reviewed the underlying model.

3.3.2.3. Night flights and freight connectivity

Several of the scheme promoters point to the potential for 24 hour operation to further boost capacity and connectivity.

This issue was considered in the attitudes survey undertaken on behalf of the Airports Commission⁶⁶. Discussions with airlines suggested that they do not consider increased night flight slots to be valuable due to limited passenger demand for arriving or departing overnight. However, the attitudes regarding the value of overnight freight operations were unclear, with airlines described as “undecided” on whether night flights would be beneficial.

Heathrow airport's submission also presents data on the current prevalence of flights between 2300 and 0500 at major European hubs (Amsterdam, Frankfurt, Paris, Madrid and Heathrow)⁶⁷. This data shows that there is almost no passenger traffic in this window and a very limited number of freight flights.

The Estuary airport would clearly provide additional freight capacity relative to a Do Minimum option (i.e. where no airport expansion occurs). Some submissions have noted that more capacity is needed. For example, the Association of International Courier and Express Services submission on May 23 claims that the traffic limit at Stansted will restrict freight movements within a 2-4 year timeframe. The overnight operation capability would also likely mean that significantly more freight capacity is available than other expansion options (such as Heathrow and Gatwick), assuming night flying restrictions remain.

However, there remain significant questions over whether there would be demand for the overnight capacity at the Estuary site. Submissions note that the location is relatively remote to the UK market, making it difficult to provide next day delivery services to customers.

⁶⁵ This tests the effects of 2 runways at each of Heathrow, Gatwick and Stansted.

⁶⁶ “Operational Viability and Attitudes to Moving to an Estuary Airport – draft report”, Leigh Fisher, forthcoming.

⁶⁷ “Inner Thames Estuary Feasibility Studies: Heathrow airport response to call for evidence”, Heathrow Airport Limited, 2014.

The economic value of this freight connectivity relative to a Do Minimum option is captured in the Oxford Economics estimates. Several studies have also established a correlation or association between trade flows and air connectivity⁶⁸. However, we are not aware of any assessment of the incremental impact of a single hub with 24 hour operation relative to alternative expansions options and this may be an area for additional study.

3.3.3. Agglomeration

Agglomeration economies are increases in productivity – i.e. increasing returns to scale – that arise from the spatial concentration or density of firms and workers (large numbers of firms and people closely co-located). There are several potential theoretical channels through which such agglomeration economies occur. These are most usefully classified as sharing (of input markets, output markets, and infrastructure), matching (of workers to firms) and learning (from the activities of others).

3.3.3.1. Spatial location of businesses

The potential implications of the Estuary airport schemes on the spatial location of economic activity are discussed in more detail in Chapter 4 (local impacts) - but this may also lead to some impact at the national level.

If the Estuary airport leads to movement of economic activity to the east, this could weaken agglomeration effects (i.e. productivity) in West London and the M4 corridor (as businesses and workers move east). The corollary could be an increase in agglomeration effects in the east. The net effect of this at a national level would depend on the scale of the movement of activities, the effective density in the original and new locations, the sectors in which this occurred and the timing of any movement. It would also be affected by any international movement of business that result from the change.

However, no evidence has been presented on this effect and it may not be material at the national level. Moreover, care is needed to avoid double counting as these national agglomeration effects may be captured in the econometric analysis linking aviation connectivity to GDP (discussed above).

3.3.3.2. Surface transport

There is likely to be incremental impact at the national level through the surface transport improvements accompanying the airport schemes. The original proposed transport improvements are listed in table 3.10 below, which shows that the schemes include spending of between £9.2 billion and £14.2 billion on surface transport. The scheme proposers subsequently revised some of the estimates in the May 23 submissions which we also include in the table.

Table 3.10: Surface transport investment plans

Scheme	Description of original planned surface transport improvements	Original planned Investment (Cash value, undiscounted)	Revised estimate (May 2014 submissions)
Mayor of London – Isle of Grain (Sift 2 template, no. 51)	<ul style="list-style-type: none"> New high speed branch to HS1 Airport express line to Waterloo via Canary Wharf and Essex Extension of Crossrail 1 to airport 	£9.2 billion	Up to £19.2 billion (note this value includes road improvements)
Metrotidal - Thames Reach Airport (Sift 2 template, no. 48)	<ul style="list-style-type: none"> Metrotidal tunnel system New rail line from ECML to HS1 New rail line to C2C at Dagenham Major eastwards extension of Crossrail 	£14.2 billion	n.a.
Foster + Partners (Sift 2 template, no. 46)	<ul style="list-style-type: none"> New rail link Major extension to Crossrail 1 Expansion at London rail termini New road link to M2/A2 and highway enhancements on A229, M2, A2 and 	£9.2 billion	£6.4 billion

⁶⁸ See for example “The value of aviation connectivity to the UK – a report for BAA”, Oxford Economics, 2012.

Scheme	Description of original planned surface transport improvements	Original planned Investment (Cash value, undiscounted)	Revised estimate (May 2014 submissions)
	M20		
IAAG (Sift 2 template, no. 47)	<ul style="list-style-type: none"> New east-west road and rail tunnel to connect airport to Kent and Essex, with connections to A13 and A2 New rail shuttle link to Gravesend and Ebbsfleet with major extension to Crossrail 	£9.2 billion	n.a.

Source: Airports Commission sift documents.

It is likely that non-airport users will also make use of this transportation which will lead to some additional economic benefit. To assess transport schemes of this magnitude in more detail it would be normal to produce a benefit cost ratio using a transport model which computes user time reductions as a result of the improvements. This information can then be used in analysis of agglomeration effects and wider economic benefits. This analysis has not been performed to date, however it is useful to consider estimates for other transport schemes that have been assessed in this way.

Several figures from major UK transport improvements are shown in table 3.11.

Table 3.11: Agglomeration and wider economic benefits arising from surface transport improvements

Scheme	Cost of Investment (NPV)	Estimated agglomeration effects	Total wider economic impacts, including agglomeration	Ratio of agglomeration benefit to investment	Ratio of wider economic impacts to investment	Comments
High Speed 2	£22.1 billion	£8.7 billion	£13.3 billion	0.4	0.6	Values respond to full network benefits, principal WEI is competition improvements.
High Speed 1	£7.3 billion	£1.8 billion	£3.8 billion	0.2	0.5	
Crossrail	£13.9 billion	£3.1 billion	£7.2 billion	0.2	0.5	Based on original figures from 2005. Updates 2010 and 2011 do not have a breakdown of agglomeration effects

Source: DfT

Note all figures are given as a net present value over the life of the project, not an annual figure.

These figures suggest that agglomeration effects can add around 20p-40p of benefit for every £1 of upfront investment. If other wider economic effects (principally via competition effects and increased labour force participation) are included this rises to 50p-60p of GDP per £1 of investment.

It is likely that the ratios delivered by the Estuary airport transport improvements will be lower than these benchmarks. The benchmarks are all “pure” transport schemes that are designed, in part, to maximise these effects. The airport transport improvements will be used in large part by tourists, business people and freight vehicles travelling to and from the airport. These journeys are either unlikely to deliver agglomeration benefits (e.g. tourist trips), or the benefits may already be captured in the catalytic impacts derived from better aviation connectivity. Care would also need to be exercised to avoid double counting these effects as the literature linking connectivity and growth may already capture some surface access benefits for non-airport users.

3.3.4. Summary of catalytic effects

Overall the evidence submitted suggests that an Estuary airport may have catalytic effects relative to a Do Minimum (i.e. no expansion) scenario by 2050. The key effects would likely arise as better

connectivity would lower costs for business, boost market access and support clustering effects. These figures should also capture the wider effects of the airport on competition. The key uncertainties are that causality is unproven, the analysis undertaken takes no account of the specific airport in question, and any connectivity boost is dependent on the commercial success of the airport in attracting traffic.

There may also be some benefits from non-airport users through the surface transport improvements although we are not aware of any analysis undertaken on this issue.

A major gap in the analysis is whether an inner Thames Estuary airport would provide significant incremental passenger and freight connectivity relative to other expansion options in the London System that meet the unconstrained traffic forecasts. The initial analysis carried out by the Airports Commission for its interim report indicated that the incremental additional passenger connectivity would be likely to be small at the national level, though somewhat larger if the South East is considered in isolation. We note that the work carried out by York Aviation indicates a more significant incremental connectivity boost in the South East.

4. Local socio-economic impacts

Chapter summary

Inner Thames Estuary airport

TfL's submission contains estimates that the development of a new hub airport in the inner Thames Estuary has the potential to generate an uplift in employment above the baseline of approximately 98,000 jobs (24 per cent) by 2030 in the six north Kent local authorities in closest proximity to the proposed airport. There is also some potential for a new hub airport to generate employment within Essex local authorities to the north of the Estuary.

The large number of local jobs offers an opportunity to local residents and could support reductions in deprivation and unemployment. However, the extent to which the employment opportunities would be taken up by local residents (as opposed to people commuting in from elsewhere) will depend critically on increased provision of local housing, employment land and surface access improvements.

These may present challenges and constraints. Our review of local authority planning documents identified that house building and, linked to this, the local supply of labour were identified as notable constraints in Medway and Swale, but are identified as less prominent constraints in Tonbridge and Malling, Gravesham and Dartford.

Limited availability of employment land was identified as a potential constraint to future economic development in Maidstone, Tonbridge and Malling and Gravesham. This would need to be overcome to realise increased economic activity outside of the airport fence in these areas.

Overall, there are notable potential risks to both realising beneficial economic impacts arising from the development of a new hub airport in the Inner Thames Estuary area based on the economic and infrastructural capacity of the local area to support such a development, at least without considerable re-direction of current local planning policies and investment.

Closure of Heathrow airport

Heathrow airport currently employs 76,600 people directly on-site, creating GVA of approximately £3.3 billion. When including indirect and induced effects the estimates of its local economic impact rise to between 114,000 and 123,000 in the local area. Its total GVA contribution is estimated to be in the order of £5.3 billion to £6.2 billion which is likely to grow in the future.

Many of these local jobs would be lost if the airport closed, although several studies highlight potential mitigating effects on local residents as some Heathrow employees find other work, and the redevelopment of the site could provide local jobs and housing as well. A number of redevelopment scenarios have been put forth in studies commissioned by TfL, which are estimated to potentially generate local economic activity of a similar order of magnitude to the airport. The JLL research suggests capacity for 54,000-98,000 local jobs, and £3.9 billion - £7.8 billion in annual GVA once the redevelopment is complete. Oxford Economics comparable estimate is £3.4 billion under an alternative scenario.

However, there is huge uncertainty over the scale and timing of these impacts and the key risks identified in the evidence around Heathrow redevelopment include an increase in out-commuting, higher numbers of local people looking for work, and the suitability of the land. We also believe that some of the local jobs provided in these estimates would simply be transferred from other local areas. These negative local effects from displacement of activity from other locations have not been assessed.

London City airport

London City airport currently supports approximately 2,100 jobs on site and 61% (1,200) of the employees live within five miles of the airport. The airport will deliver some £750 million of economic

benefit to the UK in 2014. The airport is perceived as a major contributor to the success of Canary Wharf, the ExCeL centre and to a lesser extent the City. If closure is required, it would put jobs at risk and may impact upon the attractiveness of the surrounding business and financial districts.

Southend airport

Southend airport had approximately 2,000 direct employees in 2012. If closure was required this would have a considerable impact on the local area and the growth potential of surrounding business parks and industrial estates.

As our summary indicates, the main focus of the evidence submitted is on the local economic effects and regeneration impacts on Kent, with much less evidence on the social consequences such as deprivation and social cohesion, but which are also important considerations.

4.1. Introduction

This chapter considers the potential local economic impacts of developing a new inner Thames Estuary airport in north Kent and closing Heathrow airport. The assessment is based on a review of the existing evidence, including local planning documents for the authorities nearest to the two airport sites, and submissions to the Airports Commission's call for evidence. The remainder of this chapter provides:

- An overview of the current (2012), and where available, forecast (2030) baseline data for the local authorities in the Thames Estuary and around Heathrow⁶⁹;
- Analysis of the projected local impacts of the Thames Estuary hub airport against the capacity identified within local plans to meet current future growth;
- An evaluation of the evidence on the potential local impacts of closing Heathrow; and
- An assessment of the evidence presented on the potential redevelopment of Heathrow⁷⁰.

We assess the local impacts in terms of population and housing, labour supply, land and surface access. Appendices C and D provide further evidence underpinning our review in this chapter.

The context for this section is the strategic plans for growth in London and the Thames Gateway set out in the London Plan. This targets building 424,000 homes between 2015 and 2025⁷¹, to accommodate the rising population. The Estuary airport would affect this plan, by making development land available at the Heathrow site and supporting growth in the Thames Gateway area (which includes parts of East London). Current completion rates in London are well below the 42,000 per annum needed until 2041. Delivery in East London is lower than the London average. TfL has identified space for dwellings outside London, including 380,000 in the Thames Gateway, and believe that a new hub airport and associated surface transport links will help unlock development in these areas.

However, submissions by Thames Gateway local authorities to the Airports Commission identify their own housing targets and economic plans, based on population projections, which do not include projections for a new airport. The analysis below addresses these issues.

4.2. The inner Thames Estuary airport

This section considers the evidence on the local impacts of building an airport in the Thames Estuary. As part of the review, we present:

⁶⁹ Note that baseline estimates assume no change in current airport provision.

⁷⁰ Southend has been excluded from this analysis as we have not found evidence of potential redevelopments scenarios for this airport.

⁷¹ Based on the January 2014 update to the London Plan.

- Information on the baseline levels of population, employment and housing in the local area;
- A summary of the key evidence in relation to the local impacts; and
- A discussion of the potential risks and capacity constraints based on the plans and submissions of local authorities in the Thames Gateway.

4.2.1. Baseline performance of the inner Estuary airport local area

We define the 'local area' associated with a new inner Thames hub airport as six local authorities in north Kent (Medway, Swale, Maidstone, Tonbridge and Malling, Gravesham and Dartford) and a further five local authorities in south Essex (Thurrock, Castle Point and Southend-on-Sea, Basildon and Rochford). The north Kent authorities are based on those modelled by Oxford Economics and Ramboll⁷².

While impacts on south Essex have not been modelled to the same extent as north Kent, with a new lower Thames Crossing in place, as the various schemes propose, access would be provided to the new airport from the north. This would therefore provide some opportunity for employment impacts in south Essex.

Table 4.1 below provides the baseline data for these local authorities (the baseline assumes the Estuary airport is not built)⁷³.

Table 4.1: Inner Thames local area baseline socio-economic performance

		Baseline (2012)				Future baseline (without airport) 2030 ⁷⁴		
		Pop (000s)	Average Age (ONS)	Emp (Nomis, 000s)	Hholds (000s)	Pop (000s)	Emp (000s)	Hholds (DCLG, 000s)
North Kent	Medway	264	37.7	119	106	286	120	126
	Swale	136	39.6	62	56	160	67	71
	Maidstone	155	40.1	79	63	178	74	79
	Tonbridge and Malling	121	39.8	58	48	143	60	62
	Gravesham	102	38.7	47	40	120	50	51
	Dartford	97	37.8	49	40	122	51	53
Total/ Mean		875	38.95	414	353	1,009	422	442
South Essex	Basildon	175	39.1	83	73	219	106	100
	Castle Point	88	43.2	43	36	101	45	46
	Rochford	83	42.3	43	34	101	45	45
	Southend	174	40.2	76	75	194	89	95
	Thurrock	158	36.8	83	62	207	109	91
	Total/Mean		678	40.32	328	280	822	394
Total/mean for north Kent and south Essex		1553	40.12	742	633	1,831	815	819

Source: ONS and Oxford Economics, PwC analysis.

The baseline population in the north Kent area is forecast to grow by approximately 134,000 between 2012 and 2030. Local employment is forecast to grow by only 8,000, indicating high levels of out-

⁷² Oxford Economics and Ramboll, (2013). *Impacts upon the national and local economy. Transport for London.*

⁷³ The baseline data presented in this section is drawn from a variety of sources as outlined in Appendix C.

⁷⁴ Population and household data are 2008 based ONS projections (note that household figures are 2033 projections), employment estimates are calculated by apportioning Oxford Economics baseline employment data based on 2008 based projected population.

commuting⁷⁵. The number of households is forecast to increase by approximately 89,000. This demonstrates high levels of demand for additional housing and associated social infrastructure in the local area even in the absence of a new airport.

Significant growth is also expected in south Essex, with increases of 144,000 in population, 66,000 jobs and 97,000 households between 2012 and 2030.

4.2.2. Evidence submitted on the impact of the Thames Estuary airport

We have summarised some of the key evidence submitted on the local impact of an Estuary airport in table 4.2 below⁷⁶.

Table 4.2: Evidence submitted on Estuary airport’s local impacts

Reference	Finding
Impacts of a new hub airport on local and national economy, Oxford Economics and Ramboll for Transport for London, 2013	Details Oxford Economics and Ramboll’s findings from modelling work undertaken to estimate the direct, indirect and induced local impacts of building and operating a new hub airport and associated surface transport links.
Inner Thames Estuary Feasibility Study Response to Call for Evidence Mayor of London (and Supporting Technical Documents), May 2014	Response from the Mayor to support the work of the Airports Commission. Identifies the role a new hub airport in the inner Thames Estuary location could have in relation to supporting the sustainable, long term development of London and its wider city-region. Highlights the inner Thames Estuary option as ‘credible and deliverable, as well as technically, economically and environmentally feasible.
Inner Thames Estuary Feasibility Studies, Foster + Partners, May 2014	Response from Foster + Partners which sets out their technical proposals for the airport and the role it could play in stimulating growth in London and the South East region.

Sources: As stated.

Oxford Economics and Ramboll produced estimates of the local impacts of the Estuary airport on employment, population and housing. The study extends the national assessment (discussed in depth in chapter 3) by apportioning a share of the national effects to the north Kent area. Estimates are provided for both the construction phase and the operational phase.

4.2.2.1. Local construction impacts

Table 4.3 below summarises the local construction impact estimates relative to the baseline. In the peak year of construction in 2020 the study estimates that there will be a £1.7 billion contribution to the local economy and 35,000 jobs created in the local area (workplace based employment). Not all of these jobs will be filled by local residents (some will be held by people commuting into north Kent). The study estimates that there will be an additional 23,000 residents employed than in the baseline.

Table 4.3: Net local impacts of building the Estuary airport, peak construction in 2020

	Gross value added	Workplace based employment	Resident based employment
Peak construction in 2020	£1.7 billion	35,000	23,000

Source: Oxford Economics and Ramboll, 2013 prices.

As before, these effects will comprise of direct, indirect and induced impacts; however, only the total is presented above. It should be highlighted that whilst these effects appear large, they will only be

⁷⁵ Note that this figure appears low as a result of using Oxford Economics and Ramboll report estimates for 2030 against current ONS estimates which are higher.

⁷⁶ A full list of all call for evidence responses reviewed can be found at Appendix C.

temporary, lasting during the construction phase of the airport only. The local effects are described in the study as net effects. This is because they factor in the impact of displacement where Oxford Economics and Ramboll assume the activity will crowd-out some activity that will have happened anyway (i.e. the impacts are scaled down as it is assumed some locals would have gained additional employment without the airport). Accounting for displacement is a standard approach in local analysis.

4.2.2.2. Local operational impacts

Oxford Economics estimate that the Estuary airport will support an increase of 98,000 direct, indirect and induced workplace based jobs in this area in 2030⁷⁷. Around half of these (55,000) are expected to be held by residents in the area, with the remainder held by in-commuters. This activity is expected to have a significant impact on local GVA.

These values were estimated by allocating the national level employment projections (as described in Chapter 3) to the north Kent local authorities. The GVA calculations are based on local multipliers and commuter shares are based on travel to work patterns from the 2001 Census which provides information on the share of residents who both live and work in the area⁷⁸. The approach described appears to be reasonable in the absence of alternative or more recent data.

The analysis only reports the total impact on employment at an aggregate level across the six north Kent local authorities. We have allocated the employment to each local authority (note this covers workplace based employment only) by assuming that approximately all of the direct employment occurs in Medway and the remaining indirect and induced employment is apportioned according to projected 2030 employment levels. These figures are presented in table 4.4 below.

Table 4.4: Comparison of local operational impacts with and without a hub airport

	2030 without airport	2030 with airport	Change
	Employment (000s)	Employment (000s)	Employment (000s)
Medway	120	195	75
Swale	67	72	5
Maidstone	74	80	6
Tonbridge and Malling	60	65	5
Gravesham	50	54	4
Dartford	51	55	4
Total	422	520	98

Source: Oxford Economics and Ramboll, PwC analysis. Figures may not sum due to rounding.

Oxford Economics and Ramboll also provide estimates of the increase in the number of households expected in the north Kent area (shown in table 4.5 below). With the airport, these six local authorities are estimated to have 421,000 households by 2030. This is an increase of 23,000 over the baseline and 62,000 over the current level⁷⁹. These values equate to an uplift of 6% or 17% respectively.

⁷⁷ Note that due to availability of data and usefulness of analysis the Airports Commission and PwC agreed that the local economic impact analysis should focus on 2030 rather than on 2050 as discussed elsewhere in this report. The 98,000 net additional employment figure is taken from Oxford Economics and Ramboll “Impacts upon the local and national economy”, Annex A, page 26 – Demographic and labour market indicators for the Isle of Grain.

⁷⁸ Note that travel to work data from the 2011 census was not available when the report was published.

⁷⁹ Note that the data presented here regarding the current baseline differs from the data set out in the baseline table 4.1 above. Since the Oxford Economics and Ramboll report does not disaggregate to local authority level 2008-based projections have been used in the baseline table 4.1. An alternative would be to apportion Oxford Economics data according to future population but for the purposes of baseline data use of 2008-based data was deemed more appropriate. Care should be exercised when interpreting this data.

Table 4.5: Oxford Economics and Ramboll household projections 2012-2030, north Kent local authorities

Metric	2012	2020	2025	2030
Households (Oxford Economics and Ramboll, 000s) baseline	359	380	389	398
Households (Oxford Economics and Ramboll, 000s) with airport	359	390	398	421

Source: Oxford Economics and Ramboll.

The recent submission by TfL also provided some very high level analysis of the impact of the Estuary airport on south Essex⁸⁰. This suggests that the airport could support a small number of jobs, but the precise number was not given⁸¹.

While the estimated uplifts in local employment are likely to generate economic benefits, it is important to recognise that such projections require:

- Appropriate uplifts in housing and supporting public infrastructure; and
- Improved access to and from the airport area for both passengers and airport employees within and outside the immediate area.

The remainder of this section describes risks to achieving such potential growth against the characteristics and plans for the local area.

4.2.3. Summary of local authority risks and capacity constraints

As shown above, both the baseline growth and the construction of an airport could lead to an increase in employment and housing in the inner Estuary area. To provide capacity for this, many new homes would need to be built, as well as infrastructure, utilities and employment premises. On the basis of this, it is worth considering the existing local plans for north Kent local authorities. The review has also included three local authorities from south Essex. We have reviewed a range of local authority plans which are summarised in Appendix D and table 4.7.

There were also two key submissions to the Commission in May 2014 from Kent and Medway and the Thames Gateway Partnership, which are summarised in table 4.6 below.

Table 4.6: Key evidence submitted by local authorities

Reference	Finding
Airports Commission – Inner Thames Estuary Feasibility Studies – Socio-economic Impacts Kent County and Medway Response, May 2014	Provides evidence of the local authorities’ opposition to a new hub airport. Concludes that the proposed airport should not be added to the shortlist of plausible long term options for airport capacity in the South East due the lack of capacity in the local area to provide adequate housing, employment and accessibility.
Inner Thames Estuary Feasibility Study Response to Call for Evidence Thames Gateway Kent Partnership (TGKP), May 2014	Sets out evidence to show that the housing, surface access and other infrastructure that would be required to support an Estuary airport are undeliverable; and that the negative environmental impacts of such an airport and associated development would be unacceptable.

Sources: As stated.

Our review of local authority plans sets out a range of potentially significant capacity constraints to being able to realise the local employment benefits from the airport in terms of the availability of local housing, labour supply and employment land. The review also highlights various risks and constraints

⁸⁰ “Inner Thames Estuary Feasibility Study Response to Call for Evidence”, Mayor of London and TfL, May 2014.

⁸¹ Note that the study does not provide the actual numbers and geographical areas, only a diagrammatic representation.

to delivering the relevant surface access to capture such benefits at a wider regional level. The analysis identifies those issues that are high risk (in red), medium risk (amber) and low risk (green). To summarise findings, the table below provides a visual presentation of the indicative risk rating.

Table 4.7: Summary of local economic risks and constraints related to an Estuary airport⁸²

	<u>Population and housing</u>	<u>Labour supply</u>	<u>Employment land</u>	<u>Surface access</u>
Medway	Red	Red	Green	Yellow
Swale	Red	Red	Green	Red
Maidstone	Yellow	Yellow	Yellow	Red
Tonbridge & Malling	Green	Green	Yellow	Green
Gravesham	Yellow	Green	Yellow	Yellow
Dartford	Green	Green	Green	Yellow
Southend-on-Sea	Yellow	Yellow	Green	Yellow
Thurrock	Red	Yellow	Yellow	Green
Castle Point	Yellow	Yellow	Green	Yellow

Source: Local authority documents and PwC analysis. See Appendix D.

In particular, our review of local planning documents identified the following:

- Medway (the local authority area in which any new hub airport would be developed) and Swale appear to have a range of potential supply constraints (housing, labour supply and surface access);
- Housing and supply of labour are identified less prominent constraints in Tonbridge and Malling, Gravesham and Dartford; and
- Available employment land has been identified in several local authorities which may suggest that there is sufficient land to support an increased level of employment.

In summary, our review of the local plans for the six local authorities in north Kent and the recent submissions to the Airports Commission by Kent County Council, Medway Council and the Thames Gateway Kent Partnership all provide evidence highlighting that the employment, housing and associated infrastructure and facilities for the hub are challenging⁸³, due to constraints on the availability of land and local labour to meet anticipated demand by 2030.

We note that local authority plans will have to change significantly in order to take account of a new Estuary airport. This was also stressed by local authority representatives during meetings organised by the Airports Commission.

However, it remains unclear how this process, and the ultimate outcome, will impact on current development strategies and objectives within each of the local authorities that form part of the review. In particular, the economic and social impact of the Estuary airport will depend on proximity to the airport and key transport corridors.

As stated above, both Medway and Swale (two local authorities close to the airport site) are identified as having a flexible land bank that provide for future growth. However, in both cases there are other key pressures in terms of population, housing and labour supply that may have a constraining influence on the long term development. It is evident that local authorities, the TfL, the airport

⁸² We have only considered the three south Essex local authorities in closest proximity to the Thames Estuary in this section.

⁸³ *Airports Commission: Inner Estuary Feasibility Studies – Submission by the Thames Gateway Kent Partnership, May 2014.*

developer and other stakeholders will need to collaborate and work closely in order to mitigate key development and planning risks.

In the following section, key observations in relation to population and housing, labour supply, land and surface access are discussed. The discussion provides further detail to support the summary presented above. It highlights some of the key points raised by local authorities and provides an illustration of the existing evidence base and key gaps. Overall, it provides examples of where additional analysis and consideration is needed, if the Estuary airport option is taken forward.

4.2.3.1. Population and housing

Several of the inner Estuary local authorities, notably Medway, Maidstone and Swale, identify significant challenges in meeting their current baseline targets for housing. Maidstone in particular highlights the need to give careful consideration to future development: “...to minimise the release of greenfield land unless it can be proven as a more sustainable option”. In contrast, Dartford points to a good future supply of land and strong estimates for future housing stock.

Kent and Medway⁸⁴ state that supplying the required houses by 2030 would imply an annual average of 5,266 new homes being delivered in north Kent, more than doubling the recent peak output achieved by the area in 2008-09 of 2,454 homes. This estimate excludes the 1,600 homes that may be demolished to accommodate the airport on the Isle of Grain⁸⁵. Further evidence cited by local authorities (see Appendix D) highlights various issues for north Kent local authorities (Dartford, Gravesham, Medway and Swale) in terms of capacity to deliver housing targets. These include:

- **Land requirements:** Current housing plans for the Thames Gateway are in place for forecast population growth until 2031. However, the delivery of this planned growth is already perceived as at risk due to a lack of suitable sites to meet the identified housing demand. This is before the demand for additional housing and associated infrastructure (in terms of retail, commercial, educational, health and community facilities) from a new airport is taken into consideration.
- **Timing of new build:** The timing of house building is also an issue in terms of the housing that would need to be built for airport workers. It is unlikely that developers will begin building houses prior to the move of workers into the local area resulting in a lag in provision. Local authorities suggest that this will consequently push up house prices post the opening of the hub in the short to medium term with negative impacts on housing affordability and worker mobility in north Kent as well as leading to a protracted period where relocated workers would endure long distance commuting.

Kent and Medway suggest that, based on existing travel to work patterns, 79% of the additional 98,000 workers needed at the Estuary airport would prefer to live locally. The submission suggests that assuming one worker per household, an additional 79,000 houses would be needed. This is much higher than Oxford Economics and Ramboll’s estimate of 62,000 additional households relative to the 2012 level. Oxford Economics and Ramboll base their figure on lower assumptions for residential employment and different assumptions about the number of people per household (they use the national average of 2.3 people per dwelling). Either of the two cases represents an significant increase in the required housing compared to the baseline.

For the south Essex local authorities included in the review, the picture is slightly different. They all have significant pressure on affordable housing. However, due to distance from the Estuary airport, additional housing pressure is unlikely to be as significant as in north Kent. Ultimately, this additional pressure will depend on whether there is sufficient access across the river.

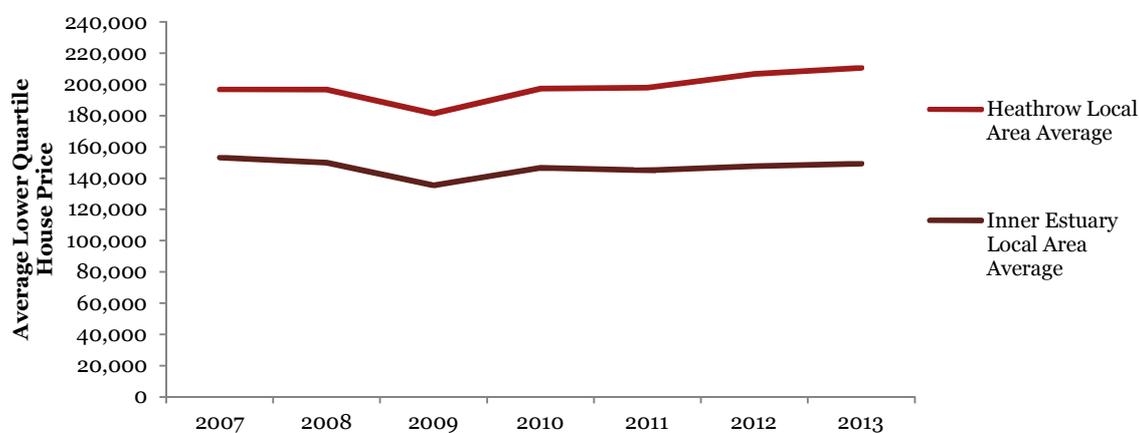
Affordability of local housing may also be an issue for airport workers, around 42% of which could earn between £20,000 to £23,900 in today’s prices (based on the Optimal Economics Report). The

⁸⁴ Airports Commission: Inner Thames Estuary Feasibility Studies - Socio-economic Impacts, Kent County Council and Medway Council, May 2014.

⁸⁵ Foster + Partners (Sift 2 template 67).

evidence suggests that the area surrounding the Estuary airport has lower house prices than the Heathrow area currently (as shown in figure 4.1).

Figure 4.1: Comparison of average lower quartile house prices in Heathrow and the six inner Estuary local authority areas



Source: DCLG housing market time series, 2013.

Lower house prices could support the possibility of those workers to live nearby. However, this assumes that relative prices remain similar in the period between now and 2030 which may not be the case given the future housing constraints identified in local planning documents, particularly in Medway which would see the highest proportion of additional employment.

4.2.3.2. Labour supply

TfL's submission contains estimates that the development of a new hub airport in the inner Thames Estuary has the potential to generate an uplift in employment above the baseline of approximately 98,000 jobs (24 per cent) by 2030 in the six north Kent local authorities in closest proximity to the proposed airport.

We also note that Southend-on-Sea, Thurrock and Castle Point present a mixed view in terms of labour supply. Castle Point has an ageing population, with a smaller proportion of economically active people. On the other hand, Thurrock has a growing population, with an active workforce. Overall, there is a potential population and labour pool that could support, and benefit from, an Estuary airport. However, surface transport may represent hurdles that would need to be addressed. It is also important to consider that there are pockets of significant deprivation within the local area, and that by providing thousands of jobs, the Estuary airport has the potential to help the employment prospects of local residents.

However, several of the local authority submissions cast doubt on the extent to which the airport could reduce deprivation locally. The study by Kent County Council and Medway Council⁸⁶ notes: "It is also unclear that an airport would improve these concentrations of deprivation, given the multiple and complex factors that tend to underpin them. Hounslow contains 12 LSOAs in the 20% most deprived nationally despite being on Heathrow's doorstep, a higher proportion of the borough than is the case in – for example – Dartford⁸⁷". The ability of the airport to reduce deprivation depends on the quality of the jobs it offers, in terms of salary, as well as the quantity. It also depends on the effect to which these jobs displace other (potentially higher value) jobs that would have been created or are new jobs.

⁸⁶ Airports Commission: Inner Thames Estuary Feasibility Studies - Socio-economic Impacts, Kent County Council and Medway Council, May 2014.

⁸⁷ Airports Commission: Inner Thames Estuary Feasibility Studies - Socio-economic Impacts, Kent County Council and Medway Council, May 2014.

All of the inner Thames local authorities identify high levels of out-commuting due to a localised low wage economy. They see this as a risk to the long-term economic viability of the relevant areas. For example, within the Maidstone Core Strategy redressing the low wage economy is identified as a key challenge to be addressed, by expanding the employment skills base and improving higher and further education opportunities to target employment opportunities in green technologies, including low carbon energy production.

The Medway Core Strategy identifies the challenges for the future are therefore to increase the number of high-value local jobs, and to reduce the current reliance on net out commuting and to grow local enterprises.

While significant proportions of inner Estuary residents will continue to commute to London given close proximity, availability of surface access and economic viability, a new hub airport would create large numbers of lower skilled jobs and smaller numbers of high skilled jobs that could be taken up by local people who currently commute out of the area for work. This may benefit them in terms of travel savings.

4.2.3.3. Land and surface access

We have not given detailed consideration of the surface access implications for the local area as a result of a new hub. The Airports Commission's study on surface access impacts will consider the extent to which proposed improvements to surface access (road and rail) can accommodate both increased baseline demand plus future projected demand from any new Estuary airport⁸⁸.

We do note that in our review of existing local plans across the inner Estuary area, it is clear the availability of land and surface access are identified as key constraints. For example, in Maidstone, modelling studies⁸⁹ have indicated that growth in the number of homes and jobs in the Borough will require an upward step change in the use of sustainable transport modes if the worsening of traffic congestion and air quality are to be avoided. Additionally, the Local Transport Plan for Kent 2012 – 2017 makes it clear that the early provision of improvements to the local authorities' transport infrastructure is a pre-requisite for growth⁹⁰.

As explained above, improved transport links will also be fundamental in order for local authorities in south Essex to benefit from the Estuary airport.

4.3. The impact of Heathrow's closure

In the rest of this chapter, consideration is given to the local economic impacts that might result if the new Estuary airport leads to the closure of Heathrow airport. We have reviewed:

- Information on the baseline levels of employment, population and housing around Heathrow, (this therefore captures what is expected to happen if the existing airports remain open with no changes);
- Studies providing evidence on the current and future local employment impact of Heathrow and implications of closure;
- Evidence on the effects of redeveloping the Heathrow site; and
- Evidence on the challenges and risks from redevelopment.

⁸⁸ This report was discussed on a call with Jacobs on 03.06.2014. It was due to be submitted to Airports Commission on 06.06.2014 and has been requested from Jacobs to reference in this report.

⁸⁹ Maidstone Borough Council, 'Maidstone Core Strategy Public Participation Consultation', Maidstone Borough Council, 2011

⁹⁰ Kent County Council, 'Local Transport Plan for Kent, Kent County Council', 2011.

4.3.1. Current and forecast baseline performance of the Heathrow local area

Table 4.8 below displays the current and future baseline data for the five local authorities which are covered by the Heathrow local labour strategy⁹¹. Baseline data assumes that the airport remains operational⁹².

Table 4.8: Demographic data for Heathrow airport local labour strategy areas, 2012 and 2030

	2012			2030		
	Pop (000s)	Emp (Nomis, 000s)	Hholds (000s)	Pop GLA/ONS (000s)	Emp* GLA 2031 (000s)	Hholds* (DCLG, 000s)
Hounslow	259	127	97	279	160	122
Ealing	341	152	125	376	152	150
Slough	142	65	51	171	n/a ⁹³	63
Hillingdon	282	134	103	298	226	129
Spelthorne	97	49	40	113	n/a	49
Total	1,121	528	410	1,218	n/a	513

Sources: Population, employment and household projections for Hounslow, Ealing and Hillingdon are 2030 GLA estimates. Population and household estimates for Slough and Spelthorne are from ONS and DCLG for 2033 based on 2008 population estimates.

Significant growth is expected in the Heathrow area. The population is projected to grow by approximately 8%, and households by approximately 25% by 2030. Employment in the two local authorities in closest proximity to Heathrow (Hounslow and Hillingdon) is projected to increase by 48% by 2030, with the greater share of this growth in Hillingdon. To meet these projections would require, in particular, a significant increase in the provision of housing and business premises in these local authorities.

4.3.2. Evidence submitted on Heathrow airport’s local impact

A number of reports have considered the current and future local impact of Heathrow. The evidence focuses on the direct, indirect and induced employment effects (see summary in table 4.9). Some studies have also considered local catalytic effects which we discuss in Chapter 5. We have reviewed the approaches adopted for each study. It is apparent that most of the studies adopt a broadly consistent approach to estimating impacts. The main differences in the numbers appear to be driven by the choice of multipliers and the choice of geographic area.

Table 4.9: Evidence submitted on Heathrow airports local impacts

Area of focus	Reference	Finding
Current Impacts of Heathrow	Optimal Economics, Heathrow Related Employment, 2011	Estimates current local direct, indirect and induced employment impacts of 114,000 and GVA of £5.3 billion for the Heathrow local labour strategy area of which direct on-airport local employment is estimated to be 76,600 and GVA £3.3 billion.
Current Impacts and Closure of Heathrow	Regeneris Consulting, London Heathrow Economic Impact Study, 2013	Uses the same employment estimates to those provided by Optimal Economics for direct on airport employment and GVA estimates but estimates local employment of 123,100 and GVA of £6.2 billion driven by higher estimates of indirect and induced impacts. The estimates of indirect and induced impacts are higher due

⁹¹ As defined in Optimal Economics, Heathrow Related Employment, 2011.

⁹² Where 2030 is unavailable data for 2021 has been used.

⁹³ Employment forecast data for non-GLA local authorities is unavailable.

Area of focus	Reference	Finding
		to the consideration of a wider local area - the 'western wedge area' compared to the local area considered by Optimal Economics. The study also provides estimates of the impacts of closure in the future estimating that 105,000 jobs may be lost in the western wedge area with a corresponding loss of £8.1 billion GVA in 2030 ⁹⁴ .
Current Impacts and Closure of Heathrow	Oxford Economics and Ramboll, Impacts of closing Heathrow airport and initial analysis of redevelopment impacts, 2013	Estimates that closure of Heathrow would lead to a reduction in local employment of between 72,000 and 95,000 below the baseline level in 2030. The equivalent GVA reduction is £6.7 billion to £8.7 billion.
Current Impacts and Closure of Heathrow	Parsons Brinckerhoff and BHC, "Heathrow employment impact study", 2013	Estimated that Heathrow supports direct employment of 84,000 in the local area and supports a total of 30,700 jobs in Slough, Ealing and Hounslow (including indirect and induced impacts).

Sources: As stated.

A key source of data on the current direct, indirect and induced impact of Heathrow is the Optimal Economics study (these figures are also used as the base for the Parsons Brinckerhoff and Regeneris studies). Consequently, these three studies provide similar estimates for the current employment performance of Heathrow, although there are some differences in the geographical areas used which affect the local indirect and induced values that are reported.

For example, Optimal Economics report local employment impacts for the local labour strategy area comprising Hounslow, Ealing, Slough, Hillingdon and Spelthorne, whilst Regeneris Consulting analyse indirect and induced impacts on the larger western wedge area⁹⁵.

Table 4.10 below presents a breakdown of residence based direct employment for Heathrow, based on the analysis by Optimal Economics across the five local authorities they defined as the local area. It shows that Heathrow draws its workforce from a wide geographical area, although 45% of employees live in nearby local authorities.

Table 4.10: Direct on-airport employment data Heathrow airport, 2008/2009

	Employment	Share of local authority Workforce	Unemployment rate (2013)
Hounslow	10,760	7.2%	7.3%
Ealing	5,760	3.6%	9.9%
Slough	4,090	6.8%	8.2%
Hillingdon	8,960	9.4%	7.7%
Spelthorne	3,920	8.3%	4.8%
Total of five local authorities	33,490	n/a	n/a
Other Areas	39,940	n/a	n/a
Total	73,430	n/a	n/a

Source: Heathrow airport Employment Survey, 2008/09.

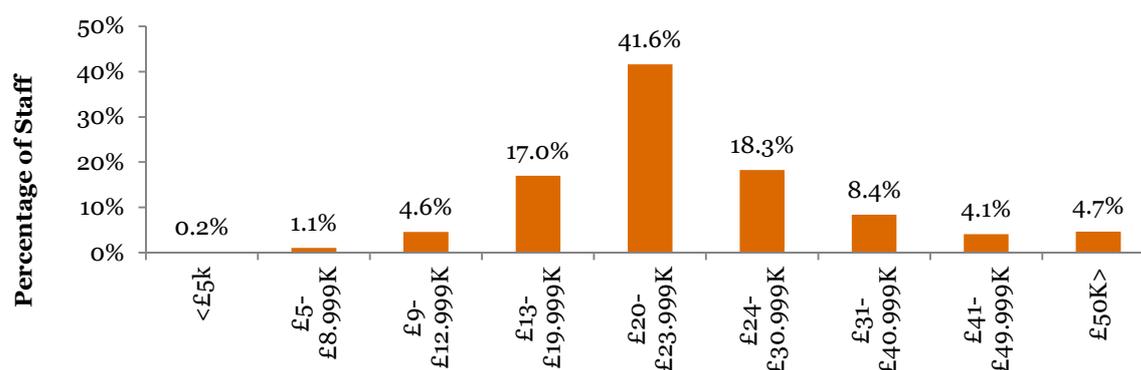
⁹⁴ GVA expressed in 2012 prices but adjusted for future real output growth per worker.

⁹⁵ This includes the local areas to the west of Heathrow including Buckinghamshire, Oxfordshire, Thames Valley Berkshire and West London Businesses.

Heathrow is a major employer in this area, supporting 73,430 direct jobs in 2008/9⁹⁶. Some of these areas, however suffer from relatively high unemployment.

The 2011 Optimal Economics report also undertook an analysis of the skill distribution of employment at Heathrow which identified that the majority of employment (approximately 75%) is in Skill Levels 1 and 2 compared to 25% in higher skilled jobs. This breakdown is also reflected in the distribution of salaries of on-site employees presented in figure 4.2, with the largest share of staff (42%) earning between £20,000 to £23,900 compared to only 17% earning over £31,000 demonstrating the high levels of demand for relatively low skilled and low paid workers at Heathrow.

Figure 4.2: Percentage of London Heathrow airport on-site employees by salary band (2009)



Source: Heathrow Related Employment, Optimal Economics, 2011.

Separately, Oxford Economics and Ramboll have developed estimates for local employment and GVA at Heathrow and the impact of closure in the future. Table 4.11 below presents a summary of their estimates for 2030. The estimates cover Hounslow, Hillingdon, Ealing, Slough and Spelthorne.

Table 4.11: Summary of Oxford Economics and Ramboll estimates for Heathrow closure, 2030

Impact	Direct	Indirect	Induced	Total
Gross local employment (workplace based)	71,000	4,000	20,000	95,000
Gross local GVA (£ billions)	6.9	0.3	1.5	8.7
Net local employment (workplace based)	58,000	2,000	12,000	72,000
Net GVA (£ billions)	5.7	0.2	0.8	6.7
Net local employment (residence based)	n/a	n/a	n/a	27,000

Sources: Oxford Economics and Ramboll. All monetary values are in 2030 prices. Figures may not sum due to rounding.

This study estimates that between 72,000 and 95,000 workplace based jobs would be lost in the local area depending on assumptions about displacement effects. We understand that this displacement assumption is attempting to simulate the effects of “crowding in” other employment in the area as the closure of Heathrow releases an abundant supply of local labour.

⁹⁶ This is slightly below the 76,600 direct jobs reported by Optimal Economics as they have accounted for the non-complete coverage of the survey.

The reduction in residence-based employment is estimated to be far lower, at 27,000 in 2030. According to the data presented above, most Heathrow employees live outside the five local authorities defined as the study area, so some negative effects are felt elsewhere. It is also assumed in the study that some of the residents would find employment at the Estuary airport, or in other locations.

In summary, there are a large number of different estimates on the local economic effects of closing Heathrow. The picture can be quite confusing since different geographical areas, time periods and types of impact are considered. However, most of the studies focus on workplace based direct, indirect and induced impacts at Heathrow. Oxford Economics and Ramboll estimates a 2030 impact of 95,000 jobs. Optimal Economics estimate a current impact of 114,000 jobs and Regeneris reports 123,000 jobs currently. The equivalent GVA value estimates are £5.3 billion (Optimal Economics) and £6.2 billion (Regeneris). This is expected to rise in the future, and Oxford Economics and Ramboll's analysis estimates it to £8.7 billion.

4.3.3. Redevelopment of Heathrow

Studies by Jones Lang LaSalle (“JLL”) and Oxford Economics and Ramboll⁹⁷ have looked at the potential impact of redeveloping the Heathrow site. It is stated that such redevelopments may offset some of the job losses from closing the airport. These papers are summarised in table 4.12 below.

Table 4.12: Summary of redevelopment analysis

Reference	Finding
Oxford Economics and Ramboll, Impacts of closing Heathrow airport and initial analysis of redevelopment impacts, 2013	Based on a housing based redevelopment scenario for the Heathrow site the study estimated that local area employment would be 33,500 lower compared to the baseline in 2050. This can be compared to the estimated of net local employment decline of 77,000 in 2050 under a closure and no redevelopment scenario.
Jones Lang LaSalle, Heathrow Redevelopment Scenarios, 2014	Estimates the potential redevelopment of Heathrow could result in between 55,000 to 100,000 local jobs based on 4 different redevelopment scenarios for the site. The equivalent GVA impact once redevelopment is complete in 2030 is estimated to be £3.9 billion - £7.8 billion annually.

Sources: As stated.

The Oxford Economics and Ramboll study considered a housing-based redevelopment scenario for the Heathrow site. As discussed in chapter 3, the study only considered the local effects in the Heathrow area. No consideration was given of effects either nationally or in other locations.

Table 4.13 below presents the reconciliation of the workplace based employment reduction with closure only (77,000) and the closure plus redevelopment scenario (33,500). The corresponding local GVA reduction for closing Heathrow is estimated to be £10.7 billion with no redevelopment and £7.3 billion net loss with redevelopment.

Table 4.13: Estimate of Heathrow closure impact post redevelopment, 2050

	Jobs (workplace based)	GVA (£ billion)
Total net local area reduction in activity under closure scenario	77,000	10.7
Less		
associated residential employment	36,000	n/a
Commercial employment	5,500	n/a
Residential construction employment	1,900	n/a

⁹⁷ Jones Lang LaSalle, “Heathrow Redevelopment Scenarios”, 2014 and Oxford Economics and Ramboll, “Impacts of closing Heathrow airport and initial analysis of redevelopment impact”, 2013.

	Jobs (workplace based)	GVA (£ billion)
Commercial construction employment	100	n/a
Total redevelopment estimate	43,500	3.4
Net local reduction with redevelopment scenario	33,500	7.3

Source: Oxford Economics & Ramboll. All monetary values are in 2030 prices.

It is helpful to understand what the mitigating jobs are claimed to be, in order to better understand the local implications. Some of the redevelopment jobs are construction based and these are likely to only persist during the transformation of the site. They are therefore potentially less valuable than permanent jobs. The majority of the offsetting jobs arise from associated residential employment. These are jobs that tend to occur in residential areas to serve the local population (e.g. convenience stores, dry cleaners etc.).

These jobs would occur wherever this population is based, so to the extent that the new residents at Heathrow come from elsewhere in the UK, there would be a corresponding loss of employment in other local areas. We also note that the study focuses on the estimates for 2050. There would also be a long period of reduced activity in the local area in the gap between closing Heathrow and completing the redevelopment.

Table 4.14: Summary of Jones Lang Lasalle scenarios, 2031

Scenario	Population increase	Gross local Employment	Gross local GVA per annum (£ billion)
1 Education and technology quarter	76,000 (ex. students)	98,000	7.8
2 New town	112,000	76,000	6.0
3 Residential quarter	200,000	54,000	3.9

Source: Jones Lang LaSalle. All monetary values are in 2011 prices.

The redevelopment estimates from JLL are similar to those from Oxford Economics and Ramboll. JLL considers the land area available at the Heathrow site and from that work out the capacity for employment and housing, based on benchmark density ratios. Unlike the Oxford Economic and Ramboll analysis, only the gross local impacts of redevelopment are presented, rather than the net effect of closure and redevelopment.

JLL estimates a gross local impact of £3.9 billion to £7.8 billion once redevelopment is complete. As before, the study does not factor in the potential negative economic consequences on other local areas if the economic activity and populace is simply transferred from elsewhere. However, we do recognise the social benefits of increased housing stock and availability in London.

The estimates of the gross economic activity in a redeveloped Heathrow site are large and of a comparable scale to that currently produced by the airport (although smaller than the projected future negative impact). Clearly these impacts are dependent on the redevelopment actually going ahead and being able to attract residents and employers. Whilst we recognise these scenarios are possible, we believe it is too soon to accurately estimate the impact of redeveloping Heathrow given the uncertainties surrounding the timing and take up of any such future redevelopment.

Nevertheless, the Oxford Economics and Ramboll analysis does provide an initial indicative basis to estimate the net impact of closure and potential redevelopment of the site. However, the focus of this analysis on the local area around Heathrow only is quite narrow, and more consideration could be given to how this may affect other locations.

It is also important to highlight the limitations regarding how the figures should be interpreted:

- The estimates do not factor in additionality. By this, we mean that some impact could potentially be generated elsewhere by spending the public or private sector funds used for redevelopment on different project(s);
- The estimates do not appear to factor in displacement. By this we mean that some of the jobs included will be simply transferred from another area leading to negative local impacts elsewhere. For example, the “associated residential employment” is likely to be transferred from wherever the population lived prior to Heathrow; and
- Some of the offsetting jobs (e.g. construction) are temporary. These should not be compared with permanent jobs provided by the airport.

Further risks associated with the airport closure and redevelopment plans have been articulated in submissions to the Airports Commission. In particular, Heathrow airport Limited (“HAL”, the owners and operators of London Heathrow) raised several concerns that we summarise in table 4.15 below.

Table 4.15: Key risks associated with closure and redevelopment of Heathrow airport

Key Issues	Key risks identified by HAL ⁹⁸	PwC commentary
Closure of Heathrow		
Impact on jobs	<p>Closure of Heathrow would count as Britain’s biggest ever mass redundancy programme, the previous largest being Shotton Steel (in 1985) and MG Rover (in 2005) which resulted in 13,000 job losses. This compares to the loss of 76,700 direct jobs at Heathrow.</p> <p>Relocation of former Heathrow employees to the Estuary is likely to be small based on historical precedent e.g. relocation of German federal government from Bonn to Berlin resulted in the transfer of 10,000 jobs. The closure of the docks in London resulted in the loss of 150,000 jobs in the five Docklands Boroughs and over the past 30 years. These jobs have not been fully replaced.</p>	<p>We agree that these issues are high risk given the scale of the employment created by Heathrow. Given the 15 year period until the new hub will be operational, some mitigation measures could be put in place to help address these issues to some degree prior to closure.</p> <p>Further analysis is needed to understand the likelihood and extent of relocation of existing staff. Finally the interim period between closure and redevelopment could be significant given both the size of the site and level of private sector investment required to secure development, with a high risk that local job losses may not be replaced in the short to medium term.</p>
Redevelopment of Heathrow		
Timing	<p>The Heathrow site comprises a 12.3km² heavy industrial brownfield site with the requirement to modify existing engineering structures. Heathrow redevelopment could take up to 30 years or longer compared to around 20 years for smaller locations close to Central London.</p>	<p>Agreed risk and recognised as part of the TfL’s redevelopment scenarios.</p>
Surface access	<p>HAL notes: “it is unrealistic to expect” that Heathrow’s current accessibility and extensive transport infrastructure will continue to exist at the same level for a new airport city that will be delivered 30 years later. Due to the time lag between closure and redevelopment, many of the existing transport nodes will not be commercially viable without a significant population to support them. The study also raises concerns about the capacity of the existing transport infrastructure to accommodate the projected growth figures under the redevelopment scenarios.</p>	<p>Agreed risk. Current assumptions that existing transport infrastructure along with the development of Crossrail will continue under the Heathrow closure option and provide adequate capacity, to meet future growth, needs to be assessed. In addition, the viability and maintenance of existing infrastructure in the interim period between closure and potential redevelopment needs to be tested.</p>

⁹⁸ HAL: *Inner Thames Estuary Feasibility Studies, Heathrow airport response to call for evidence, 2014.*

Key Issues	Key risks identified by HAL ⁹⁸	PwC commentary
Distribution sector	High risk that the closure of Heathrow (the UK's largest freight port by value) will result in the closure of the freight and distribution sector in the area despite the proximity to the strategic road network.	Agreed risk. The viability of the freight and distribution sector post the closure of Heathrow requires to be assessed in some detail to determine the extent of this risk.
Hotel sector	Significant likelihood that the existing hotel provision in the area will decline due to reduction in demand.	Agreed risk and shared by the redevelopment scenarios. The magnitude of this impact needs to be quantified in terms of employment and GVA.
Planned developments	The closure of Heathrow may affect the attractiveness of planned redevelopments in West London including Old Oak Common (100,000 jobs) and White City (10,000 jobs) given these sites may rely on proximity to Heathrow airport and existing transport nodes to be attractive to investors and promoters.	Medium risk that needs to be considered further to understand the potential implications of the closure on the attractiveness of these developments.
Wider markets and business clusters	High risk that closing Heathrow: "will create uncertainty and threaten the supply chain and clusters that support and rely on Heathrow".	Agreed risk and noted in the TfL's report however further analysis is needed to assess the magnitude of this impact on catalytic jobs in the local area.

Source: HAL: *Inner Thames Estuary Feasibility Studies, Heathrow airport response to call for evidence, 2014.*

4.3.4. Risk assessment of potential redevelopment scenarios based on a review of local planning documents

The analysis in table 4.16 below sets out further key risks and capacity constraints associated with the potential redevelopment options for the Heathrow airport site, in relation to population and housing, labour supply, employment land and surface access⁹⁹.

In summary, the analysis suggests that the risks associated with any redevelopment option are relatively high, and, of the three JLL scenarios assessed, Scenario 3: Residential Quarter appears to present the least risk in terms of future capacity. Risks related to availability of a suitable supply of labour and sufficient employment land seem greater than those related to population and housing.

However, it is important to note that the extent of primary research, particularly with local authorities, used to inform the JLL report appears limited. On this basis, the extent to which the proposed options represent credible alternatives that are aligned with local authority capacity and expectations is unclear. We would suggest that any future development of these scenarios is based on extensive consultation with local authorities.

⁹⁹ As defined in *Optimal Economics, Heathrow Related Employment, 2011.*

Table 4.16: Key risks and capacity constraints analysis of potential redevelopment scenarios for the Heathrow site

Redevelopment scenario	Population and housing	Labour supply	Employment land	Surface access
JLL Scenario 1 – Education and Technology Quarter	The projected population growth of 76,000 constitutes a 5% growth in population above the baseline population forecast in the Oxford Economics and Ramboll report for 2050. Whilst the housing stock of 32,000 represents a 6% rise in housing stock. The study notes this will help to address London’s housing shortage.	Estimates an increase in jobs of 100,000 representing an increase in total employment of 13% above the baseline. It is unclear how the projected population growth would be able to sustain the new level of employment growth due to lack of analysis of proportion of working age population, skill levels and commuting patterns (the report assumes the scenario will be able to leverage existing highly skilled labour in the area but does not provide the evidence to underpin this). The analysis of potential employment profile has been undertaken based on the employment profile of Cambridge.	Projected development of 1.3 million square metres of non-residential land including a convention centre. The study notes the potential constraints of land supply in and around London for housing and commercial developments beyond 2030 and particularly lack of available land to deliver a convention centre. The study assumes take-up of the commercial developments, but analysis of anticipated levels of demand for the development space has not been undertaken.	The study identifies the existing public transport accessibility of the Heathrow site as strong, and assumes that in the future accessibility will increase further, e.g. through the development of Crossrail to Heathrow in 2019. Detailed analysis of the capacity of the existing infrastructure is required to test this assumption.
JLL Scenario 2 – New Town	Under this scenario population and housing stock is estimated to grow by approximately 8% above the projected baseline in 2050. As above will help address the housing shortage facing London.	Increase in jobs by 10% by 2050 as a result of the commercial developments proposed under this scenario. Provides an approximate employment profile breakdown based on Milton Keynes. Concerns as above regarding the match between labour supply and demand given lack of analysis of local skills and commuting patterns against projected jobs.	Estimates the development of 1.6 million square metres of non-residential land based on the development of a new town similar to Milton Keynes with a mix of residential, retail, distribution and commercial developments. As above, the report anticipates that the development of a new town would help address the land supply constraints facing London.	In addition to the above, the implications of this scenario (in terms of capacity) upon the existing road network also need to be assessed.
JLL Scenario 3 – Residential Quarter	Projected population growth of 14% above the baseline for 2050 with associated growth in housing provision of 15%. Assumes the development of a new London Residential Quarter in line with Hammersmith and Fulham and Kensington and Chelsea with large numbers of commuters into London. As above, assumes this will address the housing shortage facing London.	Lower employment increase of 7% compared to the scenarios above given the residential nature of this option. Employment profile has been based on GLA employment projections for a residential borough. As above, this raises some concerns regarding the assumption that existing labour supply will be best placed to benefit from the projected job increases.	A lower level of 0.57 million square metres of non-residential land has been assumed to support retail and social infrastructure. Anticipates this development will help address the housing constraint facing London. Lower levels of provision of additional commercial (office) space compared to the above two scenarios.	As above, assumes Heathrow’s existing road and rail infrastructure is sufficient to sustain the projected levels of growth. Detailed analysis of this assumption is required.

Redevelopment scenario	Population and housing	Labour supply	Employment land	Surface access
JLL Heathrow City	Combination of the above three scenarios balancing housing growth with job provision projecting population increase of 13% above the baseline with a 14% increase in housing stock in order to address London's housing shortage.	12% increase in employment above the baseline projection. Based upon an employment profile similar to scenario 1. As above, concerns exist regarding the extent to which the local labour market will be in a position to take up local employment growth due to potential mismatch of skills.	1.1 million square metres of non-residential land provided under this scenario. As above, assumes take up of the development space due to the land supply constraints facing London.	As above.
Oxford Economics and Ramboll Closure plus redevelopment scenario	Projected population increase of 9% above the 'do nothing' or 'as is' baseline scenario by 2050 with 55,000 extra household's equivalent to 11% additional houses above the 'do nothing' or 'as is' baseline scenario.	Estimates a reduction in employment by 34,000 or 4.6% due to considerations of net impacts, out commuting and migration and the fact that more people in the local area are likely to be looking for work.	Scenario developed upon the 12 million square metres site at Heathrow airport. The study notes that TfL have indicated that a further 6m square metres of surrounding land could be brought forward for development over time but does not provide further evidence regarding this potential source of this additional land. Assumes: "given the pressing need for urban space in a city such as London ¹⁰⁰ ", it is unlikely the Heathrow site would remain vacant upon closure of the airport.	Assumes strong ground transportation infrastructure around Heathrow, meaning many of those who lose jobs at Heathrow are able to seek alternative employment elsewhere in London.
Oxford Economics and Ramboll Do Nothing	Assumes population grows to 1.46 million by 2050, with 557,000 households if Heathrow continues to grow per the 'do nothing scenario'.	Growth in employment to 74,700 with consideration of commuting and migration trends.	Not relevant.	Not relevant.

¹⁰⁰ Oxford Economics and Ramboll: "Impacts of closing Heathrow airport and initial analysis of redevelopment impacts".

4.4. London City and Southend airports

This section provides a brief overview of evidence of the local economic impacts of the two smaller airports. As discussed previously, these airports may not have to close, but their operations could be affected by an estuary airport.

London City airport is the only London airport located within London in the London Borough of Newham - three miles from Canary Wharf, seven miles from the City and 10 miles from London's West End, with rail connectivity to all these locations via the Docklands Light Railway (DLR).

London City airport is currently utilised by 11 airlines, serving 46 predominantly European destinations and approximately 3 million passengers a year. The airport has permission (granted in 2009) to increase its operation to 120,000 movements per annum carrying 6 million passengers by 2023 and growing to 8 million by 2030.

London City airport¹⁰¹ estimates that it supports £750 million of direct, indirect and induced economic benefit at the national level and direct employment of 2,100 jobs. It estimates that 61% (approximately 1,200) of the employees live within 5 miles of the airport itself and 27% (570) live in Newham¹⁰².

London City expects its local economic impact to rise as passenger numbers grow, projecting an additional 1,500 full time direct jobs by 2023 with a further 500 jobs created in construction. By 2030 the airport plans to have created 2,500 additional direct jobs relative to the 2014 level.

Southend airport's annual report to June 2013 estimates that the direct employment of the airport was 2,000 in 2012, up from 1,500 in 2011¹⁰³. Most of the 500 additional jobs were filled by people living locally; at the end of the reporting period, of all the staff employed by the airport, 79% came from the local Southend-on-Sea ('SS') postcode area, with a further 13% of new employees coming from elsewhere in Essex.

Both airports support local catalytic employment, although estimating the effects of these is difficult.

¹⁰¹ *London City Airport submission to the Airports Commission, "Consideration of an Inner Thames Estuary Airport as a credible option", May 2014.*

¹⁰² *"Royal Docks revival: Replacing London City Airport", NEF, 2014.*

¹⁰³ *Southend Airport Annual Report 2012-2013.*

5. Local catalytic impacts and spatial implications

Chapter summary

TfL in particular have claimed that an Estuary airport will spatially rebalance economic activity by acting as a catalyst for the development of new business activity in East London and along transport corridors in Kent and Essex. Such catalytic impacts would be additional to the direct, indirect and induced activity at the local level.

Access to airports is one driver of the attractiveness of locations to business. The Estuary airport would raise the attractiveness of some locations in the east, whilst lowering the attractiveness of areas in the west following the closure of Heathrow. For some businesses, this change in location attractiveness may be sufficient to overcome the barriers to moving, such as the dislocation of access to the existing workforce, one-off moving costs and contractual limitations (e.g. long term leases on commercial premises). Such businesses may then move location, although it does not follow that they must move east. They may move abroad or elsewhere in the UK.

Business location decisions are complex and depend on many other factors beyond access to airports, including access to skilled labour, access to markets, agglomeration effects and the cost and availability of premises.

The areas surrounding the Isle of Grain are characterised by low current levels of employment density, population density and road access relative to Heathrow. Although these factors would be improved somewhat by building the Estuary airport, these factors raise questions over the extent to which significant catalytic activity would be generated near the site beyond those firms for whom airport proximity is essential. However, the area does benefit from lower costs for commercial space relative to the west of London.

Based on a high level consideration of selected drivers of location attractiveness, we believe that any movement of catalytic activity would be most likely to flow from West London and the M4 corridor towards Central London, East London and the transport corridors to the Estuary airport. These areas would see a relative improvement in airport access when compared with those to the west of London. The scale and timing of any movement of activity is highly uncertain.

TfL commissioned a study on the potential catalytic effects of the Estuary airport which estimated that there may be between 47,000-138,000 catalytic jobs created locally. The approach relied on benchmarks from other airports and took no account of the specific circumstances for this airport and the closure of Heathrow. Moreover, these benchmarks, along with other case studies, highlight the wide range of potential outcomes, the long time periods that can elapse before impacts manifest themselves and the importance of other factors in determining the location of economic activity. Furthermore, the local effects are likely to represent activity displaced from elsewhere (such as the existing clusters around Heathrow), rather than gains at a national level.

There is a huge amount of uncertainty over the extent to which building an airport in the Thames Estuary would catalyse additional economic activity in the East of London. We are not aware of a single established methodology that is accepted as a standard approach to estimating these effects, although further work could be conducted on how the change in airport provision would affect the relative attractiveness of different locations.

5.1. Local catalytic impacts

The preceding chapter focused on the local direct, indirect and induced employment impacts of building and operating a new airport in the Thames Estuary and the closure of existing airports. We have seen that it is estimated that the airport has the potential to support the development of approximately 100,000 direct, indirect and induced jobs in the surrounding local authorities by 2030 and 134,000 by 2050.

TfL in particular have stated that the airport has the potential to spatially rebalance economic activity by further acting as a catalyst for the development of new business activity to the East and along major transport corridors. Such “catalytic impacts” would be additional to the direct, indirect and induced activity.

A potential vision for the way in which growth could be distributed goes even further than this, and could see significant movement of existing activity from the London boroughs around Heathrow and the M4 corridor to Kent and East London, along the key transport corridors to the Estuary airport. Businesses in the west would experience weaker airport access, reducing the attractiveness of the location. Areas in the east would become relatively more attractive. If the change in the attractiveness of the location was considered sufficiently material to overcome the one-off costs of moving then businesses may choose to relocate. They could move eastwards, elsewhere in the UK or abroad (e.g. a business in Slough may find Schiphol more attractive than its current location or the areas around the Thames Estuary following the closure of Heathrow). Equally, businesses from abroad may choose to move to East London or Kent as these areas become relatively more attractive.

On the other hand, it may be that the changes in airport access are not sufficient to encourage widespread movement of businesses, especially from the strong agglomerations economies and from existing clusters in West and Central London. Because of this, fewer jobs may migrate other than the direct on-site airport employment and the supply chain activity that needs to be located close to the airport fence (discussed in the preceding chapter).

This highlights that there is a high level of uncertainty and speculation in relation to predicting future spatial patterns for growth as a result of a new airport.

The remainder of this chapter discusses the potential for these location decisions to lead to catalytic activity relocating as a result of the Estuary airport. The catalytic effects on trade, tourism, agglomeration and investment could all affect the spatial choices of businesses. This could be manifested in several ways:

- Firms and workers that make intensive use of air travel may locate in places which provide good access to the airport, leading to new concentrations of economic activity.
- The scale of economic activity required to support the operation of the Estuary airport is large in itself. The numbers of workers employed directly on the airport site is around 100,000, the size of a city like Worcester. The airport and its supporting activities therefore constitute a significant cluster and market in its own right. This may encourage firms outside of the indirect and induced value chain to relocate closer to this airport in order to take advantage of agglomeration effects.
- Planned improvements to surface transport that enable passengers to access the airport may also be used by non-airport users. This may improve the attractiveness of the airport location and transport corridors through reduced journey times and improved labour and market access for non-airport users.

5.1.1. Firm location decisions

The opening of an Estuary airport would relocate direct employment from Heathrow airport to the Thames Estuary. For other types of activity the firms would need to choose whether the benefit of being close to the airport justifies the costs of relocation.

We have summarised some existing evidence on the key criteria that affect business location decisions (table 5.1 below) and the operational and attitudes study (study 4) includes some further information about the views of some existing businesses. Access to airports is considered to be an important

driver, but in some studies is not necessarily considered more important than other factors, such as access to labour.

Table 5.1: Selected evidence on drivers of firm location decisions

Source	Comments
McQuaid et al., <i>The importance of transport in business location decisions</i> , 2003	<p>Key factors for business location (not in order of importance):</p> <ul style="list-style-type: none"> • Skilled and/or inexpensive workforce • Quality of the local environment • Cost of premises • Transport access <p>The evidence suggests that transport is a necessary, but not sufficient condition in determining business location. The most important sector for air transport is financial services - air transport spending per employee in this sector is six times the average for UK businesses in general. Air transport is important to computing, software, R&D, biotechnology and some food manufacturing.</p> <p>Transport costs are often a small proportion of firms' total costs, and businesses change location in discrete steps. Hence (re)location responses to changes in transport costs will occur only after a substantial cost saving threshold has been reached.</p>
Cushman & Wakefield, <i>European Cities Monitor</i> , 2010	<p>Key factors for business location (in order of importance):</p> <ul style="list-style-type: none"> • Easy access to markets, customers or clients • Availability of qualified staff • Quality of telecommunications • Transport links with other cities and internationally • Value for money of office space • Cost of staff <p>Based on a survey of important factors to the location of businesses in cities around Europe.</p>
Strauss-Kahn & Vives, 2006	<p>Key factors associated with the relocation of headquarters (not in order of importance):</p> <ul style="list-style-type: none"> • Low corporate taxes • Low average wages • High levels of business services • Good airport facilities • Same industry specialisation • Agglomeration of headquarters from similar sectors
Arndt et al., <i>Economic catalytic impacts of air transport in Germany</i> , 2009	<p>A survey of 100 foreign-owned firms in Germany of the factors behind their location decision. It found that access to air transport was one of the four most important factors affecting location decisions, and that 57% would have chosen another location had connectivity been less good. Another important factor behind using air transport is to maintain contact with parent company and affiliates.</p>
<i>Bel & Fageda, Getting there fast: Globalization</i>	<p>Quantitative analysis found that a 10% increase in intercontinental flights is associated with a 4% increase in the number of headquarters in the nearby urban area.</p>

Sources: As stated.

Business location decisions will depend on the way the benefits (and costs) of different geographic areas vary, and the way in which these benefits vary across different types of firm.

For some types of business (e.g. finance, high-tech) it may be the centrality of a hub airport in the global and national air network that attracts businesses. For others it is the market provided by the airport itself that attracts (e.g. transport and logistics). For firms with high-skill workers engaged in business travel (e.g. the finance and high-tech sectors, multinationals) proximity to a highly skilled workforce, the transport network and airport are likely to be important¹⁰⁴.

¹⁰⁴ For example, see Cheshire and Gordon 1996.

5.1.2. Evidence submitted on local catalytic effects

Several pieces of evidence were submitted to the Airports Commission on the local catalytic impacts of opening an Estuary airport and closing Heathrow. These are summarised in table 5.2 below.

Table 5.2: Key evidence submitted on local catalytic effects

Scheme	Reference	Finding
Isle of Grain Airport (TfL)	Oxford Economics & Ramboll, <i>Impact of new hub options on business locations, FDI and alignment with strategies</i> , 2013	Estimated that 47,000-138,000 catalytic jobs would be generated in the surrounding local authorities ¹⁰⁵
Isle of Grain Airport (TfL)	Mayor of London, TfL and Atkins <i>The strategic planning case for a new hub airport in the Inner Thames Estuary, Inner Thames Estuary Feasibility Study: Response to Call for Evidence</i> , 23 May 2014	Response from the Mayor to support the work of the Airports Commission. Identifies the role a new hub airport in the Inner Thames Estuary location and seeks to predict the potential locations of the direct, indirect, induced and catalytic employment associated with the Estuary airport.
Closure of Heathrow	Regeneris, <i>London Heathrow impact study</i> , 2013	Estimated 170,000-230,000 catalytic jobs in the surrounding local authorities and up to £11 billion -£15 billion in GVA ¹⁰⁶ that could be “at risk”.
Closure of Heathrow	Parsons Brinckerhoff and BHC, <i>Heathrow employment impact study</i> , 2013	Estimated catalytic employment that could be “at risk” in the surrounding local authorities is “probably in excess of 250,000” ¹⁰⁷ .

Sources: As stated.

These studies use different methodologies to consider the catalytic employment associated with these airports. These methodologies have different strengths and weaknesses and we are not aware of a single established methodology that is accepted as a standard approach to estimate these effects, which involve very complex interactions.

The section below discusses these studies, with further details provided in Appendix B.

5.1.2.1. Estimates of catalytic employment due to the Isle of Grain Airport (TfL)

TfL commissioned Oxford Economics and Ramboll to consider the potential local catalytic employment impact of building an Estuary airport. Their assessment looked at benchmark data from other airports from which they estimated a catalytic multiplier in relation to direct jobs. They take a catalytic multiplier of 0.5-1.5 based on these benchmarks and apply it to their estimates of direct employment at the Estuary airport.

Using this methodology, the local catalytic employment is estimated to be 47,000-138,000 as a result of the Estuary airport. The method appears to take no account of the impact of closing Heathrow and other airports so the estimates appear to be gross rather than net. It is likely that this catalytic employment estimate does not represent additional activity at a national level, but in most part would be relocated from other locations (e.g. the area surrounding Heathrow).

Table 5.3 below shows the underlying estimates of catalytic multipliers from which the estimate is derived, which are based on a 2001 paper by Hakfoort et al.

¹⁰⁵ This study included several local authorities in Kent: Medway, Maidstone, Gravesham, Dartford, Swale and Tonbridge and Malling.

¹⁰⁶ This study included four Local Enterprise Partnership (“LEP”) areas - Buckinghamshire Thames Valley, Enterprise M3, Oxfordshire and Thames Valley Berkshire.

¹⁰⁷ This study included local authorities surrounding Heathrow, Ealing, Hounslow and Slough.

Table 5.3: Estimates of the catalytic multipliers associated with airports

Reference	Location/airport	Study area	Catalytic multiplier
	Paris – Orly and Charles de Gaulle	Ile-de-France	2.1
Hakfoort et al, <i>The regional economic impact of an airport: the case of Amsterdam Schiphol Airport</i> , 2001	London airports	South East England	1.3 – 1.8
	Manchester	North West England	1.6 – 4.1
	Copenhagen	Copenhagen region	2.1 – 2.5
	Dusseldorf	Nord Rhein Westfalen	5.5
Oxford Economics & Ramboll, <i>Impact of new hub locations on business locations, FDI and alignment with strategies</i> , 2013	Inner Estuary	In the local area around the airport	0.5 – 1.5

Sources: As stated.

The figure of 0.5-1.5 that is used in the estimate appears to be at the lower end of the range of benchmarks. This is a prudent approach but it does not necessarily mean that the estimate is conservative due to the limitations inherent in this approach. We believe the principal limitations include:

- No account is taken of the specific scenario (i.e. opening an airport in the Thames Estuary and closing Heathrow airport), therefore we cannot be confident that the catalytic multiplier used is appropriate.
- The benchmarks show a wide range of possible outcomes which highlights the uncertainty associated with estimating these catalytic impacts.
- The timing implications are not considered thoroughly in the research. In practice, any development of catalytic activity due to the airport would likely only develop over the decades following airport opening in 2030. As a result, any benefits of this impact would be heavily discounted under conventional appraisal methods that discount future impacts to account for time preferences.
- The catalytic multiplier is applied to estimates of direct, indirect and induced employment which are based on the assumption of the Estuary airport supporting 170 million passengers per annum by 2050. The estimate of catalytic employment would be significantly lower if the Airport's Commission's demand forecast of 143 million passengers per annum by 2050¹⁰⁸ was used instead.

5.1.2.2. Geographical location of catalytic employment (TfL)

TfL's May submission to the Airports Commission on the Strategic Planning Case of an inner Thames Estuary airport allocates the estimated catalytic employment to different locations¹⁰⁹.

The allocation is based on the opportunity to build on existing development hotspots, infrastructure routes which provide good airport access, connectivity to Central London, and where there are existing employment centres. These factors align broadly with the business location factors that have been identified above, although access to the airport or Central London is emphasised rather than the broader factors of access to labour markets and to businesses and markets, which have been identified in a number of studies as an important driver of business location.

A general finding in the report is that catalytic employment is likely to be located along the important transport corridors between the airport and Central London, including the Royal Docks in Newham, London Riverside in Barking & Dagenham and Havering, Bexley Riverside in Bexley and Ebbsfleet

¹⁰⁸ This forecast is derived from sift 3 template 67, which assumes a total capacity of 150 million passengers per annum for an Isle of Grain airport, and 95% utilisation of this capacity by 2050.

¹⁰⁹ "The strategic planning case for a new hub airport in the Inner Thames Estuary", Atkins Ltd, 2014.

Garden City in Kent. The main justification for these locations appears to be the strong policy support for development of these areas as being ready to be ‘unlocked’ and where investment is going to happen and be needed in the future, with less emphasis placed on the drivers of agglomeration.

The map below illustrates the key employment locations (note this also includes direct, indirect and induced employment as well as catalytic effects), as set out by TfL.

Figure 5.1: Projected spatial distribution of employment, Isle of Grain airport



Source: Atkins, TfL, Mayor of London.

As identified throughout this chapter, estimating the additional catalytic employment associated with an Estuary airport is highly uncertain, and projecting the potential locations of this employment is similarly difficult to quantify. The study acknowledges that its assessment is necessarily high-level and somewhat subjective. However, taking these constraints into account, the approach used to identify catalytic employment is subject to the following additional limitations:

- The rationale for the distribution of catalytic employment places high importance on supply-side conditions, such as the policy support to increase the capacity for additional employment and housing. Less emphasis is placed on demand-side factors such as the fundamental drivers of business location decisions.
- There is no detailed discussion of the sectoral dimension of catalytic employment. As identified later in this chapter, the drivers of business location are likely to vary considerably by sector. The assessment of where catalytic employment is likely to occur should take into account these differences, in addition to the current distribution of sectoral agglomerations.
- The analysis does not address the loss of catalytic employment from closing Heathrow and other airports, or any other displacement effects. The map of employment distribution indicates that the Estuary airport would generate employment in West London, but it is likely that the net impact on catalytic employment in this area would be negative if existing catalytic jobs associated with Heathrow are likely to move closer to the new airport or elsewhere. In order to provide a fuller picture of local catalytic impacts, the quantity of catalytic employment offset due to the closure of the airports and displacement should be estimated, and its geographical distribution assessed.
- The analysis does not consider relative attractiveness. In order to draw stronger insights into how much catalytic activity may move and the location you need to assess the relative attractiveness of different areas before and after the change in airport provision. This could also include considering areas outside of the UK (such as Frankfurt and Schiphol).

- As discussed in Chapter 4, several of the areas identified as locations for this activity have identified capacity issues around housing, transport and workplaces that would need to be addressed.

5.1.2.3. Estimates of catalytic employment at Heathrow airport

Two studies have considered the potential scale of catalytic employment around Heathrow, both using similar underlying methodologies. Both of the studies use the prevalence of foreign-owned firms as a proxy for catalytic activity. By comparing the share of foreign-owned firms around Heathrow to the South East average they calculate the catalytic effect as the difference between the two.

Whilst it is likely that some catalytic activity around an airport can be identified in this way (e.g. European headquarters of multinational firms), it is likely that the approach does not accurately capture catalytic effects for the following reasons:

- It may double count the indirect and induced impacts of the airport. The approach will count all foreign-owned firms over the baseline as catalytic. In practice some of these firms may be in the airport's supply chain.
- The approach will not capture catalytic activity from UK-owned firms. This could potentially be significant, given the data shows that the majority of firms based around Heathrow are UK-owned.
- There are likely to be more drivers of above average foreign ownership than simply the proximity to an airport. As TFL's review of the Parsons Brinkerhoff study points out, Ealing has approximately the same foreign ownership level as Greenwich and Bexley and Slough is similar to Dartford despite differences in airport accessibility¹¹⁰. This also raises questions over the appropriateness of the assumption that all foreign-owned firms above certain baselines count as catalytic activity.

Notwithstanding these limitations, the studies find that the cluster of foreign owned firms around Heathrow is large (at least 170,000 jobs). These jobs are described as "at risk" from the closure of Heathrow. It is unclear the extent to which these companies are likely to move either abroad or elsewhere in the UK, although the Regeneris study included a survey of around 500 companies based in the Heathrow airport area to ask what they would expect to happen to them if the airport closed. 72% of respondents said that there would be little or no effect, 24% said they may downsize their local operations or relocate (closer to the new airport). Only 4% of respondents said they may move operations abroad. The study rightly identifies that these survey results can only be interpreted as indicative, given the risk of survey bias (businesses that are more likely to be affected by Heathrow are more likely to have taken part in the survey), and the level of sample coverage, which was only 2%.

A survey conducted by Leigh Fisher for the Airports Commission also conducted surveys on attitudes to moving to the Estuary airport¹¹¹. This highlighted that most businesses do not know whether they will relocate at this stage as this issue has not been considered in their strategies. The results suggested that businesses that are highly dependent on the airport (e.g. freight-forwarding) would move before or upon opening. However, the majority of businesses would wait and see before making a decision. Concerns were also raised that the closure of Heathrow would raise the probability that offices of multinational firms in the M4 corridor would move abroad.

In summary, the existing evidence base on both the scale of existing local catalytic effects around Heathrow and the uncertainty about clusters transferring to the Estuary highlights that more detailed work is needed to understand this area. This could potentially be done by looking at relative locational attractiveness in more detail (the section below starts to show how locational attractiveness can be considered). More detailed modelling work could also be undertaken, for example through CGE or LUTI modelling approaches. However, it is unlikely that any analysis will allow firm conclusions to be

¹¹⁰ "Review of Heathrow Employment Impact Study by Parsons Brinckerhoff (PB) and Berkeley Hanover Consulting (BHC)". TFL.

¹¹¹ "Operational Viability and Attitudes to Moving to an Estuary Airport – draft report", Leigh Fisher, 2014.

reached on the exact scale or timing of movement of catalytic activity which ultimately would depend on the individual decisions of businesses in the future.

5.2. Drivers of location attractiveness

To try to build on the understanding of what may happen in the Thames Estuary area if an airport is built, we assess some of the drivers of location attractiveness for business, comparing the Estuary airport area to the Heathrow area and other associated transport corridors¹¹². As previously identified, the literature indicates that the most prominent drivers of firm location decisions include access to labour markets, access to other businesses, the cost of premises and transport links, so these drivers are the focus of this section.

5.2.1. Access to labour

Access to skilled labour is an important factor in business location decisions. Table 5.4 below shows a simple measure of labour access, the population that can access each proposed Estuary airport (and Heathrow) within one hour and two hours, and respective minimum travel time to Central London. On this measure the Heathrow airport site has materially greater access to labour than any proposed Estuary airport option.

Table 5.4: Accessibility of airport locations to population, 2030 assuming planned surface transport improvements go ahead

Scheme	Minimum time to Central London	Population access within 1 hour	Population access within 2 hours
Mayor of London – Isle of Grain (Sift 2 template 51)	24 minutes	12 million	20 million
Metrotidal - Thames Reach Airport (Sift 2 template 48)	25 minutes	11 million	22 million
Foster + Partners (Sift 2 template 46)	26 minutes	13 million	25 million
IAAG (Sift 2 template 47)	30 minutes	11 million	22 million
Airports Commission Isle of Grain option (Sift 3 template 67)	28 minutes	13 million	25 million
Heathrow airport – North West Runway (Sift 3 template 62)	15 minutes	16 million	36 million

Source: Airports Commission.

5.2.2. Access to businesses

Another key driver of location attractiveness is business accessibility. This provides market and suppliers for other businesses and strong clusters of businesses in an area support agglomeration effects that can boost productivity. The tables below show a measure of effective employment density, the number of jobs that are accessible within one hour of the airport sites under current transportation options.

Table 5.5 shows that by road the Isle of Grain site currently has only a tenth of the accessible employment by road that the Heathrow site offers. This is due to the low employment density around the site and the relatively remote geographical location on a peninsula that is largely surrounded by the sea. This may improve in the future given growth planned improvements in roads in the area and additional local jobs brought by the airport.

The Isle of Grain site performs more strongly when looking at combined rail and road access. The access to employees remains 40% below the Heathrow level, but this would improve materially with the addition of new fast rail links to Central London.

¹¹² Given the relatively small scale of Southend and London City airports we do not consider them in this section.

These measures suggest that the Isle of Grain site may be less attractive for business than Heathrow, although there are important limitations with this simple analysis¹¹³. The key one is that it looks at the current situation only. There would be significant transport improvements at the Thames Estuary site (Heathrow will also benefit from transport improvements like Crossrail) and the direct, indirect and induced impacts of the airport would boost current levels of employment (although employment is also expected to grow in London). In addition, this only considers one measure of attractiveness; there are many other drivers such as cost and availability of premises and quality of IT infrastructure which are also important.

Table 5.5: Number of workers accessible within one hour by road, based on current surface transport

	All jobs	1. Higher managerial jobs	2. Lower managerial jobs	3. Intermediate jobs	4. self employed	5. Lower supervisory jobs	6. Semi routine jobs	7. Routine jobs	8. Not classified
Heathrow	4.6 million	900,000	1.5 million	640,000	370,000	302,000	455,000	276,000	157,000
Isle of Grain	400,000	33,000	93,000	48,000	42,000	43,000	63,000	50,000	15,000

Source: Stephen Law, UCL.

Table 5.6: Number of workers accessible within one hour by road and rail, based on current surface transport

	All jobs	1. Higher managerial jobs	2. Lower managerial jobs	3. Intermediate jobs	4. Self employed	5. Lower supervisory jobs	6. Semi routine Jobs	7. Routine jobs	8. Not classified
Heathrow	7.8 million	1.3 million	2.3 million	1,100,000	714,000	606,000	897,000	595,000	277,000
Isle of Grain	4.5 million	770,000	1.4 million	612,000	400,000	318,000	493,000	315,000	152,000

Source: Stephen Law, UCL.

Note: These figures are based on current surface access transport, and do not include Crossrail, the western extension to Heathrow, or airport express routes to the Estuary airport.

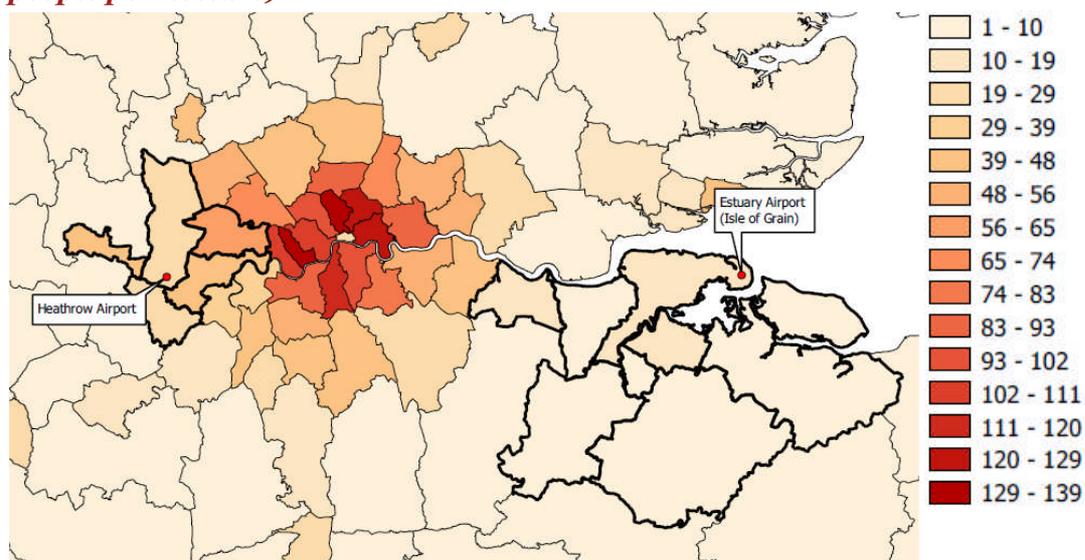
5.2.3. Wider geographic areas

Figure 5.2 below illustrates the current population density (number of people per hectare) and figure 5.3 shows employment density (workplace based jobs per hectare) in each local authority.

The data show that the local authorities around the Estuary airport are much more sparsely populated than those around Heathrow. The precise figures are shown in table 5.7 below. The data also show the current densities in selected London boroughs. Comparative density levels in Central London are far higher than in the Estuary or Heathrow airport locations.

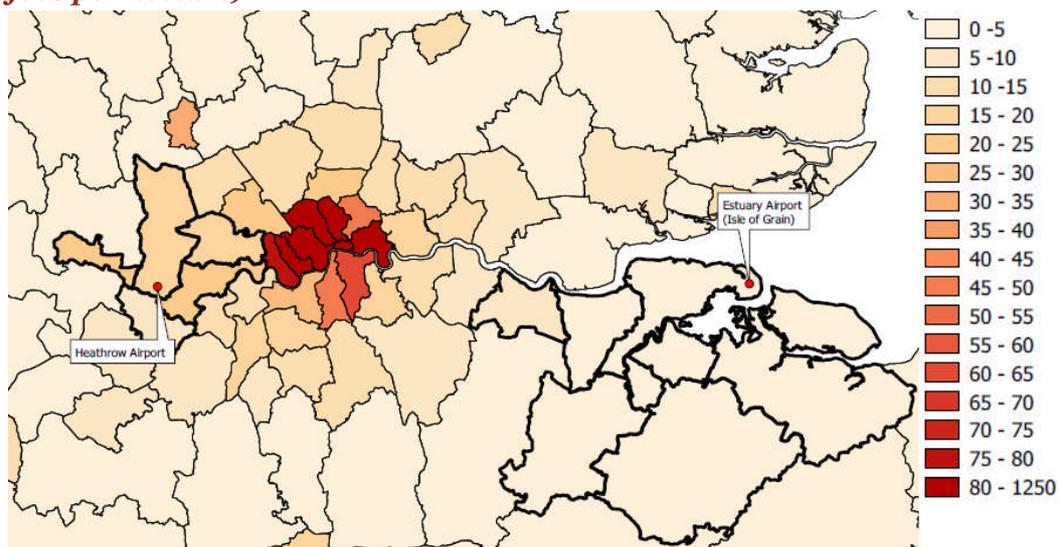
¹¹³ This analysis was not available for the Cliffe site, but we would expect the results to be materially similar the Isle of Grain given the proximity of the two locations.

Figure 5.2: Map of population density in the broader geographic area (number of people per hectare)



Source: PwC.

Figure 5.3: Map of employment density in the South East (number of workplace-based jobs per hectare)



Source: PwC.

The figures given show current density which would change if Heathrow were closed and the Estuary airport built. To understand the potential magnitude of this we simulate the effect of the additional direct, indirect and induced employment on the local authorities in north Kent¹¹⁴.

Combining Oxford Economics' estimates for the local direct, indirect and induced employment impact of 100,000 jobs by 2030 with existing employment would boost average employment density from 2.4 to 3.1 jobs per hectare¹¹⁵. Although this represents more than a 30% increase, this does not bring it significantly closer to the current employment density of the Heathrow area, which is 18.4 jobs per hectare (although this might fall slightly if Heathrow were closed).

¹¹⁴ Based on the local authorities of Medway, Maidstone, Gravesham, Dartford, Swale and Tonbridge and Malling.

¹¹⁵ These figures were not reported by individual local authority so we have only assessed this at the aggregate level. Note that this estimate is only indicative and intended to illustrate the scale of the difference since it combines current employment with forecast increases in 2030.

Table 5.7: Current population and employment densities in local authorities near Heathrow airport and the Estuary airport, 2012

Airport	Location	Population density (number of people per hectare)	Employment density (number of workplace- based jobs per hectare)
Heathrow airport	Ealing	61	20
	Hillingdon	24	16
	Hounslow	45	23
	Slough	43	25
	Spelthorne	21	8
Estuary airport	Dartford	13	7
	Gravesham	10	3
	Maidstone	4	2
	Medway	14	4
	Swale	4	1
West London	Tonbridge and Malling	5	2
	Hammersmith and Fulham	111	79
	Kensington and Chelsea	131	97
	Brent	72	23
	City of London	26	1,240
Central London	Westminster	102	296
	Southwark	100	64
	Islington	139	128
	Camden	101	133
	Tower Hamlets	129	108
East London	Hackney	129	47
	Newham	85	21

Source: Office for National Statistics, PwC analysis.

5.2.4. Costs of commercial premises

Cost and availability of premises is also important. The data on this is limited, but the figures in table 4.8 below on office rental rates highlight the material difference in costs between the Medway area and other geographies. Rental rates in the Medway towns are around half the level of Reading, and typically between a quarter and an eighth of Central London levels. On this measure alone the Medway location would be more attractive to businesses than the other areas.

Table 5.8: Office rental costs, selected locations, 2011

Geography	Rental values (per square metre)
West End	£860
City	£565
Docklands	£400

Geography	Rental values (per square metre)
Hammersmith	£375
Reading	£215
Medway towns	£120

Source: Valuations Office Agency, Property Market Report 2011.

5.2.5. Surface transport corridors

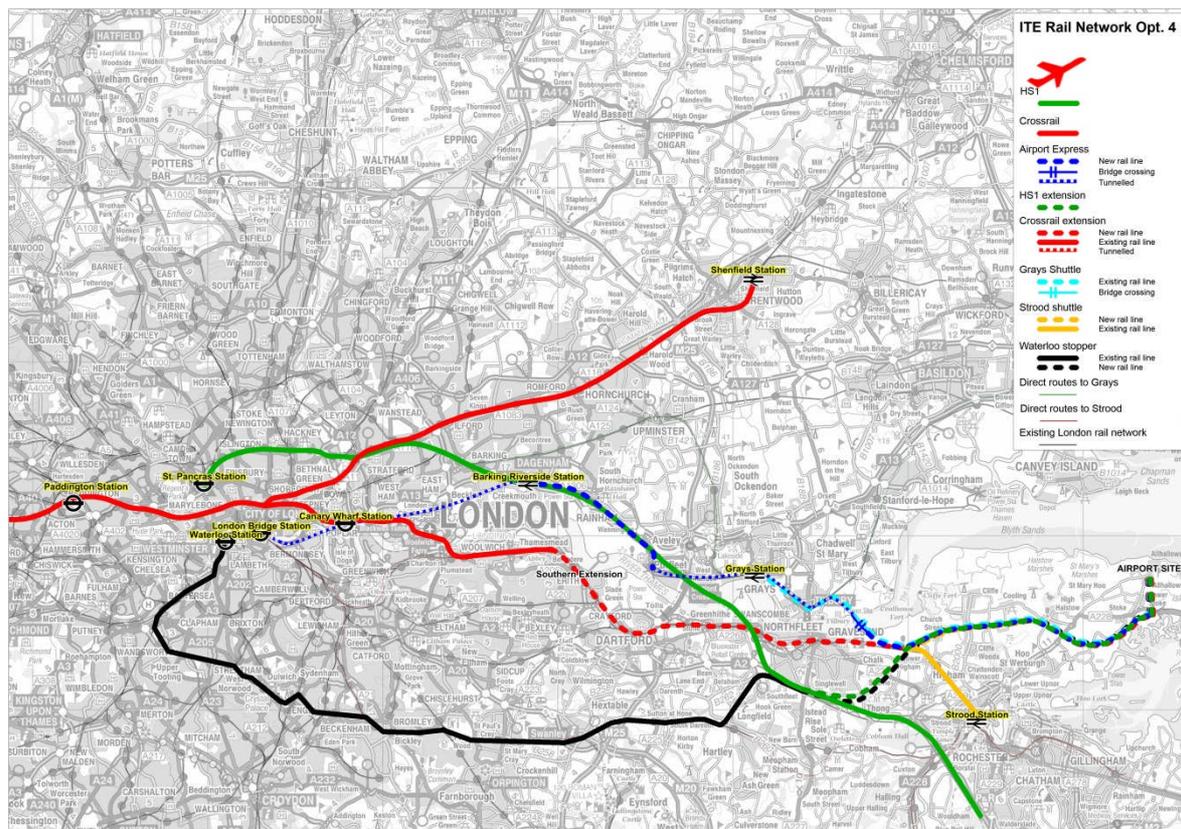
The ease of accessing an airport is also an important driver of firm location decisions, and this depends on surface transport. We showed earlier that the time taken to reach the Estuary airport would be greater than for Heathrow on average. However, the average disguises the fact that there would be winners and losers. Some locations in the east would benefit, whilst those to the west of Central London are likely to experience longer travel times to reach an airport. However, several of the schemes have claimed that a newly designed Estuary airport would enable more efficient travel through the airport itself, for example reducing the time needed to get from the rail station to the check in area. If this was the case it may partially offset increases in journey times required to reach the airport.

Airport access will be affected by the proposed surface transport packages for the Estuary airport options. A number of packages have been considered through the associated surface access study. The potential improvements making up these four packages included:

- Northern and southern extensions to Crossrail through Essex and Kent respectively;
- An extension to HS1 which branches off to the Isle of Grain;
- A stopping service from Waterloo station; and
- Road-widening improvements around nearby trunk roads.
- The Metrotidal proposal also includes a road tunnel between Kent and Essex.

Option 4 is presented below and includes enhanced express rail connections, together with the HS1 spur, the Crossrail southern extension, rail services from south Essex and north Kent, the Waterloo stopper, and the Mayor of London's express service to Waterloo via Barking Riverside, Canary Wharf and London Bridge. It does not include the Crossrail northern extension from Shenfield through to Billericay and the airport.

Figure 5.4: Potential Estuary airport rail transport improvements (option 4)



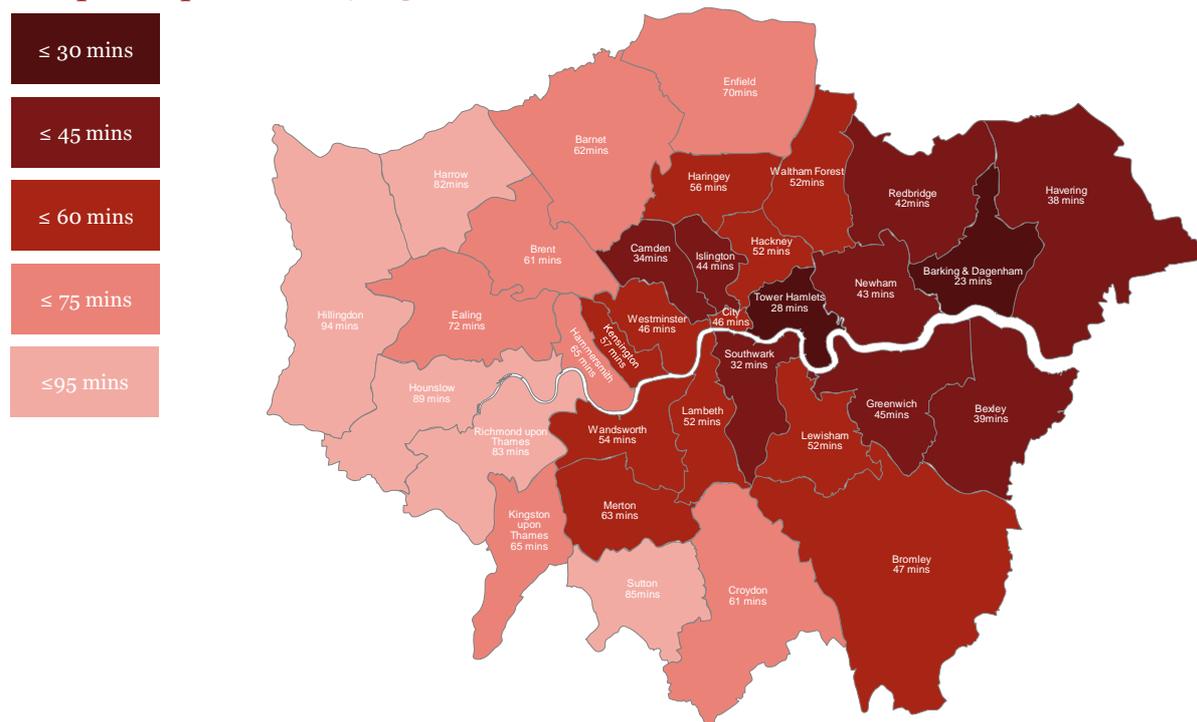
Source: Airports Commission.

The spatial implications of the Estuary airport would be affected by the impact of the planned surface transport on journey times from the surrounding areas.

Figure 5.5 shows the predicted public transport journey times from London boroughs to the Estuary airport assuming surface transport improvements that are underway and planned improvements identified above are undertaken. These figures are for trains only and only consider the time to reach the Airport, not the time to travel through the airports.

The data show that the areas with the best access to a new Estuary airport would be the central and eastern boroughs that are close to the Thames, in particular Havering, Barking and Dagenham, Newham, Southwark, Greenwich and Bexley. The areas around the HS1 Link at Camden and Islington would also be well connected as would the City and Canary Wharf due to Crossrail. The West London boroughs would be likely to experience a drop in overall airport accessibility, with train travel times of over an hour for much of West London.

Figure 5.5: Minimum rail journey times to the Estuary airport, including planned transport improvements, 2030 (clock times)



Source: Airports Commission.

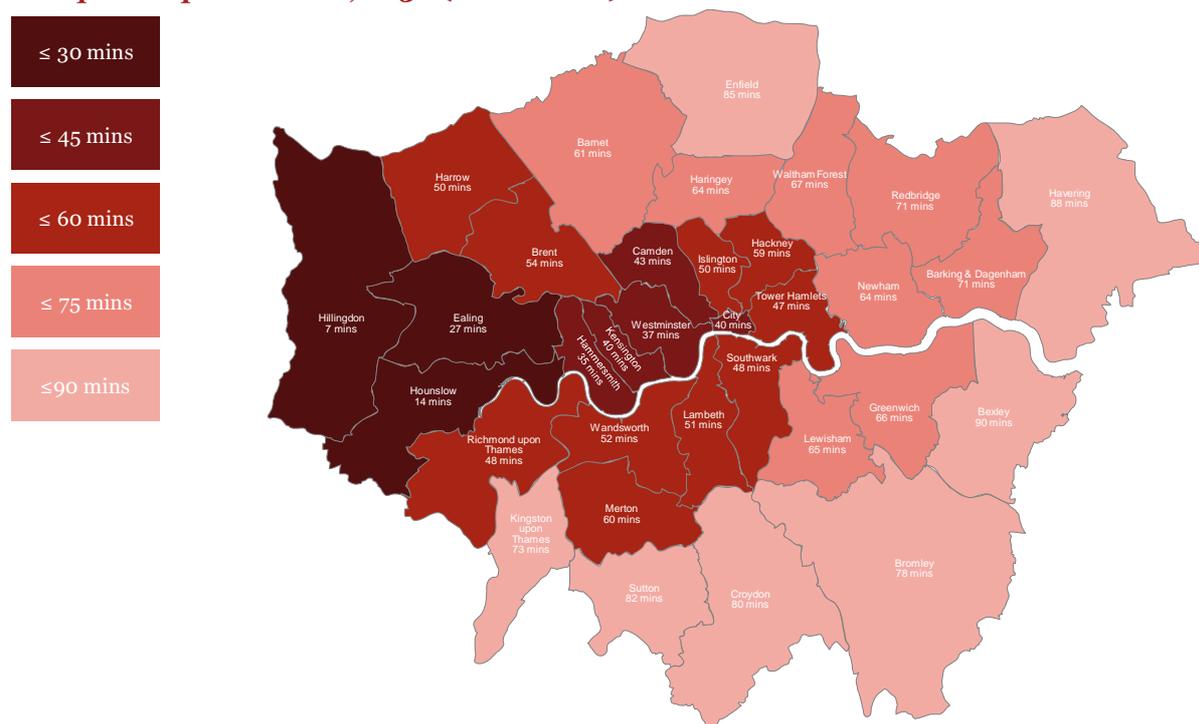
Includes option 4 transport improvements.

An opposite picture can be drawn when looking at journey times to Heathrow, as shown in figure 5.6. Access to Heathrow would be poorer from Outer East London and Outer South London (although many of these areas could access Gatwick and Stansted more easily). Access would be far better in West London. We note that with the completion of Crossrail, the access from Central London areas such as the City and Islington would be similar for both Airports¹¹⁶. Southwark and Tower Hamlets are expected to experience a reduction in journey times to the Estuary airport relative to Heathrow.

It should be emphasised that these maps only give rail access. Many passengers may still travel by car (especially to Heathrow). We also only present the minimum rail journey time due to the limited data available. Other factors would also be important when measuring access to airports, such as the cost of tickets. This is considered further in the surface transport study.

¹¹⁶ The same stations feature in Figure 5.5 and Figure 5.6 to aid comparability.

Figure 5.6: Minimum rail journey times to Heathrow airport, including planned transport improvements, 2030 (clock times)¹¹⁷



Source: Airports Commission.

Includes Crossrail but not the Southern Rail Link.

5.3. Sector level implications

Businesses which spend a larger share of their supply costs on air transport are likely to benefit the most from having strong airport accessibility. As shown in table 5.9 below, the finance and business sector is by some margin the highest relative user of aviation. The wholesale and retail sector is also a significant user, likely due to the importance of air freight, with ICT and transport and storage also notable users of air transport¹¹⁸.

Businesses which rely more heavily on aviation services would be more likely to move closer to the Estuary airport, particularly if they were to experience deterioration in their airport accessibility as a result of the new airport (i.e. due to the closure of existing airports). For example, financial firms spend approximately five times as much as manufacturing firms on aviation as a proportion of total expenditure, which may mean that their employees therefore travel to airports in the region of five times as much (assuming that they pay a similar amount per flight).

Table 5.9: Share of supply chain spending on air transport services, 2010

Sector	Purchases of aviation
Financial and other business services	1.1%
Other services	0.6%
Wholesale and retail	0.6%
Information and communication	0.5%

¹¹⁷ It should be noted that the Heathrow 2030 baseline travel times are being developed as part of phase two work, but have been used in the surface transport study to compare Heathrow and the Estuary Airport on a like for like basis in 2030. This means that they are preliminary and are subject to change.

¹¹⁸ Another way of looking at sector dependence is to look at the supply chain spending of airport users, rather than how much airport users spend on airports. However, the former effects should be largely captured in direct, indirect and induced effects.

Sector	Purchases of aviation
Agriculture and mining	0.4%
Transport and storage	0.4%
Public admin, education and health	0.4%
Manufacturing	0.2%
Energy and water	0.1%
Construction	0.1%
Accommodation and food services	0.0%

Source: UK input-output analytical tables, ONS.

Another important factor governing spatial catalytic effects is the extent to which agglomeration economics matter for different sectors. Agglomeration benefits arise as similar firms located near to each other can benefit from productivity gains as a result of the spatial concentration. These effects can arise from shared supply chains (leading to greater competition and specialisation of suppliers) and economies of scale and scope. The sectors which accrue the greatest benefits from agglomeration are more likely to form concentrated clusters (as the benefit from productivity improvements is greater).

A number of studies have attempted to capture the “agglomeration elasticity” of different sectors using econometric analysis. Table 5.10 presents the results of one such study which shows that the finance, business services and transport and storage sectors experience the greatest gains from agglomeration. The elasticities indicate that for these sectors, a doubling of effective density is associated with an increase in productivity of over 20%.

Table 5.10: Agglomeration elasticities (with respect to productivity) by sector

Sector	Elasticity of impact of changes in effective density on productivity
Banking, finance and insurance	0.237
Business services	0.224
Transport, storage and communications	0.223
Real estate	0.192
Distribution, hotels and catering	0.153
Whole economy	0.119
IT	0.082
Manufacturing	0.077
Construction	0.072

Source: “Agglomeration economies and transport investment”, Graham, 2007.

This matters because if there are strong agglomeration effects and a highly concentrated existing cluster, there is less potential for a change in airport accessibility to have sufficient impact to lead to a relocation of these clusters, as any first-mover leaving the cluster may experience a material decline in agglomeration benefits, unless they move somewhere with similar characteristics. For example, if the effective density of the clusters near Heathrow is twice that of the clusters near the Estuary airport across all sectors, then the average financial services firm would experience a 24% fall in productivity, while the average IT firm would experience an 8% fall in productivity (holding all else constant). Financial services firms therefore have a much more significant disincentive to move from their existing clusters to the new airport.

The evidence presented above therefore suggests that firms with high usage of air transport services may be more likely to relocate closer to an airport in the Thames Estuary, as they receive a greater benefit from airport access, but on the other hand, businesses that experience strong agglomeration effects that are already in large clusters may be less likely to relocate unless there are other significant clusters that would allow them to maintain agglomeration benefits. This means that there is a trade-off between these two opposing effects, particularly for sectors such as financial and business services where both effects are particularly strong.

5.3.1. Current employment clusters

To consider the question on propensity to relocate further we focus on three sectors:

- Finance and business services - due to the importance of aviation usage to this sector and strong agglomeration effects;
- Transport and storage - which have relatively high air transport spend and strong agglomeration effects. There will also be direct, indirect and induced activity which will start a cluster in the Thames Estuary and may encourage other firms to join. There is evidence that this has occurred at Schiphol Airport¹¹⁹; and
- Information and communications - which have high aviation usage and significant clusters around Heathrow currently.

For these three sectors we present the existing levels of employment density around Heathrow, the Estuary airport site and the areas of highest density in London in table 5.11.

Table 5.11: Employment density in selected areas (workplace based employment per hectare), 2012

		Financial and other business services	Transport and storage	Information and communication
Heathrow area	Ealing	4.3	1.6	1.1
	Hillingdon	3.9	4.7	0.4
	Hounslow	5.9	2.9	3.5
	Slough	4.9	2.8	3.8
	Spelthorne	1.6	0.6	0.6
Estuary area	Dartford	1.6	0.6	0.2
	Gravesham	0.5	0.2	0.0
	Maidstone	0.4	0.1	0.1
	Medway	0.7	0.2	0.1
	Swale	0.2	0.1	0.0
	Tonbridge and Malling	0.5	0.2	0.1
West London	Highest borough	22.9 (Kensington and Chelsea)	4.7 (Hillingdon)	11.3 (Hammersmith and Fulham)
	2nd highest borough	20.5 (Hammersmith and Fulham)	2.9 (Hounslow)	7.7 (Kensington and Chelsea)
	3rd highest borough	5.9 (Hounslow)	2.6 (Kensington and	3.5 (Hounslow)

¹¹⁹ See case study information on Schiphol Airport later in this section for more information.

		Financial and other business services	Transport and storage	Information and communication
			Chelsea)	
Central London	Highest borough	1040.3 (City of London)	12.4 (City of London)	86.9 (City of London)
	2nd highest borough	106.1 (Westminster)	7.7 (Westminster)	28.9 (Westminster)
	3rd highest borough	50.7 (Camden)	4.2 (Camden)	19.7 (Islington)
East London	Highest borough	65.0 (Tower Hamlets)	2.3 (Tower Hamlets)	10.8 (Tower Hamlets)
	2nd highest borough	15.8 (Hackney)	1.3 (Newham)	3.6 (Hackney)
	3rd highest borough	3.7 (Newham)	1.0 (Barking and Dagenham)	0.5 (Greenwich)

Source: PwC analysis based on data from the Office for National Statistics.

This sector level data reinforces the aggregate figures, which previously showed very low current employment density around the Isle of Grain site. With the exception of Dartford, many of these local authorities have density levels that are only one tenth of the authorities around Heathrow. This suggests that the most likely location for significant catalytic activity to occur may be the transport corridors to the airport, rather than outside the airport fence due to the implications for the attractiveness of these locations.

5.3.1.1. Finance and business services

Financial services are currently dominated by clusters in the City and Canary Wharf (Tower Hamlets), although the local authority level measure exaggerates the difference between the two as Tower Hamlets is geographically much larger and unlike the City has significant areas of predominantly residential zoning.

Business services are more distributed with significant clusters in Camden (legal, accounting and consulting) and Westminster (consulting), as well as significant activity in the City and Canary Wharf.

Given the enormous disparity between the concentration of Central London clusters and Kent (and consequent differences in the benefits from agglomeration that would be realised), it seems unlikely that the airport would catalyse significant finance and business service clusters nearby, at least in the short term.

It would be more likely that some business service activity may transfer from the smaller clusters to the west of London (e.g. Kensington, Hammersmith, and Hounslow) who would experience degradation in airport access, to Central London and some of the existing clusters in the East like Tower Hamlets and Hackney, who would benefit from stronger links to the Estuary airport.

5.3.1.2. Transport and storage

Hillingdon is currently a key transport and storage cluster in West London, supported by the direct, indirect and induced employment provided by Heathrow and other catalytic employment¹²⁰. The direct activity would move to Medway, boosting employment density there. We would also expect to see some movement of indirect and induced jobs in the airport supply chain to the east of firms for whom proximity to the airport is important.

This may generate enough critical mass in the estuary area to encourage catalytic activity in this sector (e.g. freight companies, hauliers), although the area directly around the Estuary airport suffers from

¹²⁰ We have no data on the relative scale of these categories.

weaker road access than Heathrow and a more remote geographical location. Existing freight companies at Heathrow also rely on delivery companies being located close to the airport. The existing clusters in the East such as Tower Hamlets, Newham and Barking and Dagenham could also benefit from some relocation.

5.3.1.3. Information and technology

In the information and communication sector, there is comparatively lower employment density in the Heathrow area, although Hounslow, Slough and West London boroughs such as Hammersmith and Fulham have some activity. There could be some movement from these clusters to the existing centres in the East such as Tower Hamlets and Silicon Roundabout (Hackney), who would see significant improvements in airport connectivity relative to these western clusters. The clusters in Westminster and the City are materially denser than the other areas, which would act as a barrier to firm relocation.

5.3.1.4. Summary

This analysis provides a starting point to think about the propensity of different types of business to re-locate to the East by looking at some simple measures of relative location attractiveness. The assessment is very high level and could be extended to consider a greater degree of sector granularity (for example, finance and business services is a large and diverse sector that includes many disparate types of firm), greater geographical granularity and a wider range of drivers. In addition, rather than considering simple measures of employment and labour density at a given site it is more appropriate to consider *accessible* employment and labour – which also factors in the transport network.

Even if these extensions were made, the assessment would still not enable firm conclusions to be drawn about the scale of catalytic activity that would move eastwards. The analysis only considers the propensity for movement, rather than what would actually happen. Additional work could be undertaken, for example by conducting surveys of firms in the affected areas, or those who had recently moved. This would help to understand attitudes to relocation and their views and other important factors such as herd behaviour, asset investment cycles, the impact of technology and underlying geographic strategy.

It is also important to position this in the national context. Any movement of catalytic activity to the east from the west may not be economically desirable at an aggregate level. The net effect may even be negative. A reduction in productivity in the west of London (due to weakening agglomeration effects and higher air transport costs) could exceed the productivity gains to businesses in the East. Similarly, the change in relative location attractiveness (along with uncertainty associated with the transition) may lead to more firms leaving the UK than coming in as a result of the change. Far more detailed work would be required to understand the complex drivers of location attractiveness both in the UK abroad in order to predict the likely outcome of this change with more confidence.

5.4. Examples of local catalytic effects at airports

Given the uncertainty over the local catalytic effects it is useful to look at historic examples which are presented in table 5.12 below.

A common conclusion from these examples is that the nature of the clusters that have formed, in terms of their sector, economic impact and geography, varies considerably according to local contexts and is difficult to predict. The unpredictable nature of clusters means there is a risk that the expected local catalytic impacts from an Estuary airport would not be achieved, and that they might not occur at locations in which they are desired. For example, if a key objective of the Estuary airport is to regenerate areas in Kent, this may not be achieved if the airport supports clusters in East or Central London instead.

The TfL study on the distribution of catalytic employment identified that areas such as Bexley, Ebbsfleet and Ashford are likely to experience the greatest catalytic effects. However, locations closer to Central London such as the City of London, Canary Wharf and Hackney appear more likely to attract strong catalytic employment given their attractiveness to businesses, particularly in sectors where there are large existing agglomerations such as financial and business services and information

and technology. It is clear that there is a high degree of uncertainty regarding both the expected sectoral and geographical distribution of catalytic employment, in addition to its overall magnitude.

The successful formation of clusters around new airports often requires significant intervention and investment from national and local authorities to ensure that an attractive business environment is created. This adds to the difficulty of assessing the likely effects *ex ante* without knowing what strategies will be put in place. The examples also show that local catalytic effects take a considerable length of time to manifest, so any assessment of the effects should account for an initial period of little impact.

Table 5.12: Examples of local catalytic effects at airports

Airport	Reference	Comments
Atlanta, Dallas & Memphis	Prosperi, <i>Airports as Centers of Economic Activity: Empirical Evidence from Three US Metropolitan Areas</i> , 2007	<p>Compares clustering effects at Atlanta, Dallas and Memphis airports. The key findings are that the clustering effects are very different in terms of size, sector and depend on local circumstances.</p> <p>Atlanta: Economic activity at or around Atlanta airport employs 4.1% of the non-government workforce. In addition to a transport cluster, there are specific industry groups in communications, food production, wholesaling and storage that can be considered as catalytic activity. The report highlights that Atlanta’s role in both the interstate system and as a hub airport have been key in determining the nature of the local economic activity.</p> <p>Dallas/ Fort Worth: Economic activity related to the airport comprises 4% of metropolitan employment, similar to Atlanta. Higher-productivity catalytic industries, including finance, information and computing programming are shown to have developed here. This is attributed in the report to the fact that Dallas/ Fort Worth is the newest airport studied, and therefore gives the opportunity to “start fresh”.</p> <p>Memphis: Despite being a smaller metropolitan area, Memphis Airport is responsible for a similar number of workers and therefore represents 20% of all metropolitan employment. This suggests that labour market impact of an airport is not necessarily constrained by the size of the nearest city. However, the report also argues that the highway corridor around Memphis has played a crucial role in determining the nature of the clusters which have developed, which tend to be lower-productivity industries, such as wholesaling, distribution and manufacturing.</p>
Cross section of airports in the USA	GAO, <i>Airport-Centric Development</i> , 2013	<p>Identifies five factors which facilitate airport-centric catalytic development. Many of these drivers are policy related and the study emphasises the importance of government intervention to support catalytic development around an airport. The drivers are:</p> <ul style="list-style-type: none"> • Development at the airport (e.g. retail or passenger services): The scale of the opportunity here is demonstrated through the provision of 140,000 square feet for “for premier dining, retail shopping, and airline club lounges” at Los Angeles International Airport’s new terminal. • Air and surface connectivity: While Memphis has developed as a distribution hub due to its “Four R’s” (road, river, rail and runway), Miami International are building a new viaduct to stem a projected loss of \$1 billion in revenue by 2015 because of road congestion. • Access to funding sources: A lack of access to public funding can prevent airport development, as experienced by Lambert-St. Louis International Airport, who have had to delay their airport-centric development efforts due to a lack of state funding. • Linking the airport to regional development: The majority of successful attempts to attract business activity to the vicinity of the airport have looked to particularly incentivise links between the airport and the local area. For example, airport officials in six states have applied to designate the areas around their airports as ‘foreign trade zones’ in order to support tax-free manufacturing. • Stakeholder collaboration: Efforts have been made at a number of airports to form committees with a range of public and private stakeholders in order to support airport development. Where this is not done successfully it can be a barrier to development, such as in Los Angeles International Airport, where the northern airfield could not be expanded due to community

Airport	Reference	Comments
		opposition to the scheme.
Denver	Perry & Raghunath, <i>The emergence of the airport city in the US</i> , 2013	<p>Highlights the plan for an “airport city” around Denver International Airport. This would specifically focus on clusters of aviation, aerospace, logistics, renewable energy, bioscience and agrotech. This example also highlights the time lag in cluster development, with the plan coming nearly 20 years after the airport opened, and expected to evolve over the next 30 to 50 years.</p> <p>The degree of time lag in airport development can be seen through the plan, which highlights a first stage of runway development through to 2030/35, and also subsequent runways which may be developed after this. This builds on a previous plan, developed in 1988, which has guided development up until this point.</p>
Schiphol	Kasarda, <i>The evolution of airport cities and the aerotropolis</i> , 2008	<p>There has been intensive development of commercial real estate at Schiphol over the last few decades. Over 60,000 people are employed around the airport, generated from a broad spectrum of business sectors such as finance, consultancy, traffic and transportation, government or healthcare. The majority of these jobs can be classified as catalytic.</p>
	Warffemius & Martinus, <i>Modeling the Clustering of Distribution Centers around Amsterdam Airport Schiphol</i> , 2007	<p>40% of the European Distribution Centres in the Schiphol area do not rely on the airport. This demonstrates that economies of agglomeration are important in location decisions and the potential for catalytic activity to emerge around an airport. The logistics hub has developed in such a way that many businesses do not rely on the airport, instead making use of other transport modes.</p>
Guangzhou	Guangzhou International, <i>Development Plan for Guangzhou Airport Economy (2010-2020)</i> , 2009	<p>Outlines a 10-year, 4-stage development plan from the airport to the metropolitan area. Focusses on initially developing an air transport industry, later widening to air transport-related services and manufacturing. Further highlights the lengthy time lags and gradual nature of cluster development.</p>

Source: As stated.

Appendices

Appendix A: Overview of scheme proposals

Below we provide an overview of each of the submissions taken forward by the Airports Commission as a basis for further study, including a side-by-side comparison table up front, discussing the features, gaps and issues of each proposal under the following headings:

- Summary of proposal;
- Key facts and observations;
- Ground transportation plans; and
- Material issues identified with the proposal.

All issues listed in the following overviews have been taken from the scheme sift templates as provided on the Airports Commission website. Any data not based on these materials is marked as such. The data below is based on evidence that was available in April 2014.

1. Overview of different proposals

The table below provides a summary of key data for each of the proposals considered as part of this report.

Table 1: Summary of proposals

	Airports Commission		Foster		Metrotidal		TfL		IAAG	
	2030	2050	2030	2050	2030	2050	2030	2050	2030	2050
Runways	3	4	4	4	3	4	4	4	3	3
Passenger capacity (million)	105	150	110	150	<100	180	90	180	100	140
ATM	623k	830k	600k	830k	London Heathrow replaced	900k	London Heathrow replaced	1,000k	N/A	780k
Cost* (£ billion)	82 - 112	93 - 125	N/A	69	N/A	71	N/A	86	N/A	66

**Note: total cumulative cost to 2050 based on independent cost estimates provided in the Airports Commission's templates.*

We note that Mark Reckless MP has estimated a total cost for the Airport of £148 billion¹²¹. However, this comprises additional costs such as compensation payable to West London boroughs and to closed airports, costs that are not included in the independent cost estimates as cited by the Airports Commission. A breakdown of costs provided by Mark Reckless indicates a comparable cost estimate to the independent cost assessments provided in the sift templates of £112 billion (Airport cost, surface access, risk and optimism bias)¹²².

¹²¹ Submission to the Airports Commission: Cost and financing of an Inner Thames Estuary airport, roundtable hosted by Mark Reckless MP, page 1.

¹²² Ibid.

2. Proposal – Airports Commission

Summary of proposal:

New four runway airport on the Isle of Grain at the eastern end of the Hoo peninsula. This option is based on a combination of a number of submissions for suggestions on the peninsula. The Airports Commission option sought to minimise cost, environmental impact and avoid relocation of the LNG facility. The first phase of development will be based on a three runway layout with a fourth runway being operational by 2050. Later phases of development would allow for up to 150 million passengers to be served annually. The proposal requires expansion of railway networks, including extension of Crossrail1, a new high-speed airport express service and upgrading of London rail termini. Enhancements to motorways and primary roads in the airport area would also be required.

Table 2: Key facts and observations

Opening year	2029
Passenger capacity	Start of operations – 105 million per annum Ultimate capacity – 150 million per annum
Runways	4
Employment	N/A
Location	Isle of Grain
Promoter cost estimate	N/A
Independent cost assessment*	£93 billion to £125 billion

*Note: risk adjusted range reflecting the cumulative cost to 2050 and based on Airports Commission template

- 105 million annual passengers in 2029 allows for Heathrow traffic to be replaced plus a modest capacity increase. While there is no net increase in the number of runways in 2030, the proposal highlights that the three runways will have greater capacity than the three runways being replaced.
- Three runways on opening. This does not represent any additional runways for the London area (assuming London City runway closure). Four runways being operational by 2050 equates to one additional runway for the London area.
- Longer-term capacity of circa 150 million passengers per annum. There is no precedent for an airport of this size globally. The longer-term capacity level is below that proposed by TfL and the four runways are proposed to operate in segregated mode.
- The Airports Commission case cites the promoter cost at £24 billion which is consistent with that of Foster + Partners. This proposal only reflects the construction cost to 2029. It does not include phases of development post-2029 that will be required to accommodate 150 million passengers. Furthermore the promoter does not consider ground transportation costs.
- This proposal is the only one that suggests it would probably require the closure of London City airport. Other proposals mention only that growth may be held back at London City and Southend airports.
- An independent cost assessment estimates the risk adjusted cumulative cost range to 2050 of the Airports Commission case at between £93 billion and £125 billion.

Ground transport plans:

Road: Projects proposed include new access road from the A2, an additional lane on the Lower Thames Crossing and other improvements to A2 and M25.

Rail: Crossrail extension to the airport, a new high speed service to Central London with one using HS1 to St Pancras and the other using new tunnels from London Riverside to Waterloo.

Material issues with the proposal:

Specific issues mentioned in the sift template for this proposal include London City airport probably having to close, listed buildings and monuments being within the airport footprint, flooding risk, loss of quality agricultural land, the LNG facility potentially impacting operations and the considerable airspace redesign required.

Furthermore the assumptions underlying public transport usage are key to any proposal. In this case the public transport surface access strategy is based on 60% usage for passengers and 35% usage for employees. The Airports Commission considers the passenger assumption to be optimistic. The employee assumption is below both TfL and Foster proposals at 75% and 60% respectively, but the Airports Commission thought it reasonable to bring the assumption in line with current levels at UK airports (Heathrow circa 30%; Stansted circa 24% and Gatwick circa 29%).

3. Proposal - Foster + Partners

Summary of proposal:

New four runway airport on the Isle of Grain at the eastern end of the Hoo Peninsula. First phase of development would provide annual capacity for 110 million passengers, representing a modest net increase to system capacity. Later phases of development would allow for up to 150 million passengers to be served annually with potential for further growth. The proposal requires expansion of railway networks, including extension of Crossrail1 and upgrading of London rail termini to cater for the airport related demand. Enhancements to motorways and primary roads in the airport area would also be required.

Table 3: Key facts and observations

Opening year	2029
Passengers	Start of operations – 110 million per annum Ultimate capacity – 150 million per annum
Runways	4
Employment ¹²³	100,000 on-site 100,000 off-site
Location	Isle of Grain
Promoter cost estimate*	£24 billion
Independent cost assessment	£68.9 billion

**Note: submitter has only provided cost estimates for Phase 1 unadjusted for bias (this does not include ground transport costs)*

- 110 million annual passengers allow for a modest capacity increase.
- Four runways equates to one additional runway for the London area (assuming closure of London City runway).
- Longer-term capacity of 150 million passengers per annum. There is no precedent for an airport of this size globally. The longer-term capacity level is lower than other proposals which provide for wider spaced runways.
- The cost cited by the promoter of £24 billion only reflects the construction cost to 2029. It does not include phases of development post-2029 that will be required to accommodate 150 million passengers. Furthermore the promoter does not consider ground transportation costs.
- An independent cost assessment estimates the total cost of the proposal at £69 billion.

¹²³ Foster and Partners, Thames Hub Airport, Outline proposal to the Airports Commission, July 2013, page 29

Ground transport plans:

Road: Projects proposed include new access road from A2/M2, a Lower Thames Crossing and other improvements to A2/M2 and M20.

Rail: Projects proposed include passenger services from parkway stations, Crossrail1 extension to the airport and HS1 link.

Material issues with the proposal:

Specific issues mentioned in the sift template for this proposal include capacity being impacted by the configuration of runways, sites of cultural interest and protected habitat being within the airport footprint, flood risk, the LNG facility potentially impacting operations and the considerable airspace redesign required. Furthermore agricultural land loss, displacement of industrial development and contaminated land issues have not been covered, but could be significant. The surface access strategy is based on 60% rail mode split for both passengers and airport employees. The Airports Commission considered this level to be optimistic in its case.

4. Proposal - Metrotidal Tunnel and Thames Reach Airport

Summary of proposal:

New four runway airport built on an artificial island in the Thames Estuary. The first phase of development would not provide for any additional capacity for the London region. The proposal suggests the establishment of a split hub with Heathrow. Later phases of development would allow for up to 180 million passengers per annum to be served. The proposal requires expansion of railway networks including a major eastern extension of Crossrail1. No information has been provided on highway capacity impacts and improvements.

Table 4: Key facts and observations

Opening year	2024
Passengers	Start of operations – replacing Heathrow traffic, but not adding to system capacity Ultimate capacity – 180 million per annum
Runways	Start of operations – 3 Longer term – 4
Employment	N/A
Location	Artificial island north of the Hoo Peninsula
Promoter cost estimate*	£28 billion
Independent cost assessment	£71 billion

*Phase 1 and Phase 2 cost including £1 billion for Metrotidal Tunnel.

- Opening capacity will not exceed 100 million passengers and only allows for replacement of lost capacity at Heathrow.
- Longer-term capacity of 180 million. There is no precedent for an airport of this size.
- Three runways initially does not equate to any additional runways for the London area. The opening of a fourth runway over the longer term will equate to one additional runway for the London area (assuming London City runway closure).

Ground transport details:

Road: No analysis provided.

Rail: Projects proposed include a HS1 link, extension of Crossrail1 and other regional railway improvements.

Material issues with the proposal:

Specific issues mentioned in the sift template for this proposal include the proposed runway configuration being based on untried operational procedures, protected habitat being within the airport footprint, flood risk and the considerable airspace redesign required. Agricultural land loss and land quality impacts not addressed,

but are likely to be significant. The proposed timings for the project also appear ambitious, with the operation start date being before that of the other proposals. We note that no detailed information has been provided on highway capacity impacts.

5. Proposal - Transport for London

Summary of proposal:

New four runway airport on the Isle of Grain. First phase of development would provide capacity for 90 million passengers, which would only replace Heathrow traffic. Later phases of development would allow for up to 180 million passengers per annum to be served. This is the largest of the Estuary options providing the greatest capacity. This option requires expansion of railway networks including extension of Crossrail1 and enhancement of London rail termini. Enhancements to motorways and primary roads in the region would also be required.

Table 5: Key facts and observations

Opening year	2029
Passengers	Start of operations – 90 million per annum Ultimate capacity – 180 million per annum
Runways	4
Employment ¹²⁴	134,000 new additional jobs locally 138,000 catalytic jobs
Location	Isle of Grain
Promoter cost estimate	£68 billion
Independent cost assessment	£86 billion

- 90 million passengers at start of operations does not equate to any additional passenger capacity and only replaces lost capacity at Heathrow.
- Long term capacity of 180 million passengers. There is no precedent for an airport of this size.
- Four runways will equate to one additional runway for the London area.
- Cost of £68 billion, including risks, provided by the promoter. The independent cost assessment at £86 billion is the highest of all proposals.

Ground transport details:

Roads: Projects proposed include new access roads, widening of existing routes and a Lower Thames Crossing. Capacity enhancements are also planned for the M25 (60% additional capacity) and the A2.

Rail: New airport express rail service to Central London and Crossrail1 extension.

Material issues with the proposal:

Specific issues mentioned in the sift template for this proposal include the greater capital cost of this proposal compared to others given its scale, Luton Airport closure, listed buildings and protected habitat being within the airport footprint, high probability of flooding, relocation of the LNG facility and the considerable airspace redesign required. Agricultural land loss, displacement of industrial development and contaminated land issues have not been covered, but could be significant.

This proposal relies on high public transport targets (65%) that are high by airport standards and considered optimistic by the Airports Commission.

¹²⁴ The Mayor of London's submission to the Airports Commission, Outline proposal for long term aviation capacity, July 2013, page 19.

6. Proposal – IAAG

Summary of proposal:

A complex proposal for a three runway airport located at Cliffe on the Hoo Peninsula. This is a package of different measures that proposes mixed mode at Heathrow, a second runway at Gatwick and construction of a three runway airport in the Thames Estuary with a capacity of 100 million passengers. Improvements to the local road network are cited while the rail proposition requires a shuttle bus link from Gravesend.

Table 6: Key facts and observations

Opening date	2027 (implied)
Passenger capacity	Start of operations – 100 million per annum Longer-term 140 million per annum
Runways	3
Employment	N/A
Location	Cliffe
Promoter cost estimate	N/A
Independent cost assessment	£66 billion

- 100 million passengers at start of operations. It does not propose to be the UK’s only hub and cites examples of cities internationally that are served by more than one hub.
- The net impact of the three runway proposal will depend on the status of other London area airports.
- Independent cost estimate of £66 billion overall is at the lower end of the independent cost estimates provided.

Ground transport details:

Road: Connections to the A13 and A2 from new road tunnel and Lower Thames Crossing.

Rail: New East-West rail tunnel to connect airport to Kent and Essex, new rail shuttle link to Gravesend and Ebbsfleet for connections to HS1 and extension to Crossrail1.

Material issues with the proposal:

Specific issues mentioned in the sift template for this proposal include location at western end of the peninsula which could impact more people across East London than the other Isle of Grain proposals, capacity being constrained at the site as a result of only three planned runways, listed buildings and protected habitat being within the airport footprint, high probability of flooding, the LNG facility potentially impacting operations, the considerable airspace redesign required. Agricultural land loss, displacement of industrial development and contaminated land issues have not been covered, but could be significant.

It is not clear that a 10km shuttle bus service between the airport and Gravesend could adequately cater for the passenger numbers. The proposal notes that the area is already under existing Heathrow flight paths. This would be an issue if it were only a three runway airport suggesting Heathrow’s continued operation would be required. No cost information is provided by the promoter.

Appendix B: Summary of key economic impact evidence

1. Direct, indirect and induced effects

Scheme/topic	Reference	Summary	Comments on approach
TfL Impacts of Estuary airport (Isle of Grain)	“The Mayor of London’s submission to the Airport’s Commission:	Page 14 table 3.1: Employment from operating the airport estimated to be 388,000 and £42.3 billion GVA in 2050 (2013 prices).	These figures are all sourced from Oxford Economics and Ramboll reports – see comments below.
	Outline proposal for long term aviation capacity” July 2013	Page 15 Heathrow closure “In the long run, closing Heathrow would not reduce the UK’s total employment and GVA.” Page 16 “The switch from employment use to the creation of a new London Borough is estimated to result in a net loss of 33,500 jobs locally which is fewer than the jobs that London is forecast to create each year in the future (35,000).”	
TfL Impacts of Estuary airport (Isle of Grain)	“Impacts upon the local and national economy” Oxford Economics and Ramboll 2013	<p>Construction phase</p> <p>Estimates the gross national impact of building the Isle of Grain airport. They estimate that there will be 50,000 direct, 58,000 indirect 38,000 induced jobs during peak construction (143,000 in total). This is equivalent to £7.4 billion in GVA in 2020 (2013 prices).</p> <p>Operational phase</p> <p>Estimates gross national impact of operating the Isle of Grain airport. They estimate that there will be 116,000 direct, 144,000 indirect 129,000 induced jobs in 2050 (388,000 in total). This is equivalent to £43 billion in GVA by 2050 (2013 prices).</p>	<p>Construction phase</p> <p>Oxford Economics use construction cost estimates provided by Atkins as a base for their estimates. These costs are said to include the building and maintenance of surface transport (as well as the airport). The precise cost number used is not given in the report. This cost is assumed to be revenue for construction and professional services firms (e.g. architects), which is used to estimate GVA using turnover to GVA ratios from the UK input-output tables. Employment is derived based on productivity levels from regional sector accounts (grown forward based on productivity growth assumptions). This approach provides a direct impact to which Oxford Economics apply multipliers to estimate indirect and induced impacts.</p> <p>The approach described is a standard approach which should provide a reasonable estimate of the GVA and jobs associated with the expenditure. However, as Oxford Economics point out a Computable General Equilibrium approach may provide a more accurate estimate since they can account for the price impacts that such as large project may have.</p>

Scheme/topic	Reference	Summary	Comments on approach
TfL - Closure of Heathrow estimates	“Impacts of closing Heathrow airport and initial analysis of redevelopment impacts” Oxford Economics, 2013	Estimates that the closure of Heathrow would result in a gross national impact of -245,000 jobs and -£28.3 billion of GVA by 2050 (2013 prices). This is an operational impact.	Operational Phase
		Net local effects are also estimated which reduce the gross national estimate of jobs losses to 33,500 to reflect the potential that:	<p>Direct employment at the Isle of Grain is based on a benchmark from Heathrow for the number of jobs per million passengers. This approach seems reasonable, although it could be argued that the newly designed Estuary airport may give scope for enhanced labour productivity. It is assumed that each 1% increase in passenger numbers will lead to 0.5% increase in employment based on time series for Heathrow to account for economies of scale and productivity growth over time. The jobs are allocated to SIC1 (Standard Industrial Classification) sectors based on data from Heathrow; the current levels of labour productivity from Heathrow (based on ONS data) are then used to estimate GVA.</p> <p>The value for direct jobs and GVA excludes off-airport direct jobs, so it could be considered to be conservative. This approach provides a direct impact to which Oxford Economics apply multipliers to estimate indirect and induced impacts. This is a standard approach and appears appropriate.</p> <p>The report presents cumulative undiscounted values over time, which should be presented as a net present value to aid comparability between different estimates. The values provide a gross national impact, no account is taken of the closure of other airports.</p>
		<ul style="list-style-type: none"> • Some Heathrow workers will work at the Estuary airport or elsewhere in London; • Some will move out of the area; • New jobs may be created by redeveloping Heathrow (circa 7,000); and • Some jobs may be created through associated residential employment (circa 36,000). 	<p>The approach uses Heathrow Employment survey for the latest direct employment estimates for Heathrow. They develop a simple time series relationship using data from the Heathrow ward between employment and passenger numbers to estimate how employment will change in the future (in line with Atkins/DfT forecasts for Heathrow traffic). GVA was estimated based on sector level productivity data for Hillingdon after mapping to SIC 1 sectors. This results in labour productivity assumptions in 2050 that are very similar to those used when estimating the impact of the Estuary airport.</p> <p>Multipliers are then used to estimate the indirect and induced GVA and employment of Heathrow. The multipliers used are very similar to those used when estimating the impact of the Estuary airport. The approach described for estimating the gross national effects appears to be reasonable.</p> <p>The study also considers local employment impacts by offsetting these gross national losses as people in the local area are assumed to find work at the new airport, find work elsewhere in London, or the local area. Some of these offsetting jobs are not driven by the closure or redevelopment of Heathrow; they are driven by natural growth in London. Other local jobs are likely to be displaced from elsewhere in the country (e.g. the associated residential employment that comes from the increased population). No estimates of the national effects of redevelopment of Heathrow have been provided although</p>

Scheme/topic	Reference	Summary	Comments on approach
London Medway Airport	“London Medway Airport: Evidence to the Airport’s Commission” July 2013	Reference to 100,000 direct on-site, 100,000 off-site employment in the region (page 5).	we would expect to see fewer offsetting jobs occurring at the national level due to the attribution and displacement points raised above. In addition, the construction jobs due to redevelopment are temporary so should not be compared to permanent jobs lost at Heathrow. No details are given as to the source or derivation of the figure. It is also unclear whether the 100,000 off-site jobs are indirect or induced (using common terminology) or which geographic area they pertain to. However, the values are broadly consistent with other estimates (see Oxford Economics above).
Foster + Partners	“Thames Hub Airport: Outline proposal to the Airports Commission” July 2013	The report cites estimates of 100,000 direct on-site jobs and 100,000 direct and indirect off-site jobs from operating the airport. The estimated annual value of these jobs is £1.3 billion and £2.6 billion respectively. They also mention additional tax impacts, although these are not quantified (page 24). A total economic benefit of £75b is mentioned (page 23) – this cross references a DfT report which it claims stated there would be a £35 billion benefit of two extra runways in the South East DfT (2009): UK Air Passenger Demand and CO2 Forecasts (http://webarchive.nationalarchives.gov.uk/).	No detail is provided on the origin of these employment figures. It is unclear what year or definition they adhere to. It is unclear where the £75 billion or £35 billion are sourced from the DfT study referenced appears to put the value of Stansted and Heathrow expansion at around £15 billion, rather than £35 billion.
Optimal economics Closure of Heathrow	“Heathrow related employment”, Optimal Economics, September 2011	Estimate the employment related to Heathrow airport in 2010. They estimate that there are 76,600 direct on-airport and 7,700 direct off-airport jobs. They also estimate 44,400 and 77,200 indirect and induced jobs nationally. The total GVA associated with this employment is estimated to be £9.7 billion.	The direct jobs figures are taken from the Heathrow employment survey, which included results from around 95% of the companies operating in the airport. No attempt appears to be made to account for the missing companies, with the numbers described as insignificant. Therefore, the direct jobs estimate could be considered to be conservative. The employment estimates include part time jobs (circa 18% of total) – so they are not given in full time equivalent terms. GVA estimates are produced by calculating the total salary payments (number of jobs x average salary). This is then scaled up to GVA based on the economy wide GVA:wages and salaries ratio. This approach seems reasonable although we note that the wage and salaries component of GVA contains non-salary costs like employer’s social security and pension contributions. If these are excluded from the wage and salary calculation then the estimate may

Scheme/topic	Reference	Summary	Comments on approach
Jones Lang Lasalle Redevelopment of Heathrow	Jones Lang LaSalle, “Heathrow Redevelopment Scenarios”, 2013	Considers different scenarios for the population and economic activity at a redeveloped Heathrow. Their estimates range from employment of 54,000 to 98,000 in 2031 and £3.9 billion – £7.8 billion in GVA.	<p>understate the GVA. It is unclear whether any adjustment has been made to account for this. In addition, specific wage and salary ratios could have been used for each sector, but only an aggregate appears to have been used.</p> <p>Optimal Economics has also estimated direct off-airport employment as employment solely dependent on the Airport, but outside of the boundaries. They have defined these activities as hotels, freight agents, in-flight catering, car parking and airline services. They estimated these jobs using an internet search of local business meeting this description which identified 527 companies. Around half of these companies were surveyed which yielded average employment per company. These values were then grossed up to the population total. These values were then scaled down to reflect the share of the businesses revenues that were depended on Heathrow. Finally, GVA estimates were derived using the same values for GVA per worker as on-airport jobs. It could be argued whether this activity should be classified as direct or catalytic, however the scale is relatively immaterial (they only account for around 10% of direct employment).</p> <p>Multipliers were used to estimate indirect and induced employment and GVA. The indirect multiplier was estimated using the above survey of local direct off-site business to estimate supply chain spend per employee. These values were then converted to GVA and jobs using the GVA to output and output to employee ratios for each sector to the expenditure estimate. As described in the report it appears this approach may only capture indirect effects on tier one suppliers of the airport. There would be further iterations of spending and impact as the tier one suppliers spend on their suppliers and so on. This approach may understate the indirect multiplier since it only accounts for spending on tier one suppliers. It is possible to estimate the effects of iterative rounds of spending further down the supply chain by computing an indirect multiplier using an input-output table. We understand that this is the approach taken by Oxford Economics and it is likely to explain the significant differences in the value of the indirect multiplier.</p> <p>The induced multiplier is described as being derived from the indirect employment multiplier and a national figure of 1.6 is adopted. This is applied to the total direct and indirect jobs to estimate induced employment. We are not familiar with this approach, although it does provide an induced multiplier than is similar to that of Oxford Economics.</p>

Scheme/topic	Reference	Summary	Comments on approach
			<p>filled.</p> <p>The study does not assess the national impact, as it only focuses on the Heathrow area. It does not consider potential negative impacts from displacement of activity on other locations.</p> <p>The impacts are also reported for 2031, implying that the redevelopment would be complete. If Heathrow is assumed to close in 2030 it is likely that the clean-up operation and redevelopment would take considerably longer to complete.</p> <p>Some national effects may occur if the redevelopment were to lead to greater productivity (for example through agglomeration effects) or greater migration of people or businesses into the UK. But these issues are not assessed. There may also be social benefits via housing affordability which are described qualitatively in the report.</p>

2. Catalytic impacts – connectivity

Scheme/topic	Reference	Summary	Comments on approach
London Medway Airport	“London Medway Airport: Evidence to the Airport’s Commission” July 2013	This cites a connectivity coefficient from an academic study which suggests that a 10% increase in air connectivity relative to GDP, would boost the latter by 1.2%.	The report contains no references or description of the methodologies used to derive these estimates. The Coefficient stated for the connectivity impact is in-line with other academic studies that we have seen.
Foster + Partners	“Thames Hub Airport: Outline proposal to the Airports Commission” July 2013	<p>Foster + Partners state that there are national benefits from the hub airport including increased trade, inward investment, tax revenues and tourism.</p> <p>They measure global connectivity by mapping each city against the percentage of world GDP accessible via short-haul and long-haul flights. They reference the CBI (page 4), who stated that one additional daily flight to high-growth markets could boost UK trade by £1 billion a year (CBI (2013):</p> <p>Trading Places http://www.cbi.org.uk/media-centre/press-releases/2013/03/squeezed-airports-risk-uk-missing-out-on-billions-of-pounds-in-trade).</p> <p>Fosters and Partners also state that the failure to improve infrastructure could cost £90 billion a year by 2026 (page 4); (Civil Engineering Contractors Association (May 2013) Securing our economy: the case for infrastructure).</p>	<p>Connectivity and trade</p> <p>The CBI figures were based on a panel econometric analysis of the number of flights a year and trade between pairs of countries from which they estimate that each additional flight to the eight fastest-growing World economies adds £175k of trade between the UK and the economy in question. They mention that data on proximity, historical and cultural links, and economic size and growth rates are included as independent variables (i.e. the model tries to isolate the impact of number of flights by controlling for these factors).</p> <p>The trade measure used is a sum of imports and exports and the £1 billion quoted is a flow of trade and should not be considered to be a GDP figure. Given GDP is computed by adding exports and subtracting imports the net GDP effect will depend on the balance of the two values. This detail is not reported in the study. This being said, it is generally considered that trade will boost long-run GDP through spurring improvements in productivity and competition. The value of these effects is not estimated, but is likely to be captured in the range of studies which link aviation connectivity to GDP.</p> <p>No details are given regarding the specific functional form of the model, level of significance of the results or any statistical tests undertaken to assess the validity of the model results (e.g. tests for outliers, endogeneity, heteroskedasticity or omitted variables). This study is likely to suffer from similar issues over the direction of the causality noted previously. It should not be considered that flights drive additional trade, rather that there is an association between the two.</p> <p>Infrastructure</p> <p>The CECA paper the figures include all infrastructure in the UK, not just airports. There is almost no information on how the £90 billion value is derived, or whether it aims to capture a demand side or supply side impact.</p>
TfL Impacts of Estuary	“A new hub airport for London and the UK”, Mayor of London, 2013	It states that the long-term economic benefit of the increased capacity provided by a four runway hub airport is to permanently increase the UK’s GDP by	The study providing this figure is discussed below.

Scheme/topic	Reference	Summary	Comments on approach
airport (Isle of Grain)		0.5 per cent by 2050 (page 13).	
TfL Impacts of Estuary airport (Isle of Grain)	“Impacts on the UK economy through the provision of international connectivity”, Oxford Economics, 2013	<p>This study estimates the effect of an increase in aviation capacity on GDP. They find that a 10% rise in air connectivity is associated with a 0.5% increase in GDP, and that an increase in aviation capacity such as an estuary hub airport would increase connectivity by 9%, hence causing a 0.45% impact on GDP.</p> <p>This is equivalent to £6.9 billion in annual GDP.</p> <p>This study also includes estimates on trade, but these should not be considered additional to the GDP effects.</p>	<p>This paper contains an update of Oxford Economics 2006 analysis “The economic contribution of the aviation industry”. They generate a business aviation connectivity measure by summing the number of business passengers at UK airports with the volume of air freight.</p> <p>A drawback of this measure is that it does not capture whether the flight is to an economically desirable location. Also, the weighting of freight and passengers in the index appears to be somewhat arbitrary. However, the measure they develop is highly correlated with other connectivity measures, such as the IATA approach.</p> <p>They use a panel data econometric model to identify the relationship between the use of air transport services (captured as the proportion inputs spent on air transport) and total factor productivity performance for 31 UK industries over time. They control for other factors using specific time trends and constants.</p> <p>The final elasticity presented is that an increase in 10% in business air usage results in a 0.5% increase in GDP, via the impact on total factor productivity. The econometric analysis does not attempt to establish the direction of causality between total factor productivity and air connectivity, as it is likely there is a two-way relationship.</p> <p>Using the difference between the DfT’s constrained and unconstrained forecasts of business passengers from 2013 at a UK level (3 million passengers per annum) and freight usage (1 million tonnes), they estimate that the hub airport generates an increase in connectivity of 9%, by 2050 which is equivalent to a 0.45% increase in GDP.</p> <p>This finding could be applied to any increase in airport capacity which meets the unconstrained DfT forecasts, so it is comparing a hub airport to the Do Minimum option at a UK level.</p>
TfL Impacts of Estuary airport (Isle of Grain)	“Impact on tourism and other non-business travel, inbound and outbound”, Oxford Economics & Ramboll, 2013	<p>This study compares the DfT constrained and unconstrained forecasts of future inbound and outbound tourism for the UK, in order to produce an estimate of the changes in tourism that could arise from expanding airport capacity. Using this approach, they estimate that the number of non-business travellers to London could be 73 million greater by 2050 if airport capacity increases.</p>	<p>The study estimates the number of increased tourists, but not the effect on GDP, which would need to net the increase in inbound tourism against the increase in outbound tourism, and account for supply side effects.</p> <p>The study does not make any distinction between different airport proposals, so it is not specific to the Estuary airport.</p>

Scheme/topic	Reference	Summary	Comments on approach
TfL Impacts of Estuary airport (Isle of Grain)	York Aviation, <i>London airports route networks in 2050</i> , 2013	This paper estimates the connectivity of various future scenarios for airport capacity. They estimate that the number of destinations served by a four-runway hub airport would be 75% greater than Heathrow currently offers and the number of weekly flights would be more than 100% greater. The hub airport also provides much greater connectivity than a “2-2-2” scenario (i.e. 2 runways at Heathrow, Gatwick and Stansted), with 22% more destinations from London as a whole.	They combine projected global demand for UK flights (based on DfT unconstrained forecasts) and capacity constraints to create new route networks for a new hub airport and other scenarios. The measures of connectivity that they use are the number of destinations served and the number of weekly flights.
Connectivity impacts	IATA (OEF), <i>Aviation Economic Benefits</i> , 2007	This paper analyses the relationship between air connectivity and labour productivity, to estimate that a 10% rise in air connectivity boosts GDP by 0.07%.	<p>They use a panel econometric model, from the period 1996-2005, to estimate that a 10% rise in air connectivity relative to GDP will boost labour productivity and therefore GDP by 0.07%. They use IATA’s connectivity indicator which measures the number and economic importance of the destinations served from a country’s major airports, the frequency of service and the number of onward connections. Along with connectivity as a proportion of GDP, they include other explanatory variables in the model that may affect labour productivity such as capital investment and expenditure on R&D and education. Because a panel of countries was used to produce their estimate of 0.07%, this is a global result and is not a UK-specific coefficient.</p> <p>They used tests of Granger causality which did not provide evidence that either changes in connectivity caused changes in productivity, or vice versa. They state that this may demonstrate that there is a “virtuous circle” between connectivity and productivity.</p>
Connectivity impacts	“Econometric analysis to develop evidence on the links between aviation and the economy”, PwC, 2013	This paper analyses the relationship between aviation capacity and GDP, finding that there is a two-way relationship, where a 10% rise in direct seat capacity is associated with approximately a 1% rise in GDP.	Time series econometrics is used to examine whether there is a link between aviation connectivity and GDP. This suggests that that a 10% rise in connectivity is associated with a 1% increase in the growth rate of real GDP. The measure of connectivity used was seat capacity. The study considers the causality question by looking at whether there is Granger causality between connectivity and GDP - it was found that causality ran in both directions.
Heathrow connectivity	“Connecting for growth: The role of Britain’s hub airport in economic recovery”, Frontier Economics, 2011	This paper estimates that the value of UK trade could increase by around £1.2 billion a year, if there were capacity at Heathrow to accommodate the additional Emerging Market routes.	Frontier has compared the UK levels of emerging markets trade with other countries containing hub airports, to quantify how UK trade might improve if Heathrow was better connected to these emerging markets. For example, it assumes that the UK’s trade with Indonesia would increase to the levels of Germany and The Netherlands, if Heathrow was directly connected to it like Frankfurt and Schiphol airports are. A drawback of this approach is that it does not control for the specifics of supply and demand between countries (i.e.

Scheme/topic	Reference	Summary	Comments on approach
			<p>whether Britain has a comparative advantage relative to Indonesia in certain markets)</p> <p>Using this method they estimate that increasing the capacity of Heathrow would increase the UK's trade with emerging markets by £1.2 billion a year, which increases over time. They state that they control for other variables which will affect trade such as economic size, importance of trade and political factors, but they provide no detail on exactly how this is done or the quantitative approach used.</p>

3. Catalytic impacts – spatial effects

Scheme/topic	Reference	Summary	Comments on approach
TfL Impacts of Estuary airport (Isle of Grain)	“A new hub airport for London and the UK”, Mayor of London, 2013	This study estimates that a new hub airport on the Isle of Grain would trigger the creation of a further 47,000 to 138,000 catalytic jobs around the airport and in the key development zones” (page 15).	This estimate originates from an Oxford Economics and Ramboll study which is discussed below.
TfL Impacts of Estuary airport (Isle of Grain)	“Impact of new hub options on business locations, FDI and alignment with strategies”, Oxford Economics & Ramboll, 2013	The report contains an estimate that an Estuary airport may generate 47,000-138,000 catalytic jobs. These jobs are positioned as additional to direct, indirect and induced employment. The report also presents case studies of where agglomerations have developed around Airports elsewhere.	<p>The catalytic employment estimates are derived from an Australian study (Department of Infrastructure and Transport, <i>Employment generation and airports</i>) which states that the ratio of the direct, indirect and induced impacts of an airport to its direct impacts is generally found to be between 2 and 3 based on international benchmarks.</p> <p>Oxford Economics assume that the total local employment from indirect, induced and catalytic effects is 2-3 times the direct employment estimate and then compute the catalytic effects as the residual by subtracting the local direct, indirect and induced employment estimates from the total.</p> <p>The figure used of 0.5-1.5 appears to be at the lower end of the range of benchmark estimates. This is a prudent approach, but it does not necessarily mean that the estimate is conservative due to the limitations inherent in this approach. We believe the principle limitations include:</p> <ul style="list-style-type: none"> • No account is taken of the attractiveness of the Estuary airport area relative to areas around Heathrow or elsewhere. This will determine the extent to which it may attract catalytic activity from these areas, elsewhere in the UK, or abroad. • The circumstances of the Estuary airport are unique; insofar as they involve closing one of the largest airports in the world and replacing it with one that is unprecedented in scale. Given this the benchmarks used may not be representative. • The benchmarks show a wide range of possible outcomes which highlights the uncertainty associated with these catalytic impacts. <p>The timing implications are not considered in detail. In practice, the development of catalytic activity due to the airport would take a long time.</p> <p>The approach is based on international benchmarks and the evidence is not specific to the unique situation in the UK or of the proposed Estuary airport. In addition, these are local impacts. In practice we would expect most of the catalytic jobs to be displaced from elsewhere in the UK (e.g. the existing</p>

Scheme/topic	Reference	Summary	Comments on approach
TfL Impacts of Estuary airport (Isle of Grain)	“The strategic planning case for a new hub airport in the Inner Thames Estuary”, Atkins Ltd 2014	This study identifies potential locations for the catalytic employment estimated in the 2013 Oxford Economics & Ramboll analysis (47,000-138,000 jobs). It is based on a mainly qualitative assessment and identifies a number of Outer East London and Kent areas such as Bexley, Ebbsfleet and Ashford as locations of high potential catalytic employment.	<p>cluster at Heathrow). We expect the national impact of this would be limited.</p> <p>The study identifies the locations for potential clusters of employment by assessing areas against against the following factors: whether there is an opportunity to build on existing policy support or development opportunities, whether they are located along infrastructure routes which provide good access to the airport and connectivity between the airport and London, whether they are near existing service centres to the airport, and whether there are existing employment strengths, particularly in sectors likely to experience catalytic employment.</p> <p>The study acknowledges that their assessment is necessarily high-level and somewhat subjective, but taking this into account, the approach used is subject to the following limitations:</p> <ul style="list-style-type: none"> • The rationale for the distribution of catalytic employment places high importance on supply-side conditions, such as the policy support to increase the capacity for additional employment and housing. Less emphasis is placed on demand-side factors such as the fundamental drivers of business location decisions. • There is no detailed discussion of the sectoral dimension of catalytic employment. As identified later in this chapter, the drivers of business location are likely to differ considerably by sector. The assessment of where catalytic employment is likely to occur should take into account these differences, in addition to the current distribution of sectoral agglomerations. • The analysis does not address the loss of catalytic employment from closing Heathrow and other airports, or any other displacement effects. The map of employment distribution indicates that the Inner Estuary airport would generate employment in West London, but it is likely that the net impact on catalytic employment in this area would be negative given that these jobs are likely to move closer to the new airport. In order to provide a full picture of local catalytic impacts, the quantity of catalytic employment offset due to the closure of the airports and displacement should be estimated, and its geographical distribution assessed. <p>The locations identified therefore appear to be primarily founded on whether there is policy support for development and capacity for additional jobs, rather than on the important drivers of business location such as proximity to labour markets, clients/markets and existing clusters.</p>

Scheme/topic	Reference	Summary	Comments on approach
Heathrow	“London Heathrow impact study”, Regeneris, 2013	This study states that in the region of 170,000 to 230,000 catalytic jobs in the local Heathrow area appear to be a significant degree linked to proximity to Heathrow; this number of jobs are therefore potentially at risk were Heathrow to close (page 25).	<p>This estimate aims to capture the employment attributable to firms who locate near Heathrow for proximity to airport and surrounding infrastructure. They take the difference between the proportion of jobs in foreign-owned firms in the area around Heathrow and the South East average. This is assumed to reflect catalytic employment. The approach has several limitations:</p> <ul style="list-style-type: none"> • It ignores any catalytic activity from UK owned firms. • It is likely that there is double counting between the catalytic estimate and the indirect and induced employment effects of Heathrow (e.g. as foreign owned firms will also be in the Heathrow supply chain). • Above-average foreign-owned employment is not analogous to catalytic employment from a hub, and no evidence is provided to support this claim. • The description of ‘at risk’ should be treated carefully. This only refers to the local affects. They separately perform a survey of local businesses which suggests around 25% of firms may relocate closer to the new Airport and only around 4% of employment may move out of the UK. <p>Although the business survey only covered 2% of businesses in the Heathrow area, its sample size of 464 businesses is significantly larger than that of other business surveys. However, they do not apply their survey results to their estimates of catalytic jobs due to survey bias.</p>
Heathrow	“Heathrow employment impact study”, Parsons Brinckerhoff and BHC, 2013	<p>This estimate aims to capture the employment attributable to firms who locate near Heathrow for proximity to the airport and surrounding infrastructure. They estimate that catalytic employment is probably “in excess of 250,000”.</p> <p>They also state that the new hub airport and closure of Heathrow will result in a significant decline in catalytic employment in the Heathrow area.</p>	<p>In a similar manner to Regeneris, catalytic employment is estimated based on the share of employees working for foreign-owned firms in Heathrow’s adjacent local authorities relative to the South East average. This difference is used to estimate a “catalytic multiplier”. They obtain an “indicative” catalytic multiplier based on a number of sources (without providing any further detail), and scale them down to adjust for employees travelling from other boroughs. They also conduct a survey of businesses to ask the likelihood of their relocating if Heathrow were to close. The issues raised with the Regeneris work are also applicable to this study.</p>

Appendix C: Local socio-economic baseline data sources

This appendix provides the data sources used for the baseline data in Chapter 4.

Table 1: Sources for baseline data

Period	Data Point	Source
Baseline (2012)	Population	2011 Census (ONS): Usual resident population by five-year age group, Table PO4
	Average Age	2011 Census (ONS): Age structure, local authorities in England and Wales, Table KS102EW
	Employment	Annual population survey (NOMIS): All people, economically active, in employment, Jan 13 – Dec 13
	Households	2011 Census (ONS): Household estimates, Table HO1

Table 2: Sources for 2030 data

Period	Data Point	Source	Explanatory Notes
Future baseline (without airport) c2030	Population	2008-based Subnational Population Projections: Table 2d: Local authorities and higher administrative areas within England (2033 figures).	<ul style="list-style-type: none"> • 2008-based data used as 2011 population estimates only extend to 2021. • Projected figures for 2033 used for comparison with household data which are available for 2033 but not for 2030.
	Employment (Thames Gateway – South Estuary)	Oxford Economics / Ramboll Local and National Impact of a Hub Airport.	<ul style="list-style-type: none"> • Oxford Economics baseline (without airport) figures for 2030 are used due to lack of any suitable national source for future employment estimates. • Oxford Economics data has been apportioned to individual local authority area based on 2008-based population projections as data is not disaggregated to local authority level within the Oxford Economics report. • Disaggregated data was requested from Oxford Economics to inform this report but was not available.
	Employment (Thames Gateway – North Estuary)	Various Local Planning Documents: Basildon Council Core Strategy 2013, Epping Forest District and Brentwood Borough Employment Land Review, 2010, Rochford Borough Council Employment Land Study, 2008, Southend-on-Sea Core Strategy, 2007, Thurrock Council Core Strategy, 2011.	
	Households	2008-based Household Projections to 2033 (DCLG): Household projections by district, England, 1991 – 2033, Table 406.	<ul style="list-style-type: none"> • 2033 figures are used because 2008-based projections are not provided for each year and are not available for 2030.
	Population	2008-based Subnational Population Projections: Table 2d: Local authorities and higher administrative areas within England (2033 figures).	<ul style="list-style-type: none"> • 2008-based data used as 2011 population estimates only extend to 2021. • Projected figures for 2033 used for comparison with household data which are available for 2033 but not for 2030.

Appendix D: Local economic risks and constraints related to an Estuary airport

	<u>Population and housing</u>	<u>Labour supply</u>	<u>Employment land</u>	<u>Surface access</u>
Medway	<ul style="list-style-type: none"> • Comparison between Oxford Economics and Ramboll and local authority projections identify a sizeable gap between 2030 household estimates which presents a high risk from a planning perspective. • Planning documents identify "pressure to redevelop employment land for housing" which, given proximity and relative house prices represents a high risk in terms of capacity to support a new airport development. 	<ul style="list-style-type: none"> • Comparison between Oxford Economics and Ramboll and local authority projections identify a sizeable gap between 2030 employment estimates which presents a high risk from a planning perspective. • Planning documents place current emphasis on creative industries and tourism and also on construction, environmental technologies, power and energy generation and advanced manufacturing. 	<ul style="list-style-type: none"> • Results of a 2010 Employment Land Review Consolidation Study show that, overall, there is a very healthy supply situation. Not only is there sufficient floor space overall to meet the employment requirements but there are also a range of locations and types of site to cater for all likely growth sectors over the plan period. 	<ul style="list-style-type: none"> • Whilst transport is identified as a challenge within the Medway LTP 3, successful delivery of LTP 2 suggests that surface access represents a moderate risk in terms of capacity to support a new airport development.
Swale	<ul style="list-style-type: none"> • While the gap between Oxford Economics and Ramboll and local authority 2030 household estimates is not an issue, the local authority is concerned about how it will meet future housing needs. Given proximity to a new hub and relative house prices this currently represents a high risk in terms of capacity to support a new airport development. 	<ul style="list-style-type: none"> • Comparison between Oxford Economics and Ramboll and local authority projections identify a sizeable gap between 2030 employment estimates which presents a high risk from a planning perspective. • Planning documents identify that the current direction is counter to the potential impact of a new airport - reductions of jobs targets by 2031. 	<ul style="list-style-type: none"> • Swale Local Planning documents indicate that land bank "will be flexible enough to grasp any unexpected opportunities to develop more fully". 	<ul style="list-style-type: none"> • The Swale Core Strategy highlights that achieving our strategy will challenge the transport network as further demands are placed upon it, especially roads. In addition to planned growth, forecast increases in general traffic growth, lower than average public transport usage and issues regarding resources to make improvements are identified.

	<u>Population and housing</u>	<u>Labour supply</u>	<u>Employment land</u>	<u>Surface access</u>
Maidstone	<ul style="list-style-type: none"> The annual need for affordable housing shown by the SHMA is double the annual number of all new dwellings to be built during the plan period. However, given proximity to the new hub airport and relatively higher housing prices this is considered a moderate risk in terms of capacity to support a new airport development. 	<ul style="list-style-type: none"> Comparison between Oxford Economics and Ramboll and local authority projections identify a notable gap between 2030 employment estimates which suggests a moderate risk from a planning perspective. The resident labour supply is expected to meet just half of the considerably lower local planning target of 10,000 net additional jobs within the borough to 2026. 	<ul style="list-style-type: none"> The demand/supply balance indicates an unmet requirement for warehouse and distribution space. The level of unmet demand reflects the limited role that Maidstone plays within the local and regional distribution market. The max scenario at present identifies a requirement of 53,936m² of office floor space to 2031, a land requirement of 3.6ha Applying an adjustment to account for existing unlettable office space would create a total requirement for new floor space of just below 58,936m² under the “max” scenario, equating to a land requirement of 3.9ha by 2031. 	<ul style="list-style-type: none"> Modelling studies have indicated that growth in the number of homes and jobs in the borough will require an upward step change in the use of sustainable transport modes if the worsening of traffic congestion and air quality are to be avoided.
Tonbridge & Malling	<ul style="list-style-type: none"> Comparison between Oxford Economics and Ramboll and local authority projections does not suggest a sizeable gap between projected 2030 household estimates. The socio-economic profile and proximity of the area does not suggest that high proportions of future airport employees will locate in Tonbridge & Malling and housing is therefore considered to be a low risk in terms of capacity to support a new airport development. 	<ul style="list-style-type: none"> Comparison between Oxford Economics and Ramboll and local authority projections does not suggest a sizeable gap between projected 2030 employment and the direction of travel in the area is increasing employment which suggests a low risk from a planning perspective. The socio-economic profile and proximity of the area does not suggest that high proportions of future airport employees will locate in Tonbridge & Malling. 	<ul style="list-style-type: none"> The Borough has seen moderate levels of new development over the past eight years, the majority for B1a/b office uses. At the same time, Tonbridge & Malling has been losing B class space, largely industrial, placing increasing pressure on remaining space to accommodate the Borough’s economic activity. 	<ul style="list-style-type: none"> Not identified as a particular risk in local planning documents.

	<u>Population and housing</u>	<u>Labour supply</u>	<u>Employment land</u>	<u>Surface access</u>
Gravesham	<ul style="list-style-type: none"> • Comparison between Oxford Economics and Ramboll and local authority projections does not suggest a sizeable gap between projected 2030 employment which suggests a low risk from a planning perspective. • However, the Strategic Housing Market Update 2012 indicates a particular need for 2 and 3 bedroom market housing and 1, 2 and 3 bedroom affordable housing which represents a moderate risk in terms of capacity to support a new airport development. 	<ul style="list-style-type: none"> • Comparison between Oxford Economics and Ramboll and local authority projections does not suggest a sizeable gap between projected 2030 employment which suggests a low risk from a planning perspective. • Economy and Employment Space Study May 2009 indicated that the local labour market could support many more jobs. 	<ul style="list-style-type: none"> • The stock of employment space in Gravesham is low compared to neighbouring authorities with provision dominated by industrial and warehouse type uses, and offices representing a low proportion of overall supply. • Whilst the borough contains a reasonable range of industrial premises, the stock tends to be older than the regional average and there are no dedicated business parks and few modern office premises. • Whilst only modest levels of new employment space have been completed in recent years, the overall level of vacancies is also low; suggesting that levels of demand may be affected by lack of supply of the right kind of premises. 	<ul style="list-style-type: none"> • Gravesham Borough has good road, rail and river transport links and Gravesend town centre is a hub for public transport provision in the Borough. These transport links have received significant investment with resultant improvements. However, over half of working residents travel to work by car which contributes to congestion, particularly in parts of the urban area and along the A2. Levels of congestion will increase as a result of natural growth in traffic and new development.

	<u>Population and housing</u>	<u>Labour supply</u>	<u>Employment land</u>	<u>Surface access</u>
Dartford	<ul style="list-style-type: none"> • Limited potential for existing infrastructure to be enhanced/expanded. • However, there is enough suitable and available land for up to 17,300 new homes to be built between 2006 and 2026. 	<ul style="list-style-type: none"> • Comparison between Oxford Economics and Ramboll and local authority projections does not suggest a sizeable gap between projected 2030 employment which suggests a low risk from a planning perspective. • Dartford has experienced relatively high growth in employment in the recent past suggesting a direction of travel that could support a new hub airport. 	<ul style="list-style-type: none"> • The Dartford Strategic Employment Land Availability Assessment identifies land that has the potential to provide up to 714,000 square metres of employment floor space, of which just over a third (36% for High estimate and 37% for Low estimate) is assessed as being available in the period to 2016. • The assessment of key sectors indicates that available sites have the potential to meet the requirements of the Health Technologies, Environmental Technologies and Services, Built Environment, Financial and Business services, Logistics, Digital Media, and Advanced Engineering sectors. 	<ul style="list-style-type: none"> • The capacity of the road network "currently acts as a fundamental constraint to development in Dartford". • However, significant investment in both local and strategic public transport improvements has taken place in recent years, including implementation of Fastrack routes A and B, a new station and interchange facilities at Greenhithe and introduction of the international and domestic services on High Speed 1.

	<u>Population and housing</u>	<u>Labour supply</u>	<u>Employment land</u>	<u>Surface access</u>
Southend-on-Sea	<ul style="list-style-type: none"> • Lack of affordable housing is identified as an acute problem that has historically affected Southend. • The Southend-on-Sea Core Strategic Plan identifies a significant need to increase the number of affordable houses by 2021. • In the short term there is a requirement for provision of c. 1,300 units of affordable housing per annum, if all affordable needs are to be met. • While housing needs are set to remain as a notable constraint, the proximity of Southend to any new hub airport suggests that it is unlikely to add significantly to housing pressures. 	<ul style="list-style-type: none"> • Population and housing growth has outstripped economic growth in Southend in recent years. • The Southend-on-Sea Core Strategic Plan highlights that mechanisms are needed to ensure that job provision is in place in Southend before further major expansion in housing development occurs. • Southend suffers from sustained high levels of unemployment, low education and skill levels and an imbalance between workers and jobs. • The extent to which Southend-on-Sea would be required to support employment needs of any new hub airport is questionable given its proximity to the airport location, however if Southend is identified as a potential source of labour (as suggested in the recent Atkins submission) then the extent to which it could support new employment opportunities is also questionable. 	<ul style="list-style-type: none"> • The Southend-on-Sea Core Strategy identifies a future gap in employment land of circa 20,000m² by 2021. • The availability of employment land is not identified as a major constraint in Southend. 	<ul style="list-style-type: none"> • The Southend-on-Sea Core Strategy identifies poor accessibility and the worst traffic congestion of anywhere in Essex. • The extent to which surface transport in Southend-on-Sea would be required to support any new hub airport is likely to be limited, however any further pressure placed on Southend's roads would exacerbate the current problem.

	<u>Population and housing</u>	<u>Labour supply</u>	<u>Employment land</u>	<u>Surface access</u>
Thurrock	<ul style="list-style-type: none"> • Thurrock’s population growth has exceeded regional and national growth since 1991. ONS has predicted the population will reach 183,200 by 2031 an increase of 23% over the period from 2006. • This level of growth will bring about the need for substantial further housing development. Thurrock needs to plan appropriately to accommodate at least an additional 18,500 new homes between 2001-2021 and up to a further 4,750 dwellings to 2026 and beyond in order to provide a 15 year supply that satisfies government standards. • If a road link was to be established connecting Thurrock and Medway this could potentially add pressure to the housing provision capabilities of Thurrock. 	<ul style="list-style-type: none"> • Thurrock has experienced significant population growth and the Core Strategy Plan identifies the need for a sustainable platform for economic growth to match the growing population. Possible methods suggested include training programmes and strengthening the role of education in the borough. • The Thurrock Core Strategy document identifies retail, public services and manufacturing as the dominant employment sectors. • Thurrock has a high level of economically active amongst the population of the borough, 80.5%, higher than the average figure for the UK. • Establishing of a road link between Thurrock and Medway could result in Thurrock being required to support employment needs of any new hub airport. The extent to which Thurrock could support new employment opportunities, to this level, is questionable. 	<ul style="list-style-type: none"> • Thurrock Core Strategy Plan outlines the Council's role in monitoring and managing the supply of employment land to ensure the appropriate capacity to accommodate employment growth. • Areas within Thurrock, such as Tilbury, will see specific, defined release of Green Belt land to meet strategic requirements. • Key strategic economic hubs are identified within Thurrock. Employment development will be directed to these areas and assigned employment land. • The Council do appear to be planning appropriately in order for employment land to match employment growth levels. However, the release of Green Belt land would indicate relatively strained resources and a significant increase in employment land requirements may not be something that could be facilitated. 	<ul style="list-style-type: none"> • The Thurrock Core Strategy identifies a requirement for improvements in congestion, road safety and access to services. To be delivered between 2008-2021, driven by Thurrock Council's Transport Strategy. • The anticipated economic and population growth in the borough adds increased importance to improvement in the transport infrastructure. • In addition to the existing plans by Thurrock Council to improve the transport infrastructure, a new road link connecting Thurrock and Medway would likely improve Thurrock's surface access with respect to a new hub airport.

	<u>Population and housing</u>	<u>Labour supply</u>	<u>Employment land</u>	<u>Surface access</u>
Castle Point	<ul style="list-style-type: none"> • ONS predicts that the population of Castle Point will grow from approximately 88,000 to approximately 94,000 from 2012-2030. • A significant need for affordable housing is identified in the Castle Point Core Strategy. 73% of new homes need to be affordable, assuming a delivery rate of 200 homes per annum. While housing needs will remain an issue in Castle Point, the proximity to any new hub airport suggests that it is unlikely to add significantly to housing pressures. 	<ul style="list-style-type: none"> • Castle Point is characterised by an ageing population, with the proportion of people over 65 expected to increase from 21% in 2011 to 34% in 2031. • The ageing population of Castle Point means there is a smaller proportion of economically active people, therefore making it unable to provide the labour supply needed for businesses to grow and develop. • Given the expected decrease in the local labour supply Castle Point could potentially support new employment opportunities as local businesses look to grow and require a supply of labour. However, the proximity of Castle Point to any new hub airport is likely to limit the increased labour supply in the borough. 	<ul style="list-style-type: none"> • The Castle Point Core Strategy outlines the impact of employment land supply on local economic growth, it identifies the need for maintaining a flexible employment land supply. Requirements for new employment land in the north of the borough are highlighted by the council. • Castle Point has the potential to deliver at least 10,000 square metres of new employment space. • The council outline planned second phase construction of Roscommon Way which will result in access to new employment land to the South of a prominent industrial estate. • The Core Strategy indicates appropriate planning around employment land supply in conjunction with expected economic performance in the area. Despite this, a significant increase in employment land requirements may not be something Castle Point could easily facilitate. However, the proximity to any new hub airport means this is unlikely. 	<ul style="list-style-type: none"> • Castle Point sits in the heart of the Thames Gateway and suffers quite severe congestion at peak times as a consequence. The Castle Point Core Strategy identifies the out-commuting of skilled workers to other areas is causing congestion within the borough. • The congestion levels in the borough are brought about by poor surface access; many main routes are single lane carriageways with no scope for widening and there are a limited number of routes into and out of the borough. Castle Point is peripheral to the bus service network (especially poor service during evenings and weekends) and also has a very limited cycle network. • The Council plans to improve transport infrastructure, however, a significant increase in pressure on the infrastructure brought about by a new hub airport would be extremely challenging for Castle Point to facilitate. The proximity of Castle Point to any new hub airport makes the addition of surface access strain unlikely.



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