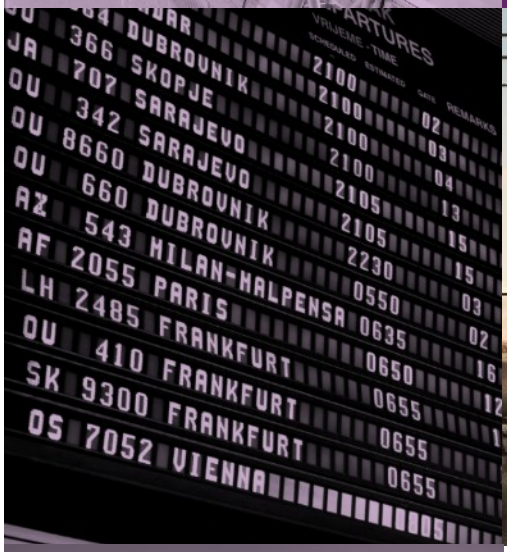
Department for Transport

Developing a Framework for the Local Economic Impact of Airports

Contract Ref: CCMK20A01



Final Report
October 2020

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1. Background

1.1 In August 2020, York Aviation (YAL) was appointed to carry out research into the Local Economic Impact of Airports for the Department for Transport ('the Department'). The context for this assignment was the impact of Covid-19 on demand in the aviation sector and the implications for airports across the UK. In this context, the Department identified a need to further develop its undertsanding of how airports contribute to the local economy, and to develop a framework for assessing the local economic impacts of individual UK airports.

1.2 The requirements for the project were outlined in the Project Specification, which set out as the primary requirement to review the mechanisms by which airports affect the local economy directly (i.e. through the activity of the airport itself), indirectly (i.e. through the activities the airport supports in its supply chain) and wider catalytic impacts (i.e. through the benefits the airport offers to its users including clusters and major supply chains). It was noted that the work would need to consider the following:

- the contribution of airline connectivity to local economies both domestic and international;
- the links between the airports, airline connectivity and key clusters/sectors in the catchment area of local airports;
- both outbound and inbound flows, passengers and freight;
- the wider supporting services provided by airports in terms of other (non-airline) users and how to measure.

1.3 The project timescales were short from inception to delivery, with the application of the Framework to an initial tranche of 16 airports within August 2020, with the list extended to cover a further 16 airports in September 2020. These 32 airports are listed in **Table 1.1**.

Table 1.1: List of Airports Considered

Aberdeen
Belfast City
Belfast International
Birmingham
Bournemouth
Bristol
Cardiff
City of Derry
Doncaster/Sheffield
Dundee
East Midlands
Edinburgh
Exeter
Glasgow
Heathrow
Humberside

Inverness
Isles of Scilly (St Mary's)
Land's End (St Just)
Leeds Bradford
Liverpool
London City
London Gatwick
London Luton
London Southend
London Stansted
Manchester
Newcastle
Newquay
Norwich
Southampton
Teesside

1.4 The development of the framework required the identification of objective sources of data/information that could serve as metrics suitable for measuring these mechanisms, recognising that the adopted metrics need to be applied quickly and efficiently to secure insight into the contribution to the local economy across multiple airports within the timescale. These metrics were intended collectively to enable the DfT to assess the contribution of individual airports to their local economy at a given point in time.

1.5 Beyond this, the Project Specification suggested that the project should also explore the feasibility of capturing in the assessment framework in a proportionate way how the local economic impacts of an airport are changing through time, including, for example, taking account of the implications of existing local plans, airport masterplans and other similar local planning documents where relevant.

2. Literature Review

2.1 Stage 1 of the requirement was a Literature Review, with the aim of identifying the mechanisms by which airports impact local economies and the identification of objective information and data that could be used to inform the assessment of the economic impact of individual airports within the framework. This section sets out the outcome of this Literature Review.

Documents Reviewed

2.2 A key part of the Department's requirement was to understand the mechanisms by which an airport impacts its local economy and to identify how this might be assessed using quantitative and qualitative measures, having regard to what could reasonably be assembled in the timeframe for the exercise.

2.3 In this literature review, for each study we concentrated on:

- understanding and setting out the principles behind the assessment of the economic impact of airports;
- the metrics used;
- the methodology used to derive them; and
- whether they would be suitable for our purposes in developing an assessment framework for the Department

2.4 We did not conduct a more thorough review of the full scope of each report and its findings, except in relation to overall approach to how airports interact with their local economy and the collation of data that could be used for the purpose of benchmarking the impacts. We concentrated on more recent work in the area of the local economic impact of airports and studies undertaken since 2010. Our review focussed on UK airports but we also considered evidence from Europe and elsewhere. Where there is more than one study regarding an airport, we have concentrated only on the most recent for each airport. In total, we reviewed 48 studies, mainly relating to individual airports, as well as work undertaken by the Airports Commission that informed UK Government policy on aviation. We grouped the studies into categories:

- York Aviation's own studies
- Other UK studies
- European studies
- North American (US) studies
- Other Nations studies

2.5 Whilst we aimed to identify all relevant material in the public domain at least for the UK, we do not claim that our review is comprehensive beyond the UK and was limited by the time available for this stage of the work. We have listed the documents reviewed and their key findings in tabulated form appended to this report and summarise here the key findings in terms of methodologies and metrics derived to inform the development of the framework within the rest of this section.

Approach adopted by the Airports Commission and in the ANPS

2.6 We started our review by considering the methodology and metrics adopted most recently by the Department, notably in designating the Airports NPS (ANPS)[1] and in consulting on the future Aviation Strategy more generally.

2.7 The context for considering the economic contribution of airports is set out in the ANPS, in particular para. 2.2 states that:

"International connectivity attracts businesses to cluster round airports, and helps to improve the productivity of the wider UK economy. Large and small UK businesses rely on air travel, while our airports are the primary gateway for vital time-sensitive freight services. Air travel also allows us ever greater freedom to travel and visit family and friends across the globe, and brings millions of people to the UK to do business or enjoy the best the country has to offer."

The ANPS also cites the employment implications of air transport at the UK level.

2.8 The local economic role of airport expansion is expanded on at paras. 3.27 -3.29 of the ANPS by way of explanation of the local impacts expected from the development of a 3rd runway at Heathrow compared to a 2nd runway at Gatwick:

"These additional benefits come from workers moving to more productive jobs around the expanded airport as well as the productivity benefits from firms who will enjoy lower aviation transport costs. Heathrow Airport already has a more developed cluster of businesses in its surrounding area, which should enable an even larger economic boost from expansion in the local economy.

Expansion via the Heathrow Northwest Runway scheme should deliver additional jobs at the airport, through its supply chain and in the local community. The Heathrow Northwest Runway scheme is expected to generate up to 114,000 additional jobs in the local area by 2030 ……

Expansion brings a wide set of non-monetised benefits such as local job creation, trade, and freight benefits"

2.9 In reaching these conclusions, the Department relied to a substantial degree on the work of the Airports Commission (AC). In respect of local economic impacts, there are two relevant volumes of the Commission's work:

- Local Economy Impacts: Assessment – November 2014

[1] We recognise that the designation of the ANPS is under review following the Court of Appeal Judgement of February 2020.

- Local Economy: Impact Assessment Post Consultation Updates – July 2015

2.10 This module of the AC's work was intended to assess the extent to which the expansion schemes were expected to promote employment and economic growth in the local area rather than establish the overall economic footprint of the airports concerned. It was informed by a literature review undertaken by PwC and published in November 2014, which was focussed to some degree on the implications of increased economic activity on land and resources in the vicinity of the airport as a consequence of expansion. Nonetheless, we reviewed these volumes to assess whether there are metrics applicable to the current task in hand.

2.11 PwC considered the economic impact of an airport in terms of the conventional categorisation:

- Direct – the direct impact of the operation of the airport, i.e employment and activity directly related to the operation of the airport itself;
- Indirect/induced – the supply chain impacts and the induced impacts from secondary rounds of spending;
- Catalytic – the wider economic impact of business retention and attraction due to the connectivity provided by the airport.

This is in line with the categorisation used in the majority of studies of the economic impact of airports.

2.12 Key findings of the PwC review of potential relevance to our work include:

- that airports typically create between 500 and 1,500 direct jobs per million passengers handled each year (mppa) dependent on the types of airlines, the nature of operations (long haul/short haul) and the volumes of air freight using the airport;
- that transport industry jobs tend to be higher skilled and more productive than the average across the economy, with a relationship between the level of employment and the impact on local GVA;
- that 75% of employees tend to live within 30 minutes of the airport;
- that multipliers for indirect/induced employment are in the range 1.45 to 2.9 but this does depend on the size of the study area and the extent to which particular types of firm are concentrated within it;
- that catalytic impacts are rarely quantified specifically, with secondary and qualitative indicators used to assess the impact on business and trade and tourism impacts;
- that local factors are material to understand the extent to which an airport will act as an attractor to firms in other sectors as well as the connectivity offered by the airport;
- that broader agglomeration factors may be relevant to the clustering of activity, over and above the presence of an airport;

- that tourism related activity will depend on the extent to which visitors remain in the local area as well as the mix of tourist passengers using the airport;
- that outbound tourism activity also sustains local employment;
- that the local labour market is a relevant consideration.

2.13 PwC illustrated the channels of impact as reproduced at **Figure 2.1**. In essence, this divides the impacts into those related to airport activities, which we generally refer to as Operational Impacts, and the Wider or Catalytic impact, which is the means by which the connectivity offered by the airport supports wider economic activity in the area surrounding the airport. We discuss these mechanisms further later in this section.

Figure 2.1: PwC Channels of Impact

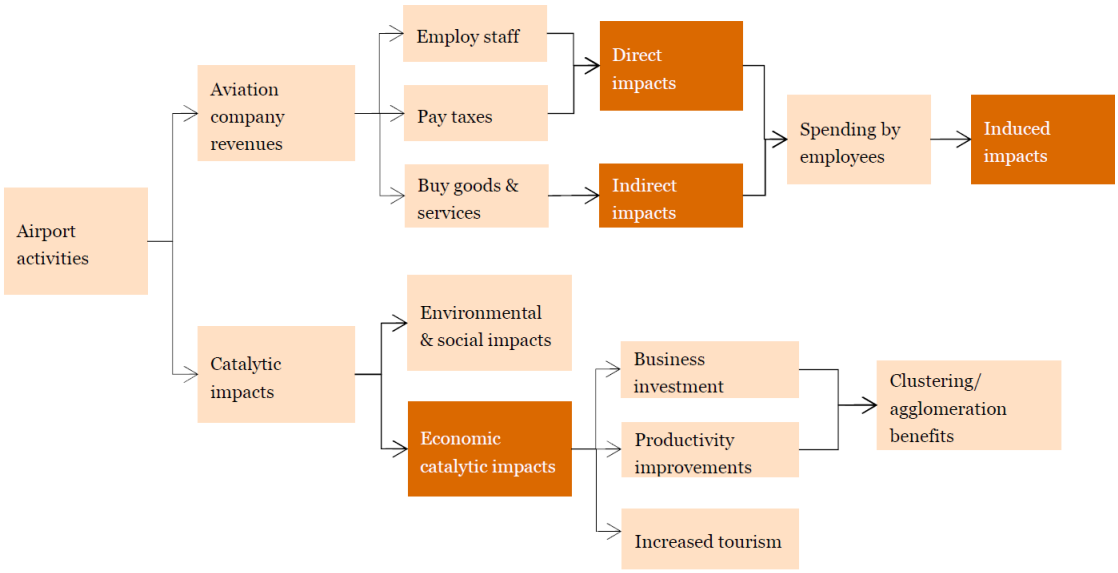


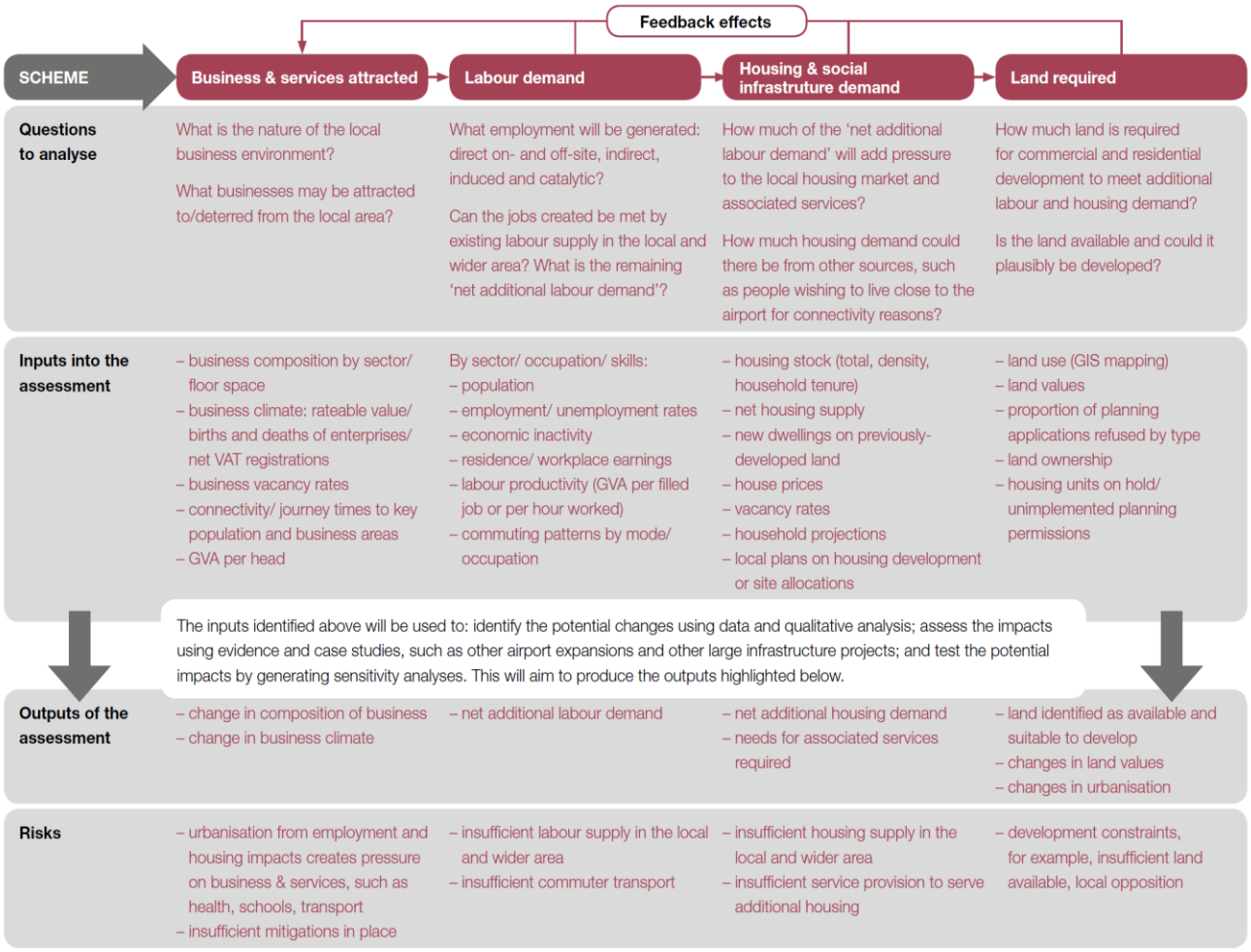
Figure 1: Local direct, indirect, induced & catalytic impacts of airports

Source: Adapted from Britton et al. (2006)

2.14 The PwC work, adopted by the AC, stressed, in particular, the importance of **defining the local area** to be considered in terms of the impacts, highlighting that, at one level, it could be the travel to work area but that a wider area might need to be drawn to assess the wider benefits. **This is an important definitional issue for our work**.

2.15 The AC summarised the basis by which it would appraise the different options for airport expansion as set out in **Figure 2.2** overleaf, which provides further indication of the way in which the different components of the economic impact of the expansion of an airport flowed through to their assessment parameters, including housing and land required. This is pertinent to the planning for airport expansion but also gives some indication of the linkage between various economic impact factors.

Figure 2.2: Airports Commission Methodology for Assessing Local Economic Impacts



2.16 In using the results of the PwC review to assess the local economic impact of the airport expansion options, the AC used and adapted the results of the more detailed studies, taking into account local factors at each airport and overarching issues such as ongoing productivity improvements impacting on direct job generation. Indirect and induced employment multipliers were adopted from each airport's own work and GVA per job determined relative to the local area. The level of employment increase was then considered by reference to local indices of unemployment and deprivation, such as the proportion of local LSOA's[2] by Index of Multiple Deprivation (IMD) decile, local population and employment profiles and the location of businesses.

2.17 The second of the AC's reports concentrated mostly on population growth and housing pressures in the context of the planned major expansion of an airport, which is beyond the scope of our exercise to consider as it relates to the impact of growth rather than the impact at a point in time. Hence, we do not comment further on this report other than to note its adoption of additional jobs as a proportion of local working population as a metric.

[2] Lower Layer Super Output Areas is a small area defined by ONS for the purpose of Neighbourhood Statistics

2.18 Although having noted above that these are seldom quantified, the wider, catalytic impacts were estimated for the AC by PwC using a Spatial Computable General Equilibrium model (S-GCE) to seek to examine the net impact of the expansion of an airport at the national level, the use of which is well outside of the scope that would be possible for this review and, in any event, such models are of a national scale and so not relevant to the assessment of the impact of an airport at the more local level.

Aviation 2050 Consultation

2.19 This consultation in December 2018 on The Future of UK Aviation noted that *"An effective transport system is an important enabler of sustained economic success, with benefits for the wider economy"* (para. 1.8) and identified the principal headings under which aviation makes an economic contribution, namely:

- Connectivity
- Productivity
- Jobs
- Tourism

2.20 Although the consultation focused on the role of aviation in terms of being an enabler of an expanded global role for the UK, the more local implications are considered further in relation to Regional Growth and Connectivity. At para. 4.1, it is noted that *"Airports can directly support thousands of jobs and generate economic benefits beyond the airport fence. Core and specialist aviation services, freight companies, logistics hubs and aerospace investment are often located close to airports, creating jobs in the local area. Regional airports also act as wider magnets attracting non-aviation businesses due to the air connections the airport offers but also the strong road and rail access links that support the airport. They act as a gateway to international opportunities for the regions of the UK."*

2.21 The Consultation Document then focuses principally on the mechanisms by which airports can seek to maximise their local contribution in terms of master plans, surface access strategies and local skills initiatives.

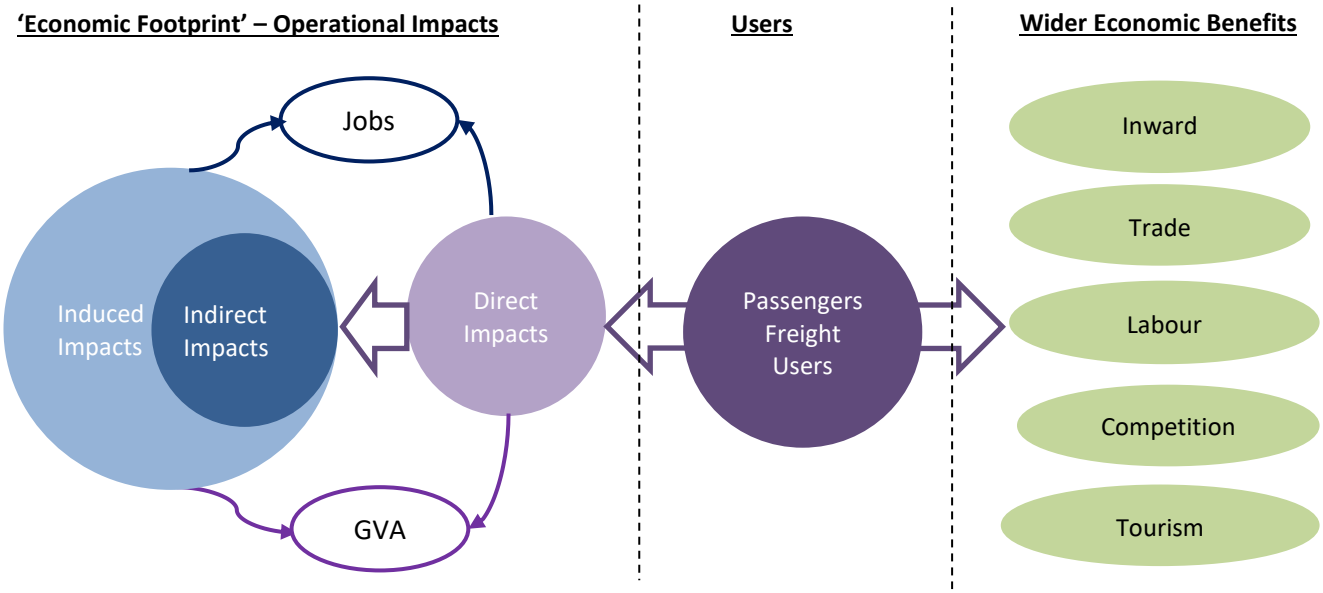
Key Methodological Approaches

2.22 We now consider way in which airports impact their local economies at the Operational level (Direct, Indirect and Induced) and Catalytic Level (Wider Economic Impact) drawn from our broader literature review, with a focus on the metrics used to assess individual airports.

2.23 The most common framework for the analysis of economic impact, and one that could be considered 'best practice' based on the documents that we have reviewed, breaks down the way that an airport interacts with the economy into a series of effects. A range of economic impact techniques are then used to provide a quantitative assessment of the GVA and employment supported through each effect. This quantitative assessment is sometimes supplemented by qualitative analysis around the wider impacts of the airport, particularly in areas where its influence is likely to be less direct.

2.24 Although there are some variations in the way in which this approach is interpreted, the basic framework is the same in the vast majority of cases we have reviewed and is outlined in **Figure 2.3** below.

Figure 2.3: Economic Impact Framework and Relationships



2.25 The 'economic footprint' of an airport effectively reflects the role it plays in supporting GVA and employment purely through its operation as an economic activity. There are three sub-effects within this classification that are consistently identified across the studies we reviewed:

- **direct** – employment and GVA supported by activities wholly or largely related to the operation of the airport or air services (passenger or cargo) and located on the airport site or in the immediate vicinity. It includes companies such as the airport company itself, airlines, handling agents, aircraft maintenance and engineering, terminal retailing, cleaning, car hire firms, hotels serving passengers and crew etc. It would normally exclude business parks and other activities which may be located at an airport but where the activities are not associated with the operation of the airport;

- **indirect** – employment and GVA supported in the supply chain to the direct activities. The companies that generate the direct impacts need to buy goods and services from others to produce their output, who in turn have their own supply chains. These purchases in turn support jobs and GVA in a wide range of sectors, such as utilities and energy, advertising, manufacturing, professional services or construction. This effect is commonly measured using a multiplier of the direct impacts, and we address how this is derived below;

- **induced** – employment and GVA supported in the economy by the expenditure of wages and salaries earned in relation to the direct and indirect activities. People working in the companies in the direct and indirect effects spend money in their local economies. This expenditure injection also supports GVA and jobs. Any sector involved with consumer spending such as general retailing, food and beverages, leisure activities, utilities, banking

and finance costs and insurance may benefit from this increase in expenditure. This effect is, again, commonly measured using a multiplier.

2.26 Wider, or catalytic impacts reflect the benefits that accrue to the region around the airport through the provision of connectivity to businesses and to inbound travellers. An airport's network provides its catchment area with access, to a greater or lesser extent, to the global economy. The air services it provides enable the movement of people and goods that ultimately support economic prosperity through a range of pathways. How the connectivity provided by airports links through to greater prosperity has been the subject of substantial research[3] and the pathways are well known and widely referred to in the studies we have reviewed:

- **Foreign Direct Investment (FDI):** air services influence FDI decisions and facilitate links between head office and branch locations, as well as enabling branches more effectively to service the country or world region they are located in;
- **Trade**: transport of goods that are high-value, low weight or time critical by air enables firms to enter overseas export markets effectively;
- **Tourism**: expanding connectivity has the potential to increase the number of visitors to an area, opening up new markets or making it easier or cheaper to visit for existing markets;
- **Labour Market Effects**: air connectivity is important in being able to attract talented individuals to live and work in a particular location;
- **Agglomeration Effects**: these effects are productivity benefits that can be achieved by firms located close to each other, perhaps through knowledge spill-overs between firms, improved access to suppliers or to larger labour markets.

2.27 The studies we reviewed address these wider effects to varying degrees, but virtually all acknowledge their existence. The majority of studies consider these effects in qualitative ways, but some (including our own) have developed ways of measuring these effects and we address these below.

2.28 Wider impacts can be encapsulated in a measure of the contribution to productivity in the economy more generally, which can be converted to a GVA impact but this is a relatively new measure and the techniques to derive this measure make it less suitable to the current study as they rely on predicting the net change in business travel and/or air freight tonnage, taking into account specific displacement to other airports. This requires complex generalised cost modelling which is time consuming.

[3] For example: Development of Bristol Airport to Accommodate 12 Million Passengers Per Annum: Further Submissions in Relation to Inbound Tourism and Foreign Direct Investment, York Aviation, July 2019; International Trade and Connectivity in the North. York Aviation and Oxford Economics for Transport for the North, April 2019; Wider Economic Impacts Assessment, Airports Commission, July 2015; and The Economic Value of International Connectivity Oxford Economics, April 2013.

2.29 Other measures can examine transport efficiency impacts, such as the value of journey time savings but these are generally calculated by reference to changes in consumer behaviour and are not suitable for the current purposes partly due to the timescale for the study and the requirement to build a detailed specific model for each individual airport. Also, such approaches require the assessment of a defined change in the activity at an airport, typically associated with a planning application or similar and so are not appropriate to assessing the existing impact. Although they could be used to assess the impact of an airport closing, specific models would need to be developed to enable the robust quantification of these effects.

2.30 Generally, to the extent that the wider impacts are quantified, this is typically in gross terms, other than when a S-GCE approach is adopted. Whilst it could be argued that the effects of outbound tourism or the cost to the environment should be included, this is seldom done. In the former case, this is because it is difficult to relate these to individual airports as passengers are likely to use alternative airports or potentially purchase other imported goods. In the latter case, this is because, over and above carbon costs, these are difficult to robustly quantify. In relation to carbon costs, these largely relate to the impact of the aircraft, which are mobile assets and so could simply choose to operate from elsewhere not necessarily in the UK, or from surface access. Hence, these are not a local economic impact.

Approaches to Measurement

2.31 The most commonly adopted approach in the majority of economic impact studies that we have reviewed (and which we also use in our own studies) is one that measures the value added to the economy by the airport or airports in question through employment and Gross Value Added (GVA), focused on a specific geographical area or areas.

2.32 Employment is commonly defined in terms of Full Time Equivalents (FTEs), which takes account of those jobs that are either part time or seasonal. Given that many airports increase their workforce by a relatively significant number during a busy summer season or offer part time employment to cover peaks, this can be an important consideration. However, it is not always possible to accurately identify the number of part time and seasonal jobs and in studies where this is the case, the fall-back metric is simply the number of 'jobs'.

2.33 Gross Value Added (GVA) is the value added to an economy by an economic activity, which is available to distribute in terms of profits, wages and taxes. It is sometimes called 'income' because it is the sum of the income to the factors of production. It is therefore equivalent to wages and profits. So Direct Income = GVA = Profits + Wages & Salaries, which is a measure of activity in an economy. Economic growth is generated by more jobs (i.e. more wages and salaries) or by increased efficiency/productivity (i.e. more profits).

2.34 In some studies that we reviewed, especially outside Europe, for example the studies for San Francisco and Denver Airports, the income from wages and salaries is identified separately but, given that these are a component of GVA, this is not a commonly adopted metric in most studies of individual airports in Europe. Furthermore, there are practical difficulties in obtaining such financial data, which many firms treat as confidential. Some studies that quantify economic impact of multiple airports at a national level use GDP (Gross Domestic Product) rather than GVA. GDP and GVA are broadly equivalent measures, but GDP sums the GVA contribution of individual firms and takes account of taxes and subsidies at a national level. For the purposes of the present exercise, which is considering the impact of individual airports, GVA is the more appropriate measure.

2.35 Some studies, especially those outside Europe, quantify 'output'. This is essentially a measure of the total turnover of an airport or group of airports. In other words, it includes broadly profits, wages and salaries, and the value of goods and services purchased by the firm. However, it is not a measure of economic value added, but rather it measures the size of a firm. Unlike GVA, output includes not only the economic activity generated by that firm but also the economic activity of the firms that supply it, which leads to double counting. For these reasons, most studies use GVA for economic impact assessments and it is the contribution to GVA that is cited as the appropriate measure in government guidance on the subject.

2.36 Some studies consider tax revenues (e.g. Oxford Economics for London Gatwick, and also for London Luton) and a number of US studies also assess tax receipts from income tax paid by employees, corporation tax on profits, business rates, Air Passenger Duty etc. However, this does not seem to be a widely used metric and is not generally relevant to the local area, although business rates could be a more local measure if information is available.

2.37 The studies we reviewed sometimes take different approaches to measurement of the effects listed above, although there is a broad measure of consistency across the piece.

Specific Measures

Direct Effects

2.38 The studies we reviewed demonstrate that direct employment at an airport can be measured in a number of ways including through:

- surveys of on-site companies (these often take some time and sample sizes may be small);
- data from previous studies, updated by reference to traffic growth;
- security pass data (although this can be problematic as some security passes are issued to people who are not regular employees (seasonal, part-time or regular visitors) and may simply be visiting the site or not cover those employees working outside of the secure areas. Hence detailed assessment is required if such data is to be used);
- travel to work surveys (usually undertaken by the airport company);

- government data (e.g., IDBR[4]) although these can take some time to source and clean the data;
- assumptions based on benchmarking (e.g., pax per mppa + type of airport + types of users), particularly for larger studies considering a large number of airports (e.g., the InterVISTAS European-wide study), although there are consequent issues with accuracy.

2.39 In practice, many studies use a combination of sources to arrive at a robust figure for on-site employment. A starting point is likely to be the airport company itself, in order to ascertain what data may already be held or easily accessed. Where airports do not have any recent data, assumptions could be derived from previous studies or from benchmarking. Surveys of onsite companies or use of Inter Departmental Business Register (IDBR) data is likely to be too time consuming for the present purposes.

2.40 Whichever methods are used, it is important to note that employment data is the basis from which other measures can be derived and so is the key piece of data required for any analysis of economic impact.

2.41 Employment Density is a measure of the number of employees (FTEs) per million passengers (or Workload Units[5]) at a given type of airport. There can be considerable variation in the density of on-site employment at UK airports, depending on their size and the characteristics of their traffic, which can impact on overall productivity. Our review of recent studies has recorded, where possible, the onsite employment density of a range of airports and this provides us with benchmarks that could be drawn on should data on employment numbers not be readily available.

2.42 Direct GVA Impact can be deduced from surveys of onsite companies if sufficient financial data about wages and profits is available (rarely the case in the studies we reviewed). The more common approach to calculating GVA effects (at least in the UK) is to use ONS data which records average GVA per job for given locations and job types.

Indirect and Induced Effects

2.43 It is possible to calculate indirect and induced effects through survey work, tracing the supply chain and the various rounds of spending, but this approach is hardly ever seen in recent studies as it involves extensive survey work and analysis and experience suggests that companies are often reluctant for resource or commercial reasons to provide such data. It would be completely impractical for the present purpose.

[4] Inter-Departmental Business Register, by the Office for National Statistics
[5] A Workload Unit is equivalent to 1 passenger or 0.1 tonnes of freight or mail.

2.44 Indirect and induced impacts are, therefore, commonly calculated using a series of so-called multipliers. These multipliers are developed using a range of economic data on the nature of spending in supply chains and by consumers in the economy and the extent to which this expenditure is captured within the geographic area that is being considered. Most of the studies that we reviewed make use in some form of input/output tables. These tables track spending relationships within the national economy and are based on extensive survey work undertaken by branches of governments or independent organisations. In the US, there is a publicly available economic impact model called IMPLAN which provides this data. In the UK, tables are available from ONS and the Scottish Government. And in Europe data can be sourced from Eurostat. It is important to note that, for the UK, regional data below national level is not typically available.

2.45 However, to be used at more local levels, adjustments need to be made to the coefficients within these tables to reflect the different sectoral make up of local and regional economies and the fact that such smaller economies are more reliant on other areas to provide the goods and services that they require. York Aviation has used a well-recognised and tested approach developed by A.T. Flegg of the University of the West of England. A full explanation of the approach can be found in 'Estimating regional input coefficients and multipliers: The use of the FLQ is not a gamble', Anthony T. Flegg & Timo Tohmo, 2013. This approach uses specialised location quotients, which assess the level of relative concentration of an economic sector, to adjust the matrix of coefficients in the input-output tables to reflect the different economic structure at a sub-regional level. In essence, the adjustments reflect that where there is a concentration of a particular sector within an area (i.e. the location quotient is greater than 1) then the coefficient within the input output tables will remain the same as at national level. However, where the regional economy does not show a concentration within a relevant sector, the coefficient is adjusted downward in line with the location quotient, reflecting the fact that the purchasing sector is likely to need to look further afield to fulfil its requirements. The resulting adjusted input-output tables are then further adjusted to reflect the greater need for external trading relationships within areas at a sub-national level and in smaller economies. The approach offers substantial advantages over a 'bottom up' methodology in that it does not require the collection of detailed data from companies on-site at the airport, which can be challenging given time pressures on respondents, and in reality, relevant data is not actually available and estimates often have to be made.

2.46 This approach has been used by York Aviation in recent studies including of Manchester, Stansted, East Midlands, Birmingham, Newcastle, and Luton. It has also been used by Oxford Economics in recent studies of London Gatwick and London Luton.

2.47 However, applying this technique can be time consuming but, nonetheless, we adopted it in considering the role of individual airports in Stage 2 of this study. An alternative approach, sometimes used in the literature we have reviewed, would be to use multipliers based on benchmarks from previous studies. Again, our literature review has identified multipliers from various studies which we could draw on if necessary. It must be remembered, however, that multipliers vary according to the scale of the study area under consideration and care needs to be taken to select appropriate benchmarks, for example it would be wholly inappropriate to apply a national level multiplier to a local area as this would substantially overstate the impacts. For this reason, it is essential to use a multiplier appropriate to the level of activity at the airport and the scale of the local area, whether derived using the 'Flegg' methodology or through use of appropriate local area benchmarks.

2.48 The studies reviewed sometimes make reference to two types of multiplier; Type I multipliers refer to the indirect effects while Type II multipliers also include induced effects. Caution needs to be exercised as to how these are expressed. For example, if an airport supported 1,000 direct jobs and 400 indirect jobs, the indirect (Type I) multiplier is sometimes expressed as 1.4 and sometimes as 0.4. We have used the latter (more commonly used) metric in our table attached to this note.

Wider (Catalytic) Effects

2.49 The methodologies used to estimate an airport's economic footprint as outlined above (i.e. direct, indirect, and induced effects) are well established and widely used in the documents and studies we have reviewed. The quantification of the wider impacts of airports, however, is a more recent development. Most studies make reference to wider impacts but acknowledge that these are often difficult to quantify and confine their analysis to qualitative effects, often derived from consultations with local employers. A number of studies cite proxy or secondary measures to indicate wider effects, such as the value of inward and outward exports by air. We address these further below.

2.50 However, a number of innovative approaches have recently been developed. Given that quantification of these benefits is an area where best practice is still evolving, the estimates of these particular effects should be considered from a broader perspective than those associated with the economic footprint of the airport. This should not be taken as suggesting that the wider impacts associated with airport growth are open to question. Their existence and the evidence base to support their existence and potential scale has been established for some time. It is simply that the techniques available for quantifying them are not yet subject to the same level of precision.

2.51 The factors that can most commonly lend themselves to a form of measurement include:

- business productivity – employment and GVA supported by the role that the airport plays in enabling business travel and the movement of air freight, which in turn supports increased trade, increased inward investment, greater competition and better access to supply chains and knowledge sources. This is ultimately reflected in higher productivity in the surrounding economy. The sectors involved in these impacts are hard to identify but

effects would tend to be concentrated in those with a strong international focus, either in terms of trade or investment;

- inbound tourism – employment and GVA supported by the airport's role in helping to bring new and additional visitors to the region. Expenditure by these visitors boosts economic activity and supports jobs and prosperity. The initial injection is into the sectors that make up the tourism industry, notably hospitality and catering, leisure activities and transport. However, indirect and induced effects stemming from this injection will spread the impact across the economy.

Both of these factors are linked to an airport's connectivity, as are all the wider or catalytic effects.

Business Productivity

2.52 In order to estimate the scale of productivity benefits, York Aviation has developed a model of passenger behaviour that uses generalised cost modelling to estimate the level of business travel from a study area that is solely reliant on a particular airport. In other words, these business passengers would not fly if that airport did not exist. It examines the patterns of travel for business passengers from CAA Passenger Survey and OAG data, identifying surface origins, potential alternative airport options, direct and indirect routings, and air fares. It ultimately assesses the generalised cost of travelling via a particular airport and the next best alternative to complete the same journey. A price elasticity based on the Department for Transport's aviation forecasts research is then applied to the price differential to identify the number of passengers that would no longer fly if they are forced to use the alternative airport.

2.53 These impacts are then calculated using a statistical relationship originally developed by Oxford Economics as part of research undertaken for Transport for London around the Airports Commission process. This relationship correlates the level of business air travel and air freight from an area to total factor productivity in the economy. It identified an econometric relationship whereby a 10% increase in combined business air travel and air freight would result in a 0.5% increase in productivity in the economy. This model has been developed over a number of years and has been used in a wide range of more recent economic impact assessments, including York Aviation's recent work on Birmingham Airport, Leeds Bradford Airport, the Manchester Airport Group airports, Newcastle Airport, Bristol Airport, and in relation to London City Airport's City Airport Development Plan planning application.

2.54 InterVistas (for ACI EUROPE) in 2015 analysed the relationship between national air connectivity and GDP per capita using data for 40 European countries between 2000 and 2012. This analysis found that a 10% increase in connectivity was associated with an increase in GDP per capita of 0.6%. Additional analysis found evidence that this relationship was two-way. That is, as an economy grows, it supports a larger air transport sector, but growth in air transport also supports economic growth.

2.55 Both of these methods, in essence, look at the effect of growth at an airport or the counterfactual implication of constraint if an airport cannot expand. As such, they would be difficult to apply within a framework assessing the impacts in a given year and, in any event, would be not be achievable within the timeframe for this study.

Tourism Effects

2.56 Most studies acknowledge tourism effects, and some quantify these in terms of numbers of visitors by air to the study area. However, it is possible to go further by combining numbers of visitors by air with data from tourism authorities on the average spend per trip to provide an estimate of the consumer expenditure injection into the economy. York Aviation's recent studies take this approach by working this through to an impact on GVA and employment based on information within the Annual Business Survey and Business Register and Employment Survey from the Office for National Statistics and indirect and induced effect multipliers calculated in the same way as for the airport's economic footprint. Oxford Economics, in a 2019 study for London Gatwick, use a similar approach to quantify the inbound tourism benefits supported by the airport. It may not be possible, however, in the time available, to quantify tourism benefits in this way for each airport, although it should be possible to note the number of inbound tourists passing through a particular airport, the extent to which their immediate origins and destinations are in the vicinity of the airport and the extent to which tourism locally is dependent on air tourism.

Connectivity

2.57 A high proportion of the studies we reviewed considered connectivity as part of the assessment of wider impacts. For example, Steer Davies Gleave (for Southampton Airport) conducted their own fairly simple connectivity analysis of seats by country in 2015 and forecast seats by country in 2037. Oxford Economics (for London Gatwick) assessed connectivity impacts using an adapted version of the IATA Connectivity Index with consideration that a 10% in air connectivity relative to GDP was associated with an increase of GDP per capita of 0.5%. Assessments were run with LGW included and without Gatwick - the difference being seen as the Airport's contribution to UK connectivity.

2.58 York Aviation has developed a Business Connectivity Index (BCI) which has been used in several recent studies. In broad terms, the BCI scores each destination that an airport serves in terms of its economic 'usefulness' based on the Globalisation and World City network analysis set out in 'The World According to GaWC'. Essentially the BCI assumes that the higher up the rankings a city is, the more likely it is to provide economic opportunities to the city or region around the base airport. Cities are scored between 0 and 10, with 10 being the most economically important world cities. For instance, London, an Alpha++ city, would score 10, while an Alpha- city, such as Melbourne, would score 7. A city or destination not in the list, for instance a major leisure destination such as Phuket, scores 0. The destination score is then weighted based on the number of weekly frequencies offered. These weightings are based upon an econometric analysis of business market capture at different frequency levels and are designed to reflect the initial significant boost from a basic level of frequency but the diminishing returns from more and more frequencies above a certain level. The resulting score for each route from each airport is then summed to provide a BCI score for the airport as a whole.

Secondary Measures

2.59 As mentioned above, some studies use a range of contextual secondary metrics, which may not necessarily be quantifiable economic impacts associated solely with the airport, but act as proxy measures for the scale of the effect the airport has on its economy. The majority of studies, for example, set out the scale and type of traffic at the airport concerned to set the context for the economic impact (such as level of business traffic or freight handled etc.). The value of freight exported or imported by air is another such measure used by the Economic Development Research Group Inc. in its study of San Francisco Airport and by InterVISTAS for Dublin Airport.

2.60 We are proposing to cite secondary measures such as the presence of air intensive sectors in the relevant study areas, the level of Foreign Direct Investment, and the dependence of the economy on tourism. In practice, there were few studies in our review that addressed these measures in quantitative terms. The Economic Development Research Group Inc. (for San Francisco) and Kimley Horn (for Denver) are exceptions, where analysis of tourist visitors passing through the airports was undertaken.

Gross versus Net Impact

2.61 Although few of the studies reviewed make explicit reference to gross and net effects, it is perhaps important to note the difference. Gross effects are simply the sum of the effects listed above, but do not necessarily take account of the following factors:

- Leakage: some effects can 'leak' outside the study area; for example, the profits of a company based on the airport site, which will be included in the direct GVA metric, may go to a head office located outside the study area or even abroad;
- Displacement and Substitution: 'product' displacement would take market share from other airports and 'factor 'displacement' would take labour (or land or capital) from other activity. Substitution is effectively internal displacement, where newly created jobs are substituted for others that are lost elsewhere within the same company;

- Deadweight - the economic activity that would continue to exist or would have happened even in the absence of the activity being assessed.

2.62 In practice, these effects are often difficult to measure with any certainty, but unless they can be quantified the economic impact effects assessed will effectively be 'gross'. This is less important at the more local level but can be more significant at the wider regional or national level. S-CGE modelling was used during the AC's work to address some of these issues but such techniques are not applicable to more local level assessments.

2.63 Quantification of these effects is beyond the scope of this study, due to timescales and the complexity of analysis required. In the time available, this has been addressed through more qualitative measuresfor the airports under consideration.

Application of the Metrics to Study Areas

2.64 It is important to note that each study we have reviewed expressly defines a study area or areas. In some cases, as many as four study areas were identified, ranging from the immediate locality, through a sub-region, a region, and the national level.

2.65 The definition of a study area is important because it determines the extent of the economic impact, which will be wider at a national level than at a local level (as a result of the wider supply chain effects for example).

2.66 It is not always straightforward to define geographical study areas consistently for every airport and so a judgment may need to be made as to what constitutes a local level or a sub-region. In broad terms, it is our intention to examine the economic footprint of an airport at a local/sub-regional level and to take into account wider (catalytic) effects at a regional level and provide clear explanations of how and why these have been defined.

Determining the Economic Context

2.67 Some of the studies of individual airports that we have reviewed acknowledge the importance of setting an economic impact analysis of an airport within a local and regional economic policy context. This means identifying the prevailing economic conditions of the airport's catchment area and the relevant policy support that might exist for growth or expansion of the airport. This approach is more common in studies that support planning applications and is not always seen in stand-alone studies on economic impact, although York Aviation have always provided this kind of contextual analysis.

2.68 Where such context is provided, the issue that are assessed include the overall GVA and employment in the study areas, which helps assess the scale of the airport's impact. GVA location quotients can be calculated for various industrial or business sectors, which describe the concentration of a particular sector in a particular location compared with the national average.

2.69 Other considerations include skill levels in the local economy (again, quotients for these can be identified), unemployment rates to provide an indication of the extent to which employment at an airport is additional or simply displacing other employment, indices of deprivation, and the volume and value of overseas visitors.

2.70 These metrics provide some context that helps to establish the extent to which the economic impact of an airport is valuable having regard to the characteristics of the local economy. In a more detailed study of a specific airport, it would be possible to examine these characteristics in more detail, in particular to understand the characteristics of the labour market and the availability of skills relevant to employment in air transport. Again, this is beyond the scope and timescale of this high level study.

Conclusions

2.71 Having considered the documents that we reviewed, we developed the framework based on the overall structure set out in **Figure 2.3** and drew on specific metrics used within the studies reviewed to populate the framework. The structure of this framework is outlined in **Section 3**.

2.72 We drew on data captured through the Literature Review to inform our assessment of airports, in particular to derive relevant data for the particular airport, if available, or to provide an appropriate set of benchmarks from which an assessment can be made and applied to each airport.

3. Developing the Framework

3.1 In this section, we set out the rationale for and the basis of calculation of the elements included in the framework. It focusses principally on those metrics included within the initial framework used to assess the initial set of airports but also highlights other measures that might be included at a later stage if more time allowed.

Basis of the Framework

3.2 We have used as our basis the principal Economic Impact Framework identified in the previous section. The 'economic footprint' of an airport effectively reflects the role it plays in supporting GVA and employment purely through its operation as an economic activity under the three sub-categories identified:

- **direct** – employment and GVA supported by activities wholly or largely related to the operation of the airport or air services (passenger or cargo) and located on the airport site or in the immediate vicinity;
- **indirect** – employment and GVA supported in the supply chain to the direct activities;
- **induced** – employment and GVA supported in the economy by the expenditure of wages and salaries earned in relation to the direct and indirect activities.

3.3 **Wider or catalytic impacts** reflect the benefits that accrue to the region around the airport through the provision of connectivity to businesses and to inbound travellers. As noted in the previous section, the quantification of these effects is relatively rare, albeit there are metrics available to estimate broader productivity GVA effects from airport growth and it is possible to examine transport efficiency impacts, such as the value of journey time savings, from a change in the use of an airport. However, such measures can be time consuming to estimate and often require complex and specific modelling. Hence, we have relied, at least for the initial version of the framework, primarily on contextual measures relating to the likely reliance of the local economy in the vicinity of each airport on international connectivity and the role of each airport in the context of available alternatives.

Components of the Initial Framework

3.4 The initial framework has been developed having regard to commonly adopted metrics for the local or regional economic impacts of airports, drawing on our extensive experience of undertaking such assessments. The development of the framework necessarily took into account the availability of data within the time available to complete the analysis of the first 16 airports and so other, potentially helpful, measures were omitted from this initial framework if data is not readily available or if more complex and time consuming calculations would be involved. We address some potential ways for the framework to be enhanced in future by the addition of further measures at the end of this note.

3.5 The framework is based on a number of components and relevant measures under each component as outlined below. The framework provides an initial evidence base for the local (sub-regional and regional) economic impact of the airports on as consistent a basis as possible and relates to the contribution in 2019, before the impact of COVID-19. We have included within the framework a commentary on the extent to which the level and nature of this contribution may be subject to change as the air transport sector recovers from the effect of the virus by reference to structural changes in the industry and by reference to the specific current plans of the airport in question.

3.6 This evidence base is tabulated for each airport, which sets out the principal contribution of each of the 32 airports within its local context and notes any specific issues, considerations or data sources used where they vary from the general methodological approach explained below.

Study Area

3.7 As noted in our Literature Review, defining the study area is critical to describing the economic footprint of an airport; the wider the study area the greater the likely effects will be, particularly in terms of the supply chain and induced activity included within the area. This also increases the risk of displacement and potential double counting of effects. As we noted in the previous section, the measures that are typically used in most economic impact studies of airports are presented in gross terms and, given the timescale for this project, we have adopted this approach in our framework. The net effects having regard to displacement would be lower but the estimation of this would be time consuming requiring more detailed modelling.

3.8 Similarly, the wider the study area the more likely it is that wider economic benefits from connectivity will be identified but it will be less easy to discern the extent to which these derive from the specific airport or from broader air connectivity provided by a number of airports serving the area.

3.9 As we noted in our Literature Review, the study areas adopted vary considerably, with some studies looking at multiple levels of study area from the very local, through the regional to the national impact. This can make comparing data from one airport to another difficult as study areas are normally specifically identified relevant to each airport and the purpose of the study.

3.10 Generally, a wider region, equating to the principal catchment area from which the airport draws passengers, will be relevant to considering the wider economic impact of an airport in terms of its role as an attractor to inward investment and/or as a facilitator of tourism and trade.

3.11 A narrower region is more relevant to considering the operational impact of an airport in terms of local employment and income generation related to the catchment area for employees. Adopting too wide an area in this regard can give rise to overstatement of local effects particularly if it is extended to cover the national level aviation supply chains. However, the wider the area, the smaller the airport's share of economic activity is likely to be.

3.12 There is no single definition that works for all airports as, in part, the relevant area within which to consider the economic impact relates to its catchment area for passengers (and freight) and its employment catchment area. Such areas do not necessarily relate neatly to defined areas for which broader economic data is available and it is clearly beyond the scope of this exercise to undertake detailed assessments airport by airport. Hence, we have tried to adopt as consistent a definition as possible based on NUTS1 and NUTS2[6] regions. These areas are defined by Eurostat and relate principally to administrative divisions but within defined ranges of population at each level (NUTS1, NUTS2 etc). This approach provides at least some level of consistency in the scale of the study areas considered for each airport.

3.13 Where particular issues arise due to the geographical position of an airport within a defined region, we have adjusted the relevant study areas for our framework to reflect the circumstances where:

- an airport clearly serves a wider area, e.g. the London airports which serve London even though located outside of Greater London;
- an airport is located close to the edge of a defined region such that is it relevant to add areas to define the relevant impact of the airport; and/or
- an airport is located at the extremity of a region such that it is far distant from areas included within the administrative region.

3.14 We recognise that our study areas may not be the same as those used by individual airports when assessing their actual economic impact but our rationale for keeping as close as possible to the NUTS1 and NUTS2 definitions is to provide some level of consistency so as to enable understanding and comparison across the airports. This means that our results will inevitably differ from those assessed in a detailed study of any airport, except in relation to direct on-site effects.

3.15 Our study areas and the rationale for them are set out in **Table 3.1** below.

Table 3.1: Study Areas Adopted

Airport	Study Areas used in Specific Identified Studies	NUTS 1 Region	NUTS 2 Subregion	Proposed Region for Framework	Proposed Subregion for Framework	Rationale
Aberdeen		Scotland	Northeastern Scotland (Aberdeen and Aberdeenshire)	Scotland	Northeastern Scotland (Aberdeen and Aberdeenshire)	NUTS areas
Belfast City		Northern Ireland	Northern Ireland	Northern Ireland	Belfast, Lisburn & Castlereagh, Ards & Northdown	NUTS 2 area not defined separately from NUTS 1 area. Sub-regional study area defined by reference to districts.

[6] NUTS – Nomenclature of Territorial Regions for Statistics.

Airport	Study Areas used in Specific Identified Studies	NUTS 1 Region	NUTS 2 Subregion	Proposed Region for Framework	Proposed Subregion for Framework	Rationale
Belfast International		Northern Ireland	Northern Ireland	Northern Ireland	Belfast, Lisburn & Castlereagh, Antrim & Newtonabbey	NUTS 2 area not defined separately from NUTS 1 area. Sub-regional study area defined by reference to districts.
Birmingham	i. West Midlands Region	West Midlands Region	West Midlands (County)	West Midlands Region	West Midlands (County, i.e. Birmingham, Solihull, Coventry, Dudley, Sandwell, Walsall, Wolverhampton	NUTS areas
Bournemouth		South West	Dorset and Somerset	South West – Gloucestershire, Cornwall + Hampshire	Dorset	NUTS1 and 2 areas adjusted to reflect position of the Airport at the south east of the region
Bristol	i. North Somerset ii. West of England (North Somerset, the City of Bristol, Bath & North East Somerset and South Gloucestershire) ii. South West v. South Wales	South West	Gloucestershire , Wiltshire and Bristol/Bath area	South West	West of England	NUTS2 region adjusted to reflect position of airport on the edge of the City region in Somerset. Wiltshire and northern Gloucestershire excluded and North East Somerset added
Cardiff		Wales	East Wales	Wales	NUTS3 areas Cardiff & Vale of Glamorgan, Central Valleys, Gwent Valleys and Bridgend & Neath Port Talbot	NUTS 2 area adjusted to reflect location of the Airport on the South Wales coast close to the boundary between NUTS 2 areas
City of Derry	i. Northern Ireland	Northern Ireland	Northern Ireland	Northern Ireland	Derry & Strabane	NUTS 2 area not defined separately from NUTS 1 area. Sub-regional study area defined by reference to districts. Note: study area should in practice be extended into Donegal in the Republic of Ireland
Doncaster/ Sheffield		Yorkshire and the Humber	South Yorkshire	Yorkshire and the Humber	South Yorkshire	NUTS areas
Dundee	i. Tay Cities Region	Scotland	1 Eastern Scotland	Scotland	Angus, Dundee City, Perth & Kinross, Fife	NUTS 2 area reduced to reflect Tay Cities Region

Airport	Study Areas used in Specific Identified Studies	NUTS 1 Region	NUTS 2 Subregion	Proposed Region for Framework	Proposed Subregion for Framework	Rationale
East Midlands	i. East Midlands ii. Midlands (East and West) ii. UK	East Midlands	2 Derbyshire and Nottinghamshire 3 Leicestershire, Rutland and Northamptonshire	East Midlands	Derbyshire and Nottinghamshire + Leicester and Leicestershire	NUTS 2 area + Leicestershire to reflect location of the Airport and traditional 3 counties focus
Edinburgh	i. Edinburgh ii. Scotland	Scotland	Eastern Scotland	Scotland	East Lothian and Midlothian, City of Edinburgh, Falkirk, West Lothian	NUTS 2 area reduced to selected NUTS 3 areas to reflect sub-region
Glasgow	i. Glasgow City Region	Scotland	West Central Scotland	Scotland	West Central Scotland	NUTS areas
Exeter		South West	Devon	South West – Gloucestershire, Wiltshire, Bristol and Bath	Devon	NUTS 1 region adjusted to reflect location of Airport in the west of the region
Humberside		Yorkshire and the Humber	East Yorkshire and Northern Lincolnshire	Yorkshire and the Humber	East Yorkshire and Northern Lincolnshire	NUTS areas
Inverness		Scotland	Highlands & Islands	Scotland	Inverness & Nairn and Moray, Badenoch & Strathspey	NUTS 3 area used for sub-region
Isles of Scilly (St Marys)		South West	Cornwall	Cornwall	Isles of Scilly	NUTS 1 region reduced to reflect location of Airport in the far south west. NUTS 2 region reduced to reflect island status
Lands End (St Just)		South West	Cornwall	Cornwall	Cornwall	NUTS 1 region reduced to reflect location of Airport in the far south west. Identical to NUTS2 sub-region
Leeds Bradford	i. Leeds City Region	Yorkshire and the Humber	West Yorkshire	Yorkshire and the Humber	West Yorkshire	NUTS areas
Liverpool	i. Liverpool City Region ii. North West ii. North Wales v.	North West	Merseyside (Liverpool City Region)	North West	Merseyside	NUTS definitions consistent with Airport study areas except North Wales not included. Could include Warrington as part of sub-region to reflect employee catchment

Airport	Study Areas used in Specific Identified Studies	NUTS 1 Region	NUTS 2 Subregion	Proposed Region for Framework	Proposed Subregion for Framework	Rationale
London City	i. 11 East London Boroughs + Epping Forest	London	Inner London East	London	Inner London East + Outer London East and North East	Two NUTS 2 areas combined for sub-region
London Gatwick	i. Gatwick Diamond (parts of W Sussex and E Surrey) ii. UK	South East	Surrey, East and West Sussex	South East + London – Berkshire, Buckinghamshire, Oxfordshire	Surrey, East and West Sussex	NUTS 1 region extended to London but excludes districts north of London. NUTS2 region slightly wider but not materially different from Gatwick Diamond
London Heathrow	i. Longford, Harmondsworth, Sipson, Harlington, Cranford Cross, Cranford, Heston, Hounslow (Central and South), Hounslow (West and Heath), Feltham North, Bedfont, Stanwell, Stanwell Moor, Poyle, Colnbrook, Brands Hill, Iver and Richings Park, West Drayton, Hayes. ii. London Borough of Hillingdon, London Borough of Hounslow, London Borough of Ealing, Spelthorne Borough Council, Slough Borough Council, Runnymede Borough Council, Royal Borough of Windsor and Maidenhead, South Bucks District Council, Elmbridge Borough Council. ii. UK	London	Outer London West and Northwest (Barnet, Brent, Ealing, Harrow and Hillingdon, Hounslow and Richmond upon Thames)	London and South East	Outer London West and Northwest + Bracknell Forest, Windsor & Maidenhead, Slough (Bucks), Runnymede, Elmbridge, Spelthorne, Surrey Heath, Woking (Surrey) and South Bucks	Heathrow lies at the western edge of London and its sub-region extends into Berkshire, Buckinghamshire and Surrey beyond its NUTS 2 sub-region, with its regional role covering the South East (two NUTS 1 regions).
London Luton	i. 3 Counties (Beds, Herts, Bucks) ii. 6 Counties (+ Oxon, Cambs, Essex) ii. UK	East	Bedfordshire and Hertfordshire	East of England + London + Buckinghamshire	Bedfordshire and Hertfordshire + Buckinghamshire	NUTS 1 and NUTS 2 definitions extended to include 3 counties for sub-regional impacts given Airport location on edge of area. London included to reflect role serving London
London Southend		East	Essex	East of England + London	Essex	NUTS 1 region extended to include London

Airport	Study Areas used in Specific Identified Studies	NUTS 1 Region	NUTS 2 Subregion	Proposed Region for Framework	Proposed Subregion for Framework	Rationale
London Stansted	i. Eastern England ii. 19 N and E London Boroughs	East	Essex	East of England + London	Essex + Hertfordshire	NUTS 1 region extended to include London. NUTS 2 region extended to Hertfordshire to reflect Airport location on the edge of the area
Manchester	i. North West ii. Northern Powerhouse (incl Yorkshire & Humber, NE)	North West	Greater Manchester	North West	Greater Manchester + Cheshire East and Warrington	NUTS 2 sub-region extended to reflect primary employment catchment due to location of the Airport on the edge of the NUTS 2 area
Newcastle	i. Tyne & Wear sub-region	North East	Northumberland and Tyne & Wear	North East	Northumberland and Tyne & Wear	NUTS areas
Newquay		South West	Cornwall	Devon and Cornwall	Cornwall	NUTS 1 region reduced to reflect location of Airport in the far south west
Norwich	i. Norwich ii. Norfolk ii. UK	East	East Anglia	East of England	East Anglia	NUTS 2 area wider than local area used in airport study but used for consistency
Southampton	i. Solent LEP	South East	Hampshire and Isle of Wight	South East – Berkshire, Buckinghamshire, Oxfordshire, East Sussex and Kent	Hampshire and Isle of Wight	NUTS 1 region reduced to reflect more local role and location at western edge of the region
Teesside	i. Tees Valley LEP ii. UK	North East	Tees Valley and Durham	North East	Tees Valley and Durham	Durham added to LEP area for consistency with NUTS definition

3.16 It is important to note that Central London (in particular the Cities of London and Westminster) is not included with the sub-regions defined for assessing the sub-regional impact of each of the London airports, which relate more closely to the employment catchment areas related to the direct operational impacts of the airport. Hence, at the sub-regional level, many of the passengers, including tourists, using these airports are not included within the more local assessment. This needs to be borne in mind when interpreting the results as reported.

Wider Economic Impact: Economic Context

3.17 The first section of the framework sets out the economic context in the sub-regional (local) area in which the airport sits. It is in this area that the principal local economic impact of the airport falls to be considered. Whilst this does not measure the economic impact of the airport directly, it does set the context for its contribution in terms of:

- relevant local planning and economic policies;

- indicators of the extent to which the local economy is likely to be dependent on air accessibility to support key economic sectors;
- indicators of the extent to which the local economy is international;
- the importance of inbound tourism;
- local economic conditions in terms of employment, GVA and deprivation.

3.18 These are largely secondary measures which provide some indication of the extent to which the contribution of an airport is likely to be valuable within its regional and sub-regional context and the importance that should be accorded to that contribution. They are included, in part, in lieu of quantified metrics of the wider economic importance of the connectivity provided by an airport. We discuss further below the potential for including such quantified measures in a later version of the framework, if time permits.

Regional and Sub-regional Economic Priorities

3.19 This sub-section sets out relevant policies towards the airport at a regional and sub-regional level and any other key economic factors or priorities relevant to the Regional and Sub-regional study areas. This draws on local plans at the district or county level, relevant regional strategies, e.g. Transport Strategies, and Economic Strategies of relevant Local Enterprise Partnerships (LEPs).

3.20 It should be noted that these plans and strategies do not always relate to the precise study areas. The documents reviewed for each airport are highlighted in the framework and any key points noted.

Presence of Air Intensive Sectors in Region

3.21 This sub-section quantifies the extent to which the Regional and Sub-regional economy is characterised by sectors which are significant purchasers of air transport services. The output is presented by way of an employment Location Quotient. This Location Quotient measures the extent to which employment in the top 10 largest purchasers of air transport services is under- or over-represented in terms of employment in a given study area compared to the average for Great Britain. A value of greater than one suggests a concentration of such sectors, while a value of less than one suggests that these sectors are under-represented[7].

[7] Location Quotients are used at a number of points in the framework. The calculation follows the same basic format in each case. Location Quotient = (Employment in the relevant sector(s) in the study region / Total Employment in the Study Region) / (Employment in the relevant sector(s) in Great Britain / Total Employment Great Britain).

3.22 The intention of this analysis is to provide guidance on the extent to which the broader economy around an airport is reliant on access to air transport connectivity for its operations. In the context of COVID 19, local economies with a concentration of air intensive sectors are more likely to be impacted by change in the level and pattern of service at their airports stemming from COVID 19. In particular, they are likely to find it more difficult to trade in global markets because of impaired access or to attract or retain overseas investment.

3.23 The top 10 air intensive sectors have been identified based on the latest available Input Output tables for the UK economy and, more specifically, the Intermediate Use table. The latest available tables were published in October 2019 and cover the UK economy in 2017. The air intensive sectors are defined as the 10 sectors that spend the most on air transport services excluding travel agencies and the air transport sector itself. The former is excluded as it probably purchases from individual consumers and a broad range of sectors, while air transport is excluded as a significant proportion of payments within the industry are likely to relate to airport charges or similar rather than air travel purchases. The sectors identified, in order of value of expenditure on air services, are as follows:

- Financial Service Activities, except Insurance and Pension Funding;
- Warehousing and Support Activities For Transportation;
- Activities of Head Offices; Management Consultancy Activities;
- Insurance, reinsurance and pension funding services, except compulsory social security;
- Office Administrative, Office Support and Other Business Support Activities;
- Postal and Courier Activities;
- Advertising and Market Research;
- Public Administration and Defence; Compulsory Social Security;
- Food and Beverage Service Activities;
- Other Professional, Scientific and Technical Activities.

3.24 The associated employment Location Quotient for air intensive sectors in the relevant study area is then calculated using data from the Business Register and Employment Survey (BRES) extracted from NOMIS. The latest data available is for 2018. The Location Quotient is calculated by dividing the percentage of total employment made up by air intensive sectors in the study area by the percentage of total employment made up by air intensive sectors in Great Britain.

3.25 This type of analysis was originally developed by MDS Transmodal for the Department in the run up to the 2003 Aviation White Paper to provide an understanding of which sectors were reliant on air travel. It was also used by a range of public sector bodies, notably the Scottish Government and the English Regional Development Agencies (RDAs) in the early and mid-2000s to help understand the potential reactivity of regional economies to air services. More recently, there has been a greater focus on quantifying catalytic impacts and the approach has not been as widely used. However, it remains a useful tool for considering context.

3.26 The primary limitation to be noted in relation to this measure is that the spend data on which it is based is collated at national level. This may mean that regionally or sub-regionally individual sectors' patterns of expenditure may be different. An example might be financial services, where the international element of this sector is focussed on London and it is likely that this cluster drives the demand for air travel nationally. Elsewhere in the country, the sector is likely to be more domestically orientated and may not require international access to the same degree. However, this varies even within the regions themselves.

3.27 To maintain consistency, we have used Great Britain as the denominator comparator across all airports, including airports in Northern Ireland. Therefore, a degree of caution may be required in interpreting results.

Internationalisation of the Regional Economy

3.28 This sub-section sets out a number of measures for how international are the Region and Sub-region within which the airport sits.

Presence of exporting sectors (goods)

3.29 This measure considers the extent to which the local economies around airports contain economic sectors that account for significant amounts of goods exports compared with the rest of the country. The intention of this indicator is to enable consideration of the extent to which an area is an internationally trading economy and, hence, is likely to be sensitive to air service access[8]. This indicator is expressed as an export value Location Quotient, comparing the concentration of the UK's top 10 goods exporting sectors within an area with the UK as whole.

3.30 The value of exports regionally (NUTS1) and across England is taken from the HMRC Regional Trade Statistics database. This database enables an assessment to be made of exporting sectors down to 2 digit SITC codes. The largest goods exporting sectors nationally, in order of size, are identified as:

- 78 - Road vehicles (including air cushion vehicles);
- 71 - Power generating machinery & equipment;
- 89 - Miscellaneous manufactured articles not elsewhere specified (n.e.s.);
- 54 - Medicinal & pharmaceutical products;
- 74 - General industrial machinery & eqp. & machine pt.n.e.s.;
- 77 - Electrical machinery, app & appliances & ele pt thereof n.e.s.;
- 33 - Petroleum, petroleum products & related materials;
- 79 - Other transport equipment;
- 87 - Professional, scientific & controlling ins & app n.e.s.;
- 68 - Non-ferrous metals.

[8] It should be noted that this does not necessarily mean that companies need to send their products by air. It relates more to the general requirement for access to air services to support their activities, for instance to enable sales trips, after care or to manage supply chains.

3.31 The Location Quotient for these sectors for an airport's home region is then calculated by dividing the percentage of a region's exports from the above sectors by the percentage made up by these sectors at a national level.

3.32 The primary limitation of this measure is that it only focusses on goods exports as data is not available for service exports. Given that services are the key driver of the UK economy some care does, therefore, need to be taken when interpreting the results.

3.33 Another limitation is the consistency across other geographies, as noted in paragraph 32, and so for airports in Northern Ireland and Scotland, the location quotient has been estimated using the airport's home region and England, to maintain consistency.

FDI (projects)

3.34 The number of new FDI projects in a region is a further measure of the internationalisation of the regional economy and the extent of its likely sensitivity to air service access. As previously discussed, air connectivity is a key decision factor for potential investors given the need to manage and operate their overseas investments. New projects provide a recent snapshot of a region's performance in this area.

3.35 The analysis provides information on the number of new FDI projects recorded and new jobs created in 2019/20 in the broad region in which an airport is located. More geographically disaggregated data is not consistently available. This information is drawn from the Department for International Trade Inward Investment Results 2019/20.

Number of Foreign Owned Companies

3.36 The number of foreign owned companies in a region provides a view on the stock of inward investment and, hence, a long run view of internationalisation of a region's business stock. Again, regions with higher levels of foreign owned companies are likely to be more sensitive to air service access given the need for investors to manage their interests in the UK effectively.

3.37 The data presented in the framework is drawn from the Office for National Statistics Annual Business Survey, which covers the non-financial business economy. It provides information on the number of foreign owned companies by UK region, their turnover and approximate GVA. The latest available information is for 2018.

GaWC Status of Main City

3.38 The Globalisation and World Cities Network (GaWC) is a leading thinktank on cities in globalisation and has diversified into related subjects where concern for inter-city relations intersects with research on issues concerning, for instance, international business, sustainability, urban policy, and logistics. The GaWC produces a wide range of research including a periodic assessment of the world city status of cities around the world entitled 'The World According to GaWC'. This research has long been recognised as an authoritative view on the global importance of individual world cities. Indeed, it was used within York Aviation's work for the Department in 2018 on the Regional Connectivity Review.

3.39 The analysis considers the location decisions of 175 advanced producer service firms across 707 cities worldwide. This information is used to classify cities into a number of categories that reflect their importance as nodes in the global economy. The categories in descending order of importance are as follows:

- *Alpha++*
- *Alpha+*
- *Alpha*
- *Alpha–*
- *Beta+*
- *Beta*
- *Beta–*
- *Gamma+*
- *Gamma*
- *Gamma–*
- *High Sufficiency*
- *Sufficiency*

3.40 In this part of the framework, the city status of the main city that an airport serves is recorded as a reflection of its status in the world economy. The higher up the GaWC scale the city's status, the more sensitive it is likely to be to air transport connectivity as its connections to the global economy are greater and more deeply embedded.

3.41 It should be noted that the GaWC city rankings are also used separately later on in the framework to consider the relative economic importance of cities within each assessed airport's network. This is a separate analysis that happens to use the same dataset. This latter analysis focuses on connections to Alpha, Beta and Gamma cities.

Tourism

3.42 This sub-section set outs the importance of tourism to the Regional and Sub-regional economy. It includes tourist visits to the Region and Sub-region by air, regardless of which airport is used. The extent to which tourists used the airport in question is addressed in the next section. The contribution of tourism to GVA in the Region and Sub-region is also included.

Visitors to the Region by air

3.43 Visitors to the region and sub-region were identified using VisitBritain Tourism Survey data. We have used the latest available 2019 survey, where we have identified the number of foreign inbound visitors to the region/sub-region by air and also estimated the spend per visitor to each of the study areas.

3.44 Due to the unique definition of sub-regions, there is no data available for inbound visits for a number of sub-regions. We have, therefore, where possible, estimated this using the nearest available data (such as a region or county level proxy).

3.45 We have also estimated the proportion of these visitors that have used the airport being considered by identifying the number of foreign inbound passengers that have used the airport from CAA Passenger Survey data. This number was then halved to convert the two-way passenger numbers into inbound visits and then divided by the total visits made to the region/sub-region by air to estimate the proportion of inbound visitors that have used the study airport.

3.46 In addition, we have also added the total number of foreign inbound tourist visits to the regions and sub-regions regardless of the mode of transport, to understand the relative size of the tourism market supported by the airports in relation to all other modes. This data was also retrieved from the VisitBritain Tourism Survey. We then estimated an overall proportion of tourists (by all modes of transport) that have used the airport in question in the Regions and Sub-regions, as well as the total air tourism GVA as a proportion of Sub-regional GVA.

3.47 Here, too, for a number of sub-regions, data for inbound visits by air is not available. We have, therefore, applied the proportion of regional air visitors to total visitors to estimate the number of inbound visits by air to the sub-region.

3.48 It is worth highlighting that the data captured in the CAA Passenger Survey only identifies the areas from which the foreign inbound passengers started their journey, which may not accurately portray the exact tourism contribution of these inbound visits.

3.49 Due to the limitations inherent in how the CAA survey is weighted, we have identified several discrepancies between the Visit Britain Tourism Survey and CAA Passenger Survey, where the number of visitors at a given airport exceeded the number of air visitors in the sub-region/region. This was the case for Newcastle and Aberdeen, for example. In these cases, we have, therefore, assumed that the airport captures 100% of the air visitor market in the sub-region and highlighted this in the framework.

3.50 The expenditure impact of foreign inbound passengers coming through the study airport was estimated based on the average spend per trip identified from the VisitBritain data. A similar estimate is made for domestic inbound visitors again using CAA Passenger Survey data. We used data compiled by Tourism Alliance, using the Great Britain Tourism Survey, to estimate the spend per visit by tourists in the specified region. A total tourism expenditure of foreign and domestic inbound tourists is then estimated by summing the two expenditure estimates.

3.51 To estimate the Direct GVA Impact, we used data from the 2017 UK Tourism Satellite Account[9] (UK-TSA) to estimate the relative size of the Direct GVA Impact of Tourism in comparison to the Inbound Visitor expenditure (for both foreign and domestic inbound visits). This ratio was then applied to the total visitor expenditure estimated for the airport to generate a Direct GVA impact for the tourism spend.

[9] UK Tourism Satellite Account 2017: TSA tables, ONS.

3.52 We have also estimated the Indirect and Induced GVA, using multipliers from *'Tourism: jobs and growth. The economic contribution of the tourism economy in the UK'*[10], where the Type II multipliers were estimated by nations in Great Britain. For London airports we have used a weighted average GVA multiplier for London and Rest of England regions and for regional airports, we have used the rest of England GVA multiplier.

3.53 The same approach was used to estimate the Air tourism GVA in the sub-region, where foreign inbound tourists to the sub-region were allocated an average spend per visit and the Direct, Indirect & Induced GVAs were then estimated.

3.54 For sub-regional Tourism GVA as a proportion of Sub-regional GVA where a proxy sub-region was used, we have used the new GVA denominator for the sub-region to maintain consistency in evaluating the real size of the tourism GVA in the sub-region.

Regional and Sub-regional Employment

3.55 This sub-section sets out the employment status in the local area in terms of unemployment and the total level of employment in the Regional and Sub-region. This provides a context for understanding how important the direct, indirect and induced employment may be locally, which is covered in a later section of the framework. Generally, such employment is of greater value in areas of relatively high unemployment, as there would be less displacement from other activities, and less important in areas where there is close to full employment and increased employment at an airport could lead to pressures on housing provision and other services. Generally, the direct impact of an airport will be closer to the net impact in areas of higher unemployment but account would still need to be taken of any displacement effects of activity from other airports.

3.56 These measures are included within the Economic Context section but are of particular relevance in considering the impact of the employment generated through the Operational Impact of the airport.

Local Unemployment rate

3.57 We have estimated the local unemployment count and rates, both at regional and sub-regional level from ONS model based estimates of unemployment for local authorities. The data is provided at a local authority level. We, therefore, estimated the unemployment rates for the entire region by estimating the workforce count using the unemployment count and rates and then re-aggregated the appropriate local authorities in the sub-regions and regions to estimate the specific unemployment count and rate for the desired study areas.

[10] Tourism: jobs and growth. The economic contribution of the tourism economy in the UK, Deloitte & Oxford Economics, November 2013, Figure 4.2.2b.

3.58 Northern Ireland and Scotland report their own unemployment counts and rates. For Northern Ireland, although data is available, the unemployment count used is the claimant count number and the unemployment rate is reported as the proportion of working age population. Scottish unemployment counts and rates are both reported at county level and, therefore, a proxy measure of unemployment was used at county level rather than at sub-regional level.

Total Local Employment

3.59 Total employment is also estimated using ONS regional employment statistics at Local Authority level. Data was aggregated according to the desired study area and summarised in the form of the regional and sub-regional employment count.

Regional and Sub-regional GVA

3.60 Regional GVA was estimated using the ONS regional gross value added (balanced) by industry: all NUTS level regions and local authority level data for 2018. The local authority districts and NUTS 2 and 3 areas were then aggregated to produce GVA estimates for the desired regions and sub-regions.

Sub-regional Deprivation (IMD Index)

3.61 Deprivation is another measure of the extent to which an airport, as a generator of local employment and income, may be valuable.

3.62 The Index of Multiple Deprivation (IMD) is a measure outlining the level of deprivation in a given area, typically Lower Super Output Areas (LSOAs). This identifies the common issues surrounding deprivation taking into account income levels, employment, skills, health and disability levels, crime, living environment and barriers to housing. The overall deprivation index is measured using a rank and a score for each indicator and is summarised as an overall deprivation index using different weights for each type of indicator. This overall measure comes in the form of the LSOA's score in its respective decile nationally.

3.63 Data is provided at a local authority district and county level containing all the LSOAs and their respective scores, ranking and decile. We then aggregate this data by each local authority to identify the count of LSOAs in the bottom 10th decile, i.e. the most deprived decile in the nation, and report it in a relative form as a proportion of LSOAs in the study area that are present in the bottom most deprived decile. This gives an overall picture of the count of deprived areas in a given study region, or in other words, how deprived a given study area is.

3.64 For regions outside England, (i.e. Scotland, Wales and Northern Ireland, data is provided by the local statistical authority. Therefore, the proportion of SOAs in the most deprived decile, have been estimated. For these regions, data at regional level was not available as the data itself covers the entire region to be used as the denominator decile. We, therefore, provided a weighted average for all sub-regions as a proxy for deprivation in the region. This was only done for Scotland as there were at least five different sub-regions within the one region.

3.65 In some cases, such as Scotland, deprivation data was only provided at county level, which meant we were unable to precisely estimate the deprivation in the sub-region. We have therefore used a county level proxy for each sub-region (highlighted in the framework).

Wider Economic Impact: Connectivity (Air Service Offer)

3.66 In this section, we set out a number of parameters regarding the air services at the airport and the characteristics of the passengers using it. These are not direct measures of the economic value of the airport but do provide evidence of the extent to which it supports wider economic activity, particularly in terms of business travel and inbound tourism. These are, in essence, secondary measures of the economic contribution in the absence of more direct measures available within the time frame, as we discuss further below.

3.67 Generally, the higher the number of businesses or inbound tourist passengers using the airport, the more economically important is the air connectivity that it offers. That is not to say that outbound leisure trips do not have an economic or social value but their contribution is less easily captured in a simple metric. The relationship between outbound travel and the local economy is in reality highly complex. Clearly, outbound passengers do spend money overseas that could, at least in theory, be spent at home. However, there are a number of issues here. It is not unreasonable to suggest that outbound leisure passengers are likely to continue to travel outside of the area in most cases regardless of the availability of air services at their local airport, either via other airports or other modes. The same cannot be said of inbound passengers. If they cannot easily reach an area they will likely simply go elsewhere. Equally, it is unclear the extent to which a reduction in outbound expenditure might be injected into the local economy. It could well be saved or spent on imports. It should also be recognised that over the medium to long term outbound travel offers important quality of life benefits that make an area an attractive place to live and work. Again, quantifying this effect is very difficult. Overall, this makes defining a simple metric for outbound travel impractical.

3.68 The overall number of passengers using an airport is included as a measure of the overall scale of activity, particularly in relation to the more direct operational impacts.

Total Terminal Passengers

3.69 This is derived from Civil Aviation Authority (CAA) Airport Statistics from 2019 and is the principal measure of the scale of activity at an airport. For this measure, we use Total Terminal Passengers, i.e. excluding those passengers that are transiting the airport on board aircraft and not related to the airport or its catchment area specifically.

Passenger Characteristics

3.70 The characteristics of passengers at each airport within the study have been ascertained from analysis of CAA Passenger Survey data. The 2019 survey included 13 of the 32 airports within the study. If an airport was not included within the 2019 survey, then the latest available survey for that airport was adopted for our analysis, with adjustments made to reflect changes in route networks and overall passenger throughput since the original survey. It is assumed that the broad characteristics of the passengers using different types of routes remain the same, e.g. low fare services to/from Spain, so these characteristics, including the catchment area for passengers using them, but the number of such passengers is factored up by the growth at the airport since it was last surveyed. This is undertaken across groups of routes at the airport to adjust the passenger characteristics to the 2019 total passenger volume.

3.71 Seven of the 32 airports within the study have never been included in a CAA Passenger Survey. In these instances, a pseudo survey was created based upon the route-by-route CAA Airport Statistics for 2019. If a non-surveyed airport had a domestic service to another airport that was included in a recent survey, then the survey at the destination airport was effectively reversed. For example, a passenger recorded on Manchester Airport's survey departing to Norwich who resided in the North West would be considered as a UK inbound passenger to Norwich arriving from the North West. This is appropriate as the survey reflects passengers on a two-way basis. As a proxy for international routes, or domestic routes where both points of the route have not been surveyed, we analysed passenger characteristics on routes to the same or similar destinations from similar origin airports where recent survey data exists, and applied these characteristics to the total 2019 passenger volume for the route at the airport in question in a similar manner to that outlined above. We recognise that there is a level of uncertainty around such analysis there is no other practicable basis for assessing the expected catchment areas and characteristics of passengers at airports for which no survey data exists. We consider this a reasonable proxy.

3.72 **Table 3.2** details the CAA Passenger Survey used for each airport, and summarises the approach taken where 2019 survey data did not exist for the airport.

Table 3.2: CAA Passenger Surveys used by Airport

Airport	Survey Source
Aberdeen	CAA Passenger Survey 2018, adjusted for 2019 route network and overall passenger volume
Belfast City	CAA Passenger Survey 2019
Belfast International	CAA Passenger Survey 2019
Birmingham	CAA Passenger Survey 2019
Bournemouth	CAA Passenger Survey 2005, adjusted for 2019 route network and overall passenger volume
Bristol	CAA Passenger Survey 2019
Cardiff	CAA Passenger Survey 2019
City of Derry	Airport has not had a recent CAA Passenger Survey - 'reversed' 2019 survey for all routes where survey data is available
Doncaster Sheffield	CAA Passenger Survey 2014, adjusted for 2019 route network and overall passenger volume
Dundee	Airport has not had a recent CAA Passenger Survey – 'reversed' survey characteristics averaged between 2015-2019 on Stansted route

Airport	Survey Source
East Midlands	CAA Passenger Survey 2019
Edinburgh	CAA Passenger Survey 2018, adjusted for 2019 route network and overall passenger volume
Exeter	CAA Passenger Survey 2012, adjusted for 2019 route network and overall passenger volume
Gatwick	CAA Passenger Survey 2019
Glasgow	CAA Passenger Survey 2018, adjusted for 2019 route network and overall passenger volume
Heathrow	CAA Passenger Survey 2019
Humberside	CAA Passenger Survey 2010, adjusted for 2019 route network and overall passenger volume
Inverness	CAA Passenger Survey 2018
Isles of Scilly (St. Mary's)	Airport has not had a recent CAA Passenger Survey. Pseudo 2019 survey created based on characteristics observed on selected comparator routes between Guernsey and regional UK airports
Land's End (St. Just)	Airport has not had a recent CAA Passenger Survey. Pseudo 2019 survey created based on characteristics observed on selected comparator routes between Guernsey and regional UK airports
Leeds Bradford	CAA Passenger Survey 2017, adjusted for 2019 route network and overall passenger volume
Liverpool	CAA Passenger Survey 2017, adjusted for 2019 route network and overall passenger volume
London City	CAA Passenger Survey 2019
Luton	CAA Passenger Survey 2019
Manchester	CAA Passenger Survey 2019
Newcastle	CAA Passenger Survey 2017, adjusted for 2019 route network and overall passenger volume
Newquay	Airport has not had a recent CAA Passenger Survey - 'reversed' 2019 survey for domestic routes where survey data is available, application of characteristics observed on comparator routes
Norwich	Airport has not had a recent CAA Passenger Survey - 'reversed' 2019 survey for domestic routes where survey data is available, application of characteristics observed on comparator routes
Southampton	Airport has not had a recent CAA Passenger Survey - 'reversed' 2019 survey for domestic routes where survey data is available, application of characteristics observed on comparator routes
Southend	CAA Passenger Survey 2019
Stansted	CAA Passenger Survey 2019
Teesside	CAA Passenger Survey 2009, adjusted for 2019 route network and passenger volume

Business Passengers

3.73 The number of business passengers using an airport is a measure of how important the connectivity offered by the airport is to local business. It is important to note that, for airports more distant from London, connections to London can account for a substantial number of these business passengers where air connections exist. The proportion of total passengers using the airport that are travelling on business is also included as an indicator of the importance of business passenger traffic to the airport.

3.74 This measure is derived, in most cases, from CAA Passenger Survey data, which records whether a passenger is travelling for business or leisure purposes.

Foreign Inbound Passengers

3.75 The number of foreign inbound passengers using an airport is a measure of how important the connectivity offered by the airport is to inbound tourism. This measure includes both those travelling for business and leisure purposes.

3.76 This measure is derived, in most cases, from CAA Passenger Survey data, which records whether a passenger resides in the UK or elsewhere.

UK Inbound Passengers

3.77 The number of UK inbound passengers using an airport is another measure of how important the connectivity offered by the airport is to inbound tourism. This measure includes both those travelling for business and leisure purposes.

3.78 This measure is derived, in most cases, from CAA Passenger Survey data, which records whether a passenger resides in the UK and if so, which region of the UK they are from.

3.79 UK inbound passengers are identified within the survey by considering the geographic location of the airport being assessed, the domestic route network of the airport, and the UK regions where the domestic route network is likely to draw passengers from. For example, UK passengers residing in Scotland and the North East would be assumed to be inbound passengers if they were travelling on a domestic service to an airport in the South West.

3.80 For domestic route pairs where both points of a route have not been surveyed, the characteristics of routes between similar destination and origin points where applied to the overall 2019 passenger volume as published by the CAA.

Airport Market Share

3.81 This sub-section captures the airport's share of all air passengers with surface origins and destinations within the region. It is important to note that this is based on the CAA survey definition of the immediate surface origin before catching a flight. The framework includes the market share for all air passengers, business passengers and inbound foreign tourists. This is based on CAA survey data, as above, and reflects the definition of surface origin of the passenger on the night before travel. Therefore, a proportion of passengers who stay at hotels within proximity to the airport the night before travel will be classed as originating from the immediate district/county/region surrounding the airport. Hence, it will not necessarily represent the share of all tourist visits within a region that used the airport in question.

Freight

3.82 The freight tonnage handled by the Airport, its share of national air freight tonnage and the number of freighter air transport movements (ATMs) is included within the framework. This provides some indication of the extent to which the airport may be important in terms of freight transport. However, this data does not distinguish between freight imports and exports nor the value of the goods transported. The number of freight ATMs is also not, of itself, the principal indicator of the contribution of an airport to the transport of freight as, in 2019, almost 70% of air freight was carried in the bellyholds of passenger aircraft. Whilst the reduction in bellyhold capacity through the COVID-19 crisis has resulted in an increase in pure freighter activity, the economics of the industry means that much general air freight may be expected to revert to using bellyhold capacity as passenger services to more distant destinations are reinstated.

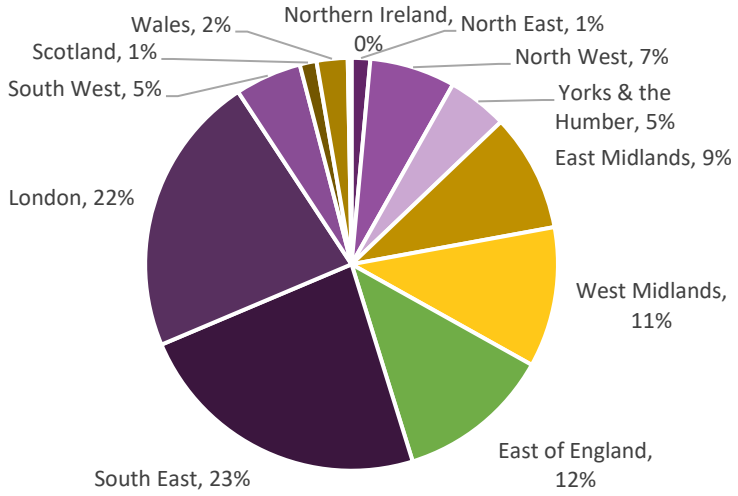
3.83 Nor does the data indicate the extent to which there is a correlation between the air freight originating in the region and the value to local exporters or industry and that flown through the airport. Much air freight is trucked to be consolidated into aircraft loads in the vicinity of Heathrow Airport but may be trucked again to be flown from elsewhere where capacity may be available at a cheaper price. There is no equivalent database to the CAA passenger survey in relation to air freight and, although there is some data available from HMRC, it is not comprehensive. We have previously estimated the amount of cargo tonnage originating in or destined for the different regions of the UK, using a simple gravity model that distributes air cargo regionally across the UK based on:

- for exports, the distribution of manufacturing employment in the UK. This is intended to reflect that air cargo exports are likely to be primarily manufactured goods;
- for imports, the distribution of UK population. This is intended to reflect that imports are in many cases destined either for consumers directly or retailers;
- a relatively low distance decay factor of 1.5, reflecting the relative insensitivity of air freight to trucking times based on our previous work for Transport for the North[11].

The resulting distribution of air cargo demand is shown in **Figure 3.1** below.

[11] International Trade and Connectivity in the North. York Aviation and Oxford Economics for Transport for the North, April 2019.

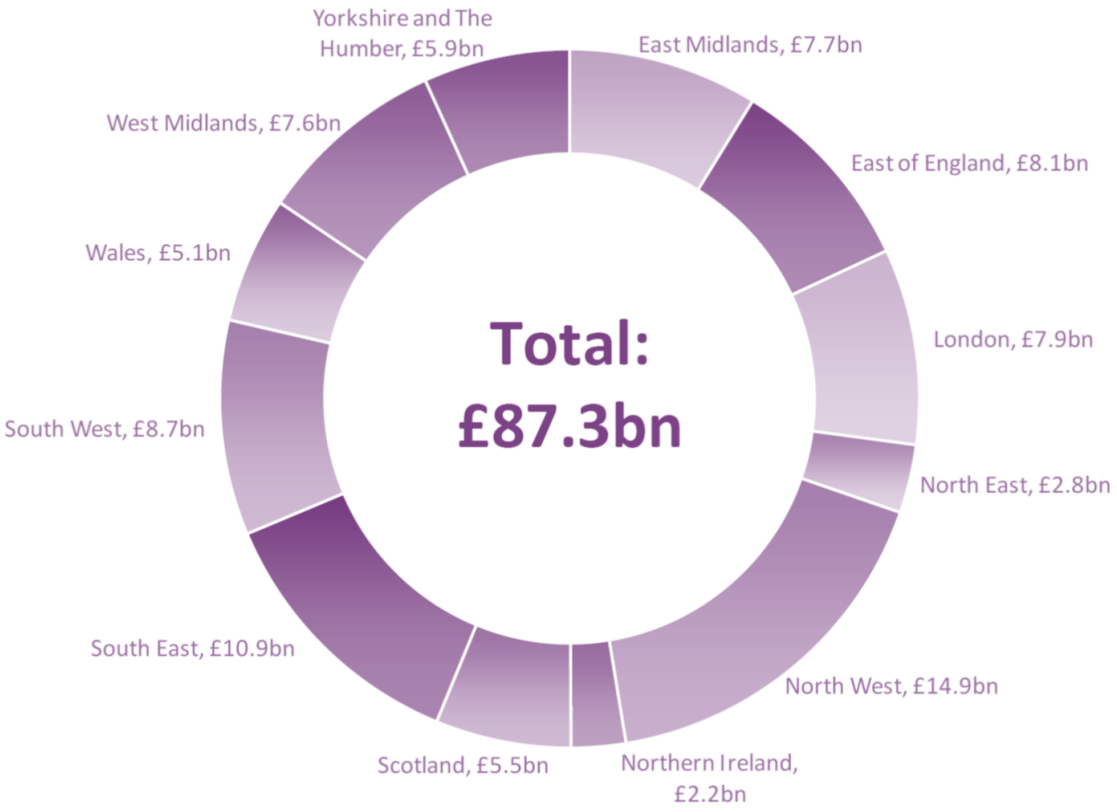
Figure 3.1: Modelled Regional Distribution of UK Air Cargo Demand[12]



3.84 Analysis by Steer for Airlines UK[13] provides more specific data on the GVA value of air freight exports by air by region. This is shown in **Figure 3.2**. This provides additional contextual data regarding the possible value of air freight connectivity in each region, albeit the air freight industry is characterised by relative insensitivity to trucking costs, particularly in the context of lower air freight rates that may be available at hub airports such as Heathrow relative to the cost of trucking. It is, hence, a much weaker index that similar information in relation to passenger travel.

[12] York Aviation analysis of CAA Statistics, ONS and Google Maps Data
[13] Assessment of the Value of Air Freight Services to the UK Economy, Steer, October 2018, Figure 5.6.

Figure 3.2: GVA Currently Dependent on Air Freight by Region



Source: ONS, HMRC, Eurostat, CAA, Steer analysis, 2016 values and prices

Structure of the Route Network

3.85 This sub-section sets out the broad structure of the route network at the airport. This provides an indicator of the broad level of connectivity offered in terms of the number of destinations served on a regular basis. The regularity of service is, prima facie, important in terms of the utility of any route to the business community and, therefore, indicative of the value of connectivity offered by a route. For domestic and short haul services, a destination is deemed to be regularly served if it offers five or more frequencies per week on average across the year. For long haul services, the threshold is assumed to be three or more services per week on average over the year. These thresholds are intended to reflect a basic level of regular connectivity for business users. For domestic and short haul destinations, five frequencies per week means that, on average, they will be able to reach the relevant destination on every day of the week for an overnight business trip. For long haul connections, three services a week provides sufficient flexibility to enable trips of a few days.

(Business) Connectivity Index (BCI)

3.86 In the first instance, this sub-section sets out the number of direct connections from an airport to the cities globally that are identified as either Alpha, Beta or Gamma cities within the GaWC analysis described above. These cities are considered to be genuine world cities with a significant value in the global economy. This provides a basic analysis of an airport's ability to connect its local economy to the global economy.

3.87 However, the more connections an airport offers to these economically important cities, the more important its connectivity is likely to be to businesses in the local area. Some years ago, York Aviation recognised this issue and developed its so called Business Connectivity Index. In the early 2000s, techniques for assessing the catalytic impact of airports in quantitative terms were limited and, hence, qualitative analysis was mainly used. The extent of connectivity was seen as important but was limited to relatively simple metrics around numbers of destinations or flights. The BCI was developed to provide a structured way of providing an assessment of economically valuable connectivity. It was initially used primarily by public sector agencies, notably the English RDAs, to consider the value of air transport to regional economies but was later used by a range of airports in the UK to support their economic impact research. Most recently it was used by York Aviation to support the Department's Regional Connectivity Review in 2018. The BCI again uses the GaWC research as a basis for assessing the economic value of a destination city but also considers the quality of the connection in terms of the frequency of service.

3.88 As a starting point the different categories of city are given a score of between 1 and 10, with 10 corresponding to Alpha ++ cities and 1 to Sufficiency cities. This score is then weighted via a parameter based on the level of frequency. This parameter is based around the logic that a basic level of connectivity offers value and that a greater number of frequencies increases flexibility and usability, but at some point there is a level of diminishing returns as flights are so frequent that little additional flexibility is added. The parameters have been derived based on analysis of market capture rates at different frequency levels for business travellers using CAA Passenger Survey data. Separate parameters are used for short and long haul travel, given that passenger expectations and behaviour are likely to be quite different. For instance, the ability to do a day return business trip is highly valued by short haul passengers, which requires at least two frequencies per day. However, this is clearly not the norm for long haul travel when multi-day trips are the expectation.

3.89 The output from the process is a single number for each airport which represents the sum of the weighted values of its destination network. The higher the number, the higher the level of connectivity offered. It should be recognised that this is a relative measure. The score does not have meaning in and of itself. It gives a view as to whether one airport's connectivity is greater or less than another.

3.90 Some care is needed in some airport cases, as the results can be a reflection of strong links to Heathrow, with London as an Alpha++ city, rather than broader international connectivity.

3.91 Whilst this measure sets out connectivity to key cities relevant to business, it is also an indicator or the extent to which connectivity will support inbound tourism as, to some degree, these same cities represent major markets for inbound tourism.

Quality of Indirect Connectivity

3.92 It is recognised that, even if an airport has relatively few direct connections to key business cities, the connectivity offered through hub airports can be very important both to local businesses and to inbound tourism.

3.93 The framework includes indirect connections available from an airport in addition to the direct connections identified in the previous sub-section. Again, these are expressed in terms of connections to GaWC Alpha, Beta and Gamma ranked cities as a measure of the likely importance of indirect connectivity to business in the area.

3.94 These connections have been assessed using an indirect connections model previously developed as part of York Aviation's work for the Department on UK Airport Connectivity. The model uses OAG schedules to enable us to consider the number of destinations served indirectly via a defined range of hubs. It uses scheduled flight times over a typical summer and winter week and matched flights arriving into hubs with flights departing from the same hub airport, limiting the analysis to what we have termed 'valid' connections:

- these are onward flights that depart within a specific time window following the arriving flight from the UK airport. This window reflects a minimum and maximum connecting time for each airport;
- connections are only allowed between the relevant hub airline, alliance members and their affiliates[14] at relevant hubs;
- the routing taken by a passenger must be geographically rational. In other words, the onward flight from the hub airport must not involve significant backtracking or involve significant deviation off the great circle path. For instance, while it would be rational for a passenger to choose a Middle East hub to travel to Asia, it would not be rational for that passenger to choose the same hub to reach North America.

3.95 There are a significant number of airports which serve as hubs for passengers travelling to/from the UK, with some providing significant global reach, and others acting in a more niche way, serving specific smaller markets. However, whilst they all contribute to the connectivity value of the UK, it is not practical to run the analysis across all such airports given the huge range of schedules data that this would involve. Hence, a defined list of hubs has been used for this analysis. This is consistent with the hubs used in our previous work for the Department. The hub airports are Dubai, Doha, Abu Dhabi, Amsterdam, Istanbul, Hong Kong, Frankfurt, Singapore, Paris (CDG), London (LHR), Madrid, Chicago (ORD), New York (JFK+EWR), Atlanta, Johannesburg, Delhi, Munich, Dublin, Copenhagen and Keflavik.

Direct Connectivity to Top 10 Inbound Tourist Markets

3.96 The extent of an airport's connectivity to key inbound visitor markets can indicate how likely an airport is to facilitate flows of inbound visitors to a region. It can be assumed that an airport without links to key international markets where foreign visitors originate is unlikely to deliver significant numbers of foreign inbound tourists. Whereas, an airport that is well connected to such markets is more likely to contribute foreign inbound tourists.

[14] including between Virgin and Skyteam flights and between bmi regional and Star Alliance flights prior to the former's demise.

3.97 Through VisitBritain data we have identified the top 10 countries where international holidaymakers to the UK in 2019 originated. These are The United States, France, Germany, Italy, Spain, Netherlands, Republic of Ireland, Belgium, China and Australia. For each airport within our study we have listed the total number of departing flights and total departing seats across 2019 to each of the top 10 countries. It should be recognised that the top 10 countries where international holidaymakers originate may vary between different regions of the UK.

Operational Impacts

3.98 The operational impacts of an airport is a term used to describe the more direct economic contribution from economic activity at an airport – its 'economic footprint', as distinct from the wider value of the connectivity it offers. This contribution includes indirect (supply chain) and induced impacts. For the purpose of this framework, the contribution is measured in gross terms, i.e. no allowance has been made for the extent to which an airport may divert economic activity from other airports or other sectors but some indicators, such as levels of local unemployment or availability of other airports nearby, are provided to provide some indication of the extent of any potential displacement of activity. This is more likely to be valid at a local level but less likely to be strictly accurate the wider the study area. It should also be recognised that in an environment, where unemployment is high and persistent, short term displacement factors may, in reality, be relatively low.

3.99 This direct contribution can be locally significant dependent on local economic conditions and the extent to which the local area is dependent on airport related employment and activity.

Direct Jobs

3.100 Direct employment is measured by the number of on-site jobs directly connected with the operation of the airport, i.e. providing services to passengers, freight and airlines. As far as possible, this should exclude jobs located on an airport in business parks or similar, which are related to the connectivity offered by the airport or attracted by its locational advantages, rather than being directly related to the operation of the airport. It is important to note that it can be a matter of judgement as to the extent to which some jobs are operational or not. To the extent that we have relied on airport studies conducted by other parties, we have assumed that on-site employment relates to that which is operationally related.

3.101 Where we have studies for a particular airport that provide on-site employment estimates over the last decade or so, we have used this information as the basis for estimating on-site employment in 2019. This was the case for most airports in the form of published economic impact assessments and/or airport masterplans. Firstly, we identify and establish the base year for which the impacts were estimated. Then, we retrieve the annual passenger volumes for the airport in that base year and estimate the employment density for the given year (explained below). The densities are then adjusted for productivity improvements over time, especially if the original economic impact values are dated. This is done by retrieving labour productivity values over the timeframe from the base year to 2018 and estimating the average annual growth (CAGR) in labour productivity for the given geographic location of the airport.

3.102 The productivity growth is then applied to the employment density each year up to 2019, reflecting the improvement in employment density. The final employment density for 2019 is then applied to airport's passenger volume for that year to estimate the direct on-site employment.

3.103 Some airports have reported their employment impact in full time equivalents (FTEs). We resolve this issue by identifying the breakdown of employment from BRES in the given sub-region and estimate the proportion of employment to FTEs to re-evaluate them to total employment levels.

3.104 Where no specific data for on-site employment was available or where there are concerns as to the appropriateness of available data, we have adopted benchmarks for employment density (jobs per mppa[15]) from comparator airports of similar size or traffic mix, reflecting the employment nature at the airport. This was the case for a small number of regional airports, where both the employment and GVA impacts were outlined at a higher level, including non-operational jobs and also included indirect and induced impacts in their reporting, making these original employment estimates impacts inappropriate for our purposes.

3.105 **Table 3.3** below highlights employment densities derived from recent studies at the airports concerned and which we have noted in the framework analysis. As can be seen, East Midlands Airport has a particularly high density which is likely to result from the major freight operations at that airport. Stansted, Luton, Bristol, and Liverpool all have densities within a similar range and all have a relatively high proportion of low fares operations. Higher employment densities can also reflect the extent to which an airport supports other activities, such as MRO[16] activity. Employment densities can also be relatively high at smaller airports that are unable to benefit from economies of scale in their operations.

Table 3.3: On Site Employment Densities at selected airports

	Pax (mppa 2019)	Employment Density
Manchester	29.4	838
Stansted	28.1	442
Luton	18.2	588
Bristol	9.0	440
Liverpool	5.0	454
East Midlands	4.7	1,205

3.106 This sub-section of the framework includes both an estimate of on-site direct airport related jobs and the employment density implied. The employment density provides some measure of the extent to which airport has attained an economy of scale but may also indicate the extent to which the airport supports ancillary higher value activities, such as on-site aircraft maintenance facilities.

[15] Million passengers per annum
[16] Maintenance Repair and Overhaul

3.107 There has been some discussion as to whether the employment supported by the airport company is a useful measure. However, in our view this is not appropriate. Although it is possible to establish employment numbers within an airport company, this is not a relevant metric because the functions undertaken in house by different airport companies vary considerably. For example, some airports employ security staff directly whilst others contract this function out to a third party. Therefore, only the total number of staff on-site can be considered a true reflection of direct local employment supported by a given airport.

Indirect and Induced Jobs

3.108 We use the direct on-site employment as the basis for estimating the total indirect and induced employment at the Regional and Sub-regional level. Multipliers appropriate to the study area for each airport are derived using the Flegg methodology, as described in the Literature Review and below.

3.109 Multipliers are developed using a range of economic data on the nature of spending in supply chains and by consumers in the economy and the extent to which this expenditure is captured within the geographic area that is being considered. Developing multipliers is a complex exercise and a range of approaches can be used. In this case, we have used a technique based on the UK input-output tables. Input-output tables track spending relationships within the national economy and are based on extensive survey work undertaken by the Office for National Statistics. The latest version of these tables was published in April 2019 and examines data for 2015[17].

3.110 However, to be used at more local levels, adjustments need to be made to the coefficients within them to reflect the different sectoral make up of local and regional economies and the fact that such smaller economies are more reliant on other areas (within the UK or internationally) to provide the goods and services that they require. We have used a well-recognised and tested approach developed by A.T. Flegg of the University of the West of England and most recently set out in "Estimating regional input coefficients and multipliers: The use of the FLQ is not a gamble" (2013).

3.111 This approach uses specialised location quotients, which assess the level of relative concentration of an economic sector, to adjust the matrix of coefficients in the UK Input-output tables to reflect the different economic structure at a sub-regional level. The resulting adjusted input-output tables are then further adjusted to reflect the greater need for external trading relationships within areas at a sub-national level and in smaller economies. This approach is commonly used in undertaking economic impact assessments and has been adopted in relation to recent York Aviation's airport economic impact assessments including Manchester, Stansted, East Midlands, Birmingham and Newcastle. It is also used by Oxford Economics within its airport economic impact work. In the absence of detailed supply chain data, it provides a more robust approach to estimating the indirect and induced impacts of an airport locally than the adoption of standard multipliers.

[17] Note that this analysis requires the use of the Analytical Tables from the Input Output tables rather than the Supply and Use Tables, which are referenced above. These are not produced as regularly.

3.112 Combining direct and indirect/induced employment provides a measure of the total employment supported by an airport within a defined local (Sub-regional) and Regional area.

Proportion of Sub-regional employment accounted for by airport

3.113 It is relevant to consider the importance of the employment provided at the Airport and its associated indirect and induced employment in the context of the local labour market. The employment provided by the airport is expressed as a proportion of Regional and Sub-regional employment set out in the Economic Context to provide an indication of the extent of reliance of the Regional and Sub-regional economy on the airport in terms of supporting employment. As noted by the Centre for Cities[18], a high proportion of local employment accounted for by an airport makes that economy more vulnerable to the negative impacts of any downsizing of activity at an airport.

Operational GVA

3.114 Where we have previous studies for an airport that provide an estimate of direct GVA impacts, we use this measure to estimate the current direct GVA impact for 2019 by estimating on-site productivity for the given year and updating this to 2019 values using Treasury GDP deflators. We then used the updated measure of on-site productivity and applied this measure to the estimated direct employment to yield a total Direct GVA impact.

3.115 Where no specific data for direct GVA impacts is available, we have estimated this using the labour productivity (i.e. GVA per job) for the sub-region (explained further below) and applied this value to the estimated number of direct jobs supported by the airport.

3.116 Indirect and induced GVA impacts are estimated by applying productivity estimates (i.e. GVA per job) for the given study area to the resultant indirect and induced employment impacts. The productivity is estimated at both regional and sub-regional levels using the regional GVA and employment estimates compiled earlier in the economic context. The estimates are then updated to 2019 values using Treasury GDP deflators and then applied to the employment impacts to derive a total value for indirect and induced GVA impact by region or sub-region.

Proportion of GVA

3.117 The airport's GVA impact is also expressed as a proportion of Regional and Sub-regional GVA (identified in the economic context sub-section) as another measure of how important the operation of the airport is to the economy locally.

[18] Centre for Cities – What does What does the COVID-19 crisis mean for the economies of British cities and large towns?, April 2020

Neighbouring Airports

3.118 In this section, we set out whether there are competing airports that serve the local area and the nature of services available from these airports. This is defined by reference to the criteria used in considering PSO applications in terms of whether there are alternative airports within 60 minutes surface access time. Airports meeting this criterion have been identified using Romes2Rio data provided to us by the Department[19].

Size and Characteristics of Other Airports

3.119 In this sub-section, the broad size and network characteristics of the alternative airports, if any, are set out. This includes the total passengers handled at the airport and the proportions of business and inbound tourist passengers to provide an indication of the extent to which the alternatives are likely to provide similar economically beneficial connectivity.

Measure of relative connectivity

3.120 As an additional measure of the extent to which the alternative airport(s) could provide replacement economically beneficial connectivity, the Direct BCI score is included, calculated as set out above.

Other Factors

General Aviation Activity

3.121 We have included the number of general aviation movements recorded at the commercial airports analysed. It is important to note how the CAA categorise these movements in order to be able to assess their potential significance to the local economic impact of the airport. The CAA categories that can be clearly defined as 'general aviation' are as follows:

- Air taxi movements – defined as movements by an aircraft of less than 15 tonnes Maximum Take Off Weight operating on a non-scheduled service – these are predominantly sole-use charter operations;
- Private movements – defined as movements for purely non-commercial purposes by private owners or other private aircraft operators, excluding aero-club movements (see below);
- Aero-club movements – defined as movements operated by aero-club members for instruction or pleasure;
- Business aviation movements – defined as non-commercial movements operated on aircraft of 2730kgs MTWA or greater (with no upper weight limit) conducting business operations (e.g. aircraft owned and operated by Shell or Ford).

[19] 26.8.20

3.122 The CAA also record 'test and training flights', which they define as "movements for the purpose of testing aircraft or for training flying crew or ground personnel. Also included in this category are demonstration flights by makers or sellers of aircraft and aviation equipment. Aero-club instructional flights are not included in this category."[20] It is, therefore, doubtful that these movements should be included as general aviation because they are likely to involve the testing of commercial aircraft and/or associated equipment or the training of commercial aircraft crew. For example, there is a relatively high number of these kind of movements at Bournemouth Airport, but we believe these may be carried out mainly by Cobham Aviation Services, an aerospace company based at the airport. We have, therefore, identified these movements separately.

Other Plans and Strategies

3.123 Other material factors relevant to the economic contribution that the airport makes now or in future could include:

- airport growth plans;
- local economic developments;
- aviation industry changes post-COVID-19 such as changes in airline route networks and bases;
- the presence of special economic initiatives such as Enterprise Zones or other developments, e.g. Spaceports;
- the presence of lifeline air services such as NPAS[21], HM Coastguard, off-shore support, or air ambulance.

3.124 We describe these qualitatively to give an indication of the broader considerations relevant to the economic and social contribution each airport.

Potential Additional Components and Considerations

3.125 We identified a number of other measures and components which could be added to an economic assessment framework but which were excluded in our initial assessments due to data availability or due to the potential complexity of calculation. We set out below these additional potential metrics and the added value they could bring if further stages of this work are commissioned over a longer time frame.

[20] Foreword to CAA Airport Data Statistics, CAA Website.
[21] NPAS – The National Police Air Service has a network of helicopter bases across England and Wales.

Wider Economic Impact

3.126 We have not, at this initial stage included any metrics that seek to quantify in employment or GVA terms the wider economic benefits delivered by the connectivity offered by an airport. This is primarily an issue of complexity and timescales. There are a number of approaches to seeking to quantify these effects that have been used in some of the airport economic impact assessments reviewed as part of this work. For instance, York Aviation uses a productivity elasticity approach allied to generalised cost modelling of business travel and freight analysis, while Intervistas have used an elasticity approach relating to seat capacity and an assessment of the importance of end destination airports. There were also approaches identified through the Airports Commission work that could be used to consider trade and FDI effects.

3.127 The difficulty in implementing these approaches within the context of this research is time. All would require detailed modelling work on each airport as they require consideration of a counterfactual. In other words, they need a change in the market to assess impacts. Commonly, this would involve considering the effects on the market of a particular airport no longer operating.

3.128 It is also very difficult to generalise assumptions across airports where research of this type has not already been undertaken as it requires detailed analysis of the make up of demand and/or the route network. Hence, reporting airports on a consistent basis for this process would not be possible.

3.129 However, given more time and resource an analysis of these effects could be undertaken for each of the airports specified to provide an estimate of wider GVA and employment impacts at a sub-regional or regional level. This would enhance the understanding of the local economic impacts of individual airports. York Aviation's preferred approach to this type of analysis would involve developing generalised cost models of business passenger behaviour for each airport and a corresponding model to allow implementation of the productivity elasticity to assess the impact on the economy.

Tax

3.130 The Framework does not consider the potential impact on tax revenues from each of the assessed airports. This is primarily because we would not ultimately consider that many of the relevant taxes represent a 'local' impact. Taxes such as either Air Passenger Duty or corporation taxes or income taxes and national insurance contributions are collected centrally. While it is reasonable to assume that some of these revenues do flow back to the local area via the provision of Government services and through Government expenditure, the relationship is clearly indirect. It should also be recognised that there would be considerable complexity in assessing tax impacts robustly in the time available, especially any more local taxes, such as business rates, given the availability of data. Hence, we do not recommend inclusion of tax effects.

Displacement

3.131 The framework currently relies on gross measures of the impact of any airport within its local context. Robust consideration of the net economic impact, having regard to the contribution of other airports and activities, is a highly complex task that would require the development and use of an appropriate passenger allocation traffic forecasting model as well as other more detailed analysis. These models use regression techniques to analyse passenger behaviour to understand decision making factors. Such models require time and resource to calibrate and build. However, further investigation of displacement effects through this type of modelling would provide greater certainty around potential displacement effects. York Aviation has built such models for a number of UK airports in recent years to enable understanding of market share and displacement dynamics that operate in a similar fashion to the Department's national aviation model but such modelling was beyond the scope of the current task.

Application of the Framework

3.132 We tested the framework initially on a smaller number of airports and made some refinements following discussion with the Department. The adopted framework is as described above. The Framework was applied to the 32 airports as identified by the Department as set out in **Table 1.1**.

3.133 The full assessments of the 32 airports using the framework are provided separately. These assessments note any specific assumptions or data sources used for an individual airport or other data limitations but the methodologies adopted to derive the metrics are as otherwise described in this note.

Appendix: Reports Reviewed

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