

# Lower Thames Crossing

## **7.7 Combined Modelling and Appraisal Report Appendix D – Economic Appraisal Package: Level 3 Wider Economic Impacts Report**

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# 7.7 Combined Modelling and Appraisal Report Appendix D – Economic Appraisal Package: Level 3 Wider Economic Impacts Report

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# 1 Executive summary

## 1.1 Introduction

- 1.1.1 This report presents a range of contextual and stakeholder evidence about the potential for the A122 Lower Thames Crossing project (the Project) to generate wider economic impacts (WEI) based on the assumption of changes to land use. These impacts are not monetised within the Project's economic appraisal and Benefit Cost Ratio (BCR). However, if realised, the scale of these impacts could be important for the Lower Thames economy, the South-East region and nationally. This evidence about wider economic impacts based on land use change, alongside the Project's appraisal of transport user benefits and WEIs based on fixed land use, has informed the Project's Value for Money assessment.
- 1.1.2 The benefits of a transport project would be fully captured within transport user benefits, such as journey time savings, if the economy in which the project is located is operating efficiently. Where this is not the case, there are WEI impacts which are additional to transport user benefits. These arise because of market failures in non-transport markets such as labour and land resulting from a divergence of private costs and benefits experienced by individuals, businesses and society. The realisation of net positive impacts implies the gain has been greater than the displacement of economic activity from other locations. Examples of evidence of market failures in the land and labour markets are: a) when businesses cluster together to gain benefits from greater labour market interactions, knowledge spill-overs and linkages between intermediate and final goods suppliers; and b) the differential between wages received by employees and the costs incurred by an employer due to the distortionary impacts of labour taxes on the labour market. These failures can be compounded by others, such as transport congestion and a lack of land development sites, which may constrain the development of clusters. If a transport project is expected to have impacts on secondary markets, such as labour and land, because of market failures then WEIs should be appraised.
- 1.1.3 Within Unit A2.1 of the Department for Transport's Transport Analysis Guidance (TAG) appraisal framework, WEIs based on land use change are categorised as Level 3 impacts (Department for Transport, 2019a). The evidence in this report also strengthens the basis for Level 2 WEIs based on the assumption of fixed land use and which are valued in monetary terms and presented in the Economic Appraisal Report.
- 1.1.4 This report focuses on two Level 3 wider economic impacts that reflect a variable land use assumption:
- a. Agglomeration benefits from dynamic clustering
  - b. Moves to more or less productive jobs (M2MLPJ)
- 1.1.5 Agglomeration from dynamic clustering, due to a transport project, refers to productivity benefits that arise from changes in the physical density of economic activity as a result of changes to either the intensity of land user or the location

of economic activity. The impact of labour moving to more or less productive jobs is captured by the change in tax receipts for government.

- 1.1.6 These two WEIs can arise due to improvements in connections between businesses and lead to behavioural responses resulting in land use changes as businesses reorganise production and/or physically relocate and as labour moves to different jobs. The impacts are additional to transport user and provider benefits, for which monetised benefits are included within the Project's appraisal presented in the Economic Appraisal Report. However, Level 3 WEIs are not additional to Level 2 WEIs.
- 1.1.7 While there is no evidence for dependent development in relation to the Project, the Project is likely to increase the overall attractiveness of land on either side of the River Thames in terms of its development, which in turn will increase the scope for Level 3 WEIs.
- 1.1.8 Quantifying Level 3 wider economic impacts based on land use change is challenging with data and methodological uncertainties and is compounded by the scale of this Project. Therefore, the approach to assessing Level 3 WEI for the Project is based on gathering socio-economic contextual information and stakeholder evidence to indicate the Project's potential to generate these impacts.

## 1.2 Socio-economic context

- 1.2.1 A review of other estuarial road crossings in the UK emphasised the criticality of understanding an area's historical development and current socio-economic characteristics in assessing whether a new crossing's wider economic impacts are likely to be realised. In the case of the Project, the socio-economic context is important because of its location, close to London and on the main trade route between the UK's industrial heartlands and Europe and congestion at the Dartford Crossing.
- 1.2.2 The report sets how the Lower Thames area's economic and social characteristics have been shaped by its historical development. It then analyses the current socio-economic conditions of the six Lower Thames local authorities – Dartford, Gravesham and Medway (referred to as the Local South area in this report) and Thurrock, Havering and Brentwood (the Local North area). Over the last decade the area has experienced marked differences in population growth, with particularly high growth in Dartford, reflecting differences in the demand for land development.
- 1.2.3 Key factors determining whether Level 3 WEIs are likely to arise are the presence of road reliant economic sectors in the Local North and Local South areas and the extent to which these two economies have similar, or diverse, industrial structures. An analysis of employment structures and performance, GVA and productivity found that the two areas have developed separately but in a similar way. Both areas have concentrations of employment in firms in the transport and logistics and construction sectors which are reliant on the road network. The similar economies suggests that for certain road reliant industries improved connectivity would result in greater competitive pressure/potential for knowledge sharing, thereby encouraging reorganisation of activities as firms seek to respond. Where there has been strong growth in other higher value economic sectors, such as private sector services in Brentwood in the period to

2019, this has resulted in much stronger growth in productivity and disposable incomes in Brentwood, relative to the other local authority areas.

- 1.2.4 Skills are a key factor that contribute to productivity levels and will influence the extent of Level 3 WEI due to the improved connectivity provided by the Project. The proportion of the resident workforce with Level 4 and higher qualifications (i.e. BTEC or HNC) in the six local authority areas has been increasing over time, but except for Brentwood, the proportion of qualified workers remain well below that of the Combined Region.

## 1.3 Dynamic agglomeration

- 1.3.1 A key finding from the review of other estuarial road crossings is that the presence of an estuary leads to additional sources of market failure, as a result of congestion, over and above the market failure that is evident when firms cluster or agglomerate together. These arise because of limited information, risk perceptions and indivisibilities and therefore they limit the propensity for businesses to develop in clusters to a much greater extent than happens in other places.
- 1.3.2 An analysis using Location Quotients (LQs) has shown that the Local North and Local South areas have similar economic structures with no clear specialisms with some cross-river duplication of activity in construction, transport and logistics and waste management industries. Further analysis of how the LQs have changed over time and an estimation of input-output relationships shows that the employment composition of manufacturing, utilities and construction sectors has become more diverse over time. There is also some evidence of a cluster of business support services.
- 1.3.3 The Project is likely to result in cluster growth and greater diversification of the Local North and Local South economies as businesses relocate from south to north and vice versa across the river and change their land intensity. While further investigation is needed to assess the likely scale of these two-way changes in those industries, the Local North is the larger market and other things being equal, it is likely that a greater level of agglomeration will take place in the larger market, indicating more relocations of firms from the Local South area to the north of the river.
- 1.3.4 Other businesses may relocate from places closer to London, where rising site values continue to change the optimum location for land-intensive activities. The Local North and Local South areas are places that would be attractive to businesses that are displaced due to factors in the land market. Conversely, businesses that are presently located to the east of the Project, in areas of lower productivity, may be attracted to relocate to the Lower Thames area with a consequent relocation of jobs to a more productive area.
- 1.3.5 Qualitative evidence, including discussions with organisations in the logistics sector, responses from the Project's 2018 Statutory Consultation and other survey and stakeholder evidence confirms the quantitative findings on existing and embryonic clusters (Highways England, 2018). The qualitative evidence also pointed to other clusters, not evident in the economic data, in agri-food, the creative industries, robotics and advanced manufacturing. Based on all the evidence gathered, Table 1.1 summarises the business clusters that have been identified in the Lower Thames area.



- 1.3.6 Many of these are road-using sectors that are likely to benefit from the Project’s provision of a step change in cross-river accessibility. Businesses in these clusters will gain opportunities for beneficial relocations and business reorganisations and changes in travel to work patterns. Changes in location and in the intensity of land use are expected to take place to reduce costs, expand output and improve competitiveness, all of which yield productivity and labour supply benefits.

**Table 1.1 Business clusters in the Lower Thames area**

Cluster type	Cluster name	Area
Key clusters	Transport, logistics and storage	Thurrock and Dartford
	Construction	Lower Thames area
	Business support services	Lower Thames area
	Agri-food	Kent and Essex
Emerging clusters	Creative industries	Thames Estuary
	Maintenance and sale of motor vehicles	Lower Thames area
	Robotics and advanced manufacturing	Lower Thames area
	Ceramics	Lower Thames area
	Financial and insurance services	Brentwood and Havering

## 1.4 Moves to more or less productive jobs

- 1.4.1 The evidence for dynamic agglomeration also indicates that there would be a further WEI impact, as labour moves to more or less productive jobs. This M2MLPJ impact reflects a labour market failure in that there is a divergence in wages received by employees from the costs incurred by the employer due to the imposition of labour taxes. These taxes distort incentives for individuals to supply, and businesses to demand, labour, thereby affecting the competitive labour market equilibrium (i.e. there is a market failure).
- 1.4.2 When a transport project is expected to impact on the labour market, as labour moves to more or less productive jobs, the net benefit from these relocations due to the transport project is the change in tax revenue.
- 1.4.3 Overall, the evidence provides context for the Level 2 wider economic impacts and indicates that the Project has potential to generate significant Level 3 wider economic impacts that would be important to the Lower Thames economy, the wider region and nationally.

## 1.5 Robustness of the evidence

- 1.5.1 The quantitative evidence for Level 3 WEI is based on data drawn from official sources, principally NOMIS labour market statistics and other statistics produced by the Office for National Statistics (ONS). The data has been used to produce outputs using a range of established analytical techniques and labour market models. These outputs have been brought together to produce a balanced and consistent economic analysis which identifies current and embryonic business clusters in the Lower Thames area and provides an



assessment of the Project's likelihood of generating wider economic impacts based on land use change.

- 1.5.2 The quantitative findings have been reinforced by a range of qualitative evidence that includes findings from contact with businesses and from research that examined the impacts at other estuarial road crossings.

## 2 Introduction

### 2.1 Purpose of this report

- 2.1.1 This report presents a range of evidence about the potential for the A122 Lower Thames Crossing project (the Project) to generate wider economic impacts (WEI) based on variable land use. These impacts are not monetised within the Project's economic appraisal and Benefit Cost Ratio (BCR). However, if realised, the scale of these impacts could be substantial on the Lower Thames economy and the evidence is used to inform the Project's Value for Money assessment.
- 2.1.2 Within the Department for Transport's (DfT) Transport Analysis Guidance (TAG) appraisal framework (Department for Transport, a) these impacts are categorised as Level 3 impacts. The evidence also strengthens the contextual basis for Level 2 wider economic impacts based on fixed land use that are monetised within the economic appraisal presented in the Economic Appraisal Report.

### 2.2 Context of this report

- 2.2.1 The Project's appraisal has been developed to support its application for a Development Consent Order (DCO). The appraisal is presented in the Economic Appraisal Report and summarised in the Appraisal Summary Table Report. These documents, along with the Distributional Impacts Appraisal Report and this report, comprise Appendix D - Economic Appraisal Package of the Combined Modelling and Appraisal Report (ComMA) (Application Document 7.7).
- 2.2.2 The ComMA also provides information about the traffic data, transport model and traffic forecasts which are used as inputs for the appraisal in the following appendices:
- a. Appendix A - Transport Data Package – This includes the transport data collected and used within the traffic modelling and forecasting as part of the evidence base for the Project's appraisal.
  - b. Appendix B - Transport Model Package – This describes the development of the Lower Thames Area Model (LTAM) traffic model.
  - c. Appendix C - Transport Forecasting Package – This includes traffic forecasts produced using the LTAM and upon which this appraisal is based.
- 2.2.3 The economic, social and environmental impacts of the Project are measured within a framework of economic welfare, consistent with HM Treasury's Green Book (HM Treasury, 2022), and are reported in the Economic Appraisal Report as Level 1, 2 and 3 impacts in line with the categorisation of impacts defined in TAG (Department for Transport, a). The appraisal provides the basis for the Project's value for money assessment, based on DfT's value for money framework (Department for Transport, 2015).

- 2.2.4 Level 1 impacts include transport user and provider benefits, such as journey time savings, and non-user impacts, such as accidents. These assume fixed land use and are based on outputs from the LTAM – the Project's transport model – and are valued in monetary terms using established valuation methods. These and other impacts are compared to net Project costs (costs less user charging revenues) in order to calculate the Initial BCR.
- 2.2.5 Level 2 impacts comprise journey time reliability benefits and wider economic impacts. These are also based on LTAM outputs and assume fixed land use or do not require land use to be explicitly quantified. They are valued in monetary terms using established valuation methods. Level 2 WEI include:
- a. Induced investment impacts due to output changes in imperfectly competitive markets.
  - b. Employment impacts on tax revenues from labour supply changes.
  - c. Productivity impacts due to agglomeration from static clustering. These impacts arise when the density of economic activity is affected by changes in generalised travel costs which bring firms and employees effectively closer together, although there is no change in physical density or land use.<sup>1</sup> Reductions in generalised travel costs will increase productivity arising from static clustering and vice versa.
- 2.2.6 The Level 2 benefits are added to the Level 1 benefits and the total is compared, over a 60-year appraisal period from scheme opening, against net project costs in order to calculate the Project's Adjusted BCR. In the case of this Project, the Level 2 WEI benefits are estimated to be worth £1,516.6 million, expressed in 2010 prices and values. They account for 46% of the £3,299.5 million of total monetised benefits (Level 1 and 2).
- 2.2.7 Level 3 impacts include a range of appraisal evidence that are not included in a Project's BCR but are taken into account in assessing its value for money. This includes impacts for which there are indicative monetary values but which are not included in the BCR, other quantitative estimates and qualitative appraisal information. This report includes evidence about the Project's ability to generate Level 3 WEI based on variable land use. These benefits, if realised, would be additional to transport user and provider benefits and result in further productivity gains beyond those included.
- 2.2.8 TAG identifies four Level 3 WEIs:
- a. Induced investment impacts due to dependent development
  - b. Employment impacts as labour moves to more or less productive jobs
  - c. Productivity impacts due to agglomeration from dynamic clustering
  - d. Any other structural economic impacts that can be estimated using supplementary economic modelling

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<sup>1</sup> Generalised travel costs include the monetary and non-monetary costs (e.g. time) of a journey.

**2.2.9** Table 2.1 taken from TAG Unit A2.1, summarises the different types of Level 2 and Level 3 WEIs in relation to the TAG levels of analysis and land use assumptions (Department for Transport, 2019a).

**Table 2.1 Wider economic impacts, levels of analysis and land use assumptions**

	Level 1 (Initial BCR)	Level 2 (Adjusted BCR)	Level 3 (indicative monetised impacts or non-monetised impacts)
Fixed land use	User and provider benefits		→
	–	Static clustering	→
Implicit land use change	–	Output change in imperfectly competitive markets	→
		Labour supply impacts	→
Explicit land use change	–	–	Dependent development
	2.2.10	2.2.11	Move to more/less productive jobs
	2.2.12	2.2.13	Dynamic clustering
	2.2.14	2.2.15	Supplementary economic modelling

\* Note the arrows signify the previous levels of analysis are required

2.2.9 TAG Units A2.1, A2.2, A2.3 and A2.4 provide more information about Level 2 and Level 3 WEIs (Department for Transport, 2019a, 2020a, 2019b, 2020b).

2.2.10 TAG Unit M5.3 provides advice on different supplementary modelling and appraisal techniques for estimating the Level 3 impacts of transport projects based on a spatial distribution of economic activity (Department for Transport, 2019c). These techniques include additionality models, reduced form models, land-use transport interaction (LUTI) models and spatial computable general equilibrium (SCGE) models.

2.2.11 The key objectives of undertaking such modelling is that the analysis should be relevant and robust. However, TAG recognises that these are new and still developing methodologies which are not analytically mature and that there are modelling challenges due to the variable land use assumption. These include data and methodological uncertainties and the difficulty of validating such models. Specific examples of these challenges are the need to appraise the immediate and wider effects of a transport project, the requirement to capture real effects (as opposed to just changes in prices), properly comprehend unintended consequences, accommodate market distortions and allow for perceived bias. The scale and estuarial nature of this Project add to these modelling challenges.

2.2.12 In light of the above, the approach to assessing Level 3 WEI for the Project is based on gathering socio-economic contextual information and stakeholder

evidence about the Project’s potential to generate two Level 3 wider economic impacts:

- a. Productivity impacts due to agglomeration from dynamic clustering
- b. Employment impacts as labour moves to more or less productive jobs

2.2.13 The analysis of these impacts in this report has focused on the six Lower Thames local authorities – Dartford, Gravesham and Medway (referred to as the Local South area in this report) and Thurrock, Havering and Brentwood (the Local North area).

2.2.14 The evidence gathered and included in the report indicates that these Level 3 WEIs could be large and important to the Lower Thames area and the wider South East regional economy. They could also be important nationally through their impact on transport capacity and the supply of labour. The Level 3 WEI evidence also provides important context for the monetised estimates of Level 2 WEI impacts.

2.2.15 TAG guidance states that it is not appropriate to appraise dependent development impacts:

*‘for... large... schemes that have significant structural impacts on multiple, geographically dispersed, unidentified sites’* (Department for Transport 2020a).

2.2.16 In the case of the Project, it is a large scheme and at the the present time there is no evidence that any development sites are dependent on the Project. Therefore, evidence for dependent development in relation to the Project is not included in this report. However, the Project is likely to increase the overall attractiveness of land on either side of the River Thames in terms of its development, which in turn will increase the scope for Level 3 WEIs.

## 2.3 Structure of this report

2.3.1 The remaining chapters of this report are structured as follows:

- a. Chapter 3 summarises the Project.
- b. Chapter 4 defines the two types of Level 3 wider economic impacts considered in this report and describes the mechanisms for how these impacts arise
- c. Chapter 5 presents the socio-economic context of the Project, which is important in assessing whether Level 3 WEIs are likely to arise.
- d. Chapter 6 presents evidence about the Project’s capability to generate dynamic agglomeration benefits.
- e. Chapter 7 provides evidence about the Project’s ability to result in employment impacts due to the movement of people to more or less productive jobs.
- f. Chapter 8 presents conclusions about the scope for the Project to generate Level 3 wider economic impacts.
- g. Annex A provides more detail about the main impacts of other estuarial road crossings.

## 3 The Lower Thames Crossing project

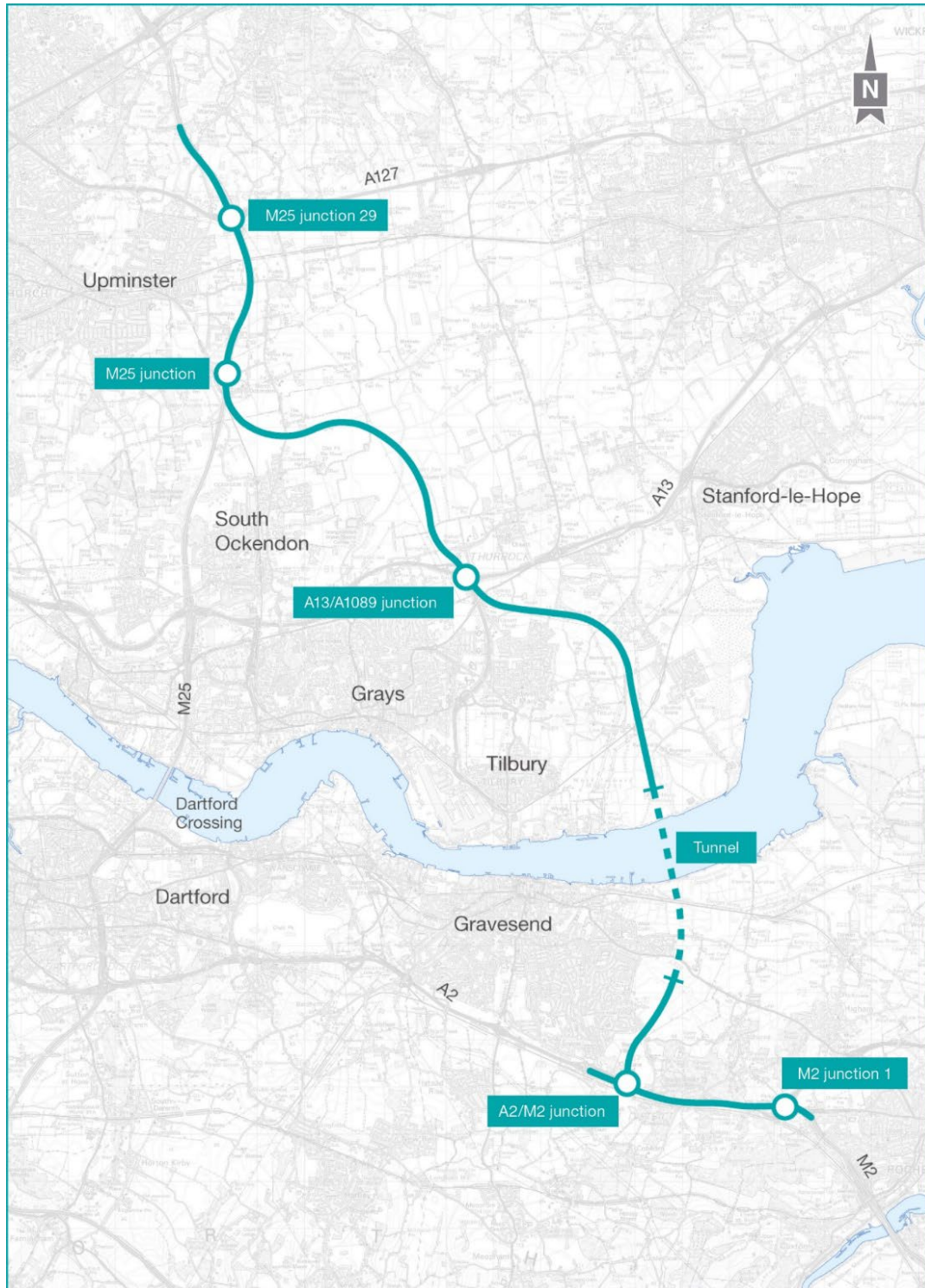
### 3.1 Description of the project

- 3.1.1 The Project would provide a connection between the A2 and M2 in Kent and the M25 south of junction 29, crossing under the River Thames through a tunnel. The Project route is presented in Plate 3.1.
- 3.1.2 The A122 would be approximately 23km long, 4.25km of which would be in tunnel. On the south side of the River Thames, the Project route would link the tunnel to the A2 and M2. On the north side, it would link to the A13, M25 junction 29 and the M25 south of junction 29. The tunnel portals would be located to the east of the village of Chalk on the south of the River Thames and to the west of East Tilbury on the north side.
- 3.1.3 Junctions are proposed at the following locations:
- a. New junction with the A2 to the south-east of Gravesend
  - b. Modified junction with the A13/A1089 in Thurrock
  - c. New junction with the M25 between junctions 29 and 30
- 3.1.4 To align with National Policy Statement for National Networks (Department for Transport, 2014a) policy and to help the Project meet the Scheme Objectives, it is proposed that road user charges would be levied in line with the Dartford Crossing. Vehicles would be charged for using the new tunnel.
- 3.1.5 The Project road would be three lanes in both directions, except for:
- a. link roads
  - b. stretches of the carriageway through junctions
  - c. the southbound carriageway from the M25 to the junction with the A13/A1089, which would be two lanes
- 3.1.6 In common with most A-roads, the A122 would operate with no hard shoulder but would feature a 1m hard strip on either side of the carriageway. It would also feature technology including stopped vehicle and incident detection, lane control, variable speed limits and electronic signage and signalling. The A122 design outside the tunnel would include emergency areas. The tunnel would include a range of enhanced systems and response measures instead of emergency areas.
- 3.1.7 The A122 would be classified as an 'all-purpose trunk road' with green signs. For safety reasons, walkers, cyclists, horse riders and slow-moving vehicles would be prohibited from using it.
- 3.1.8 The Project would include adjustment to a number of local roads. There would also be changes to a number of Public Rights of Way, used by walkers, cyclists and horse riders. Construction of the Project would also require the installation and diversion of a number of utilities, including gas pipelines, overhead electricity powerlines and underground electricity cables, as well as water supplies and telecommunications assets and associated infrastructure.



3.1.9 The Project has been developed to avoid or minimise significant effects on the environment. The measures adopted include landscaping, noise mitigation, green bridges, floodplain compensation, new areas of ecological habitat and two new parks.

**Plate 3.1 A122 Lower Thames Crossing route alignment**





## 4 Definition of Level 3 wider economic impacts

### 4.1 Introduction

4.1.1 This chapter provides a definition about the two Level 3 WEIs which are considered in this report – productivity benefits due to agglomeration from dynamic clustering and employment impacts as labour moves to more or less productive jobs. It also describes key factors that influence the realisation of Level 3 wider economic impacts. Lastly it explains the approach taken to Level 3 WEIs in this report.

### 4.2 Wider economic impacts and transport user benefits

4.2.1 As noted in Chapter 2, all wider economic impacts capture economic welfare outcomes that are additional to transport user benefits. The emphasis on welfare measures is important, not least because it aligns with the requirements of HM Treasury’s Green Book on appraisal (HM Treasury, 2022). Therefore, while outcomes such as Gross Domestic Product (GDP) and employment changes may be of interest, especially when considering how local people and communities might experience the consequences of a transport scheme, these are not welfare measures, and indeed GDP is actually a narrow and incomplete measure of economic outcomes. The relationships between welfare outcomes and GDP are explained fully in TAG Unit A2.1 (Department for Transport, 2019a).

4.2.2 Where markets function perfectly, transport user and provider benefits capture all of the welfare impacts of a scheme. However, markets often function imperfectly, giving rise to market failures, where outcomes arising in competitive markets are not fully efficient for society as a whole. Consequently, it is important to detect market failures and understand their consequences, especially given that the Project and its impacts are large.<sup>2</sup>

4.2.3 For this reason, TAG requires a full assessment of the context of any scheme, as a basis for predicting how it will change not only travel behaviours but also other behaviours, including choice of location, the scale and intensity of land use and job search (Department for Transport, a). As discussed later, these elements are highly interrelated. For example, a relocation by a firm might cause some employees to look for work elsewhere rather than travelling to the new location, while the firm in assessing its location choices has to consider, among other things, how a prospective relocation might impact on staff and skill retention and recruitment.

4.2.4 As noted later, the presence of an estuary gives rise to very specific market failures that either do not arise, or which act in a much milder form, in other places. However, even without the influence of the estuary and with perfect information, market failures still exist.

<sup>2</sup> TAG Unit A2.1 provides a general discussion of market failures (Department for Transport, 2019a).

## 4.3 Dynamic agglomeration

- 4.3.1 Agglomeration from dynamic clustering arises when, due to a transport scheme, land use change occurs when one or more firms move closer to other firms and generates additional productivity benefits for some, or all, of those firms. The firm that relocates in response to the opportunities provided by the transport scheme does so to secure net benefits to its own operations, some of which come from being in closer proximity to other firms, to suppliers and customers or to labour pools. This process of spatial agglomeration can be self-reinforcing, as the larger the group, or cluster, of firms the more attractive it will be to some other firms.<sup>3</sup>
- 4.3.2 The benefits to the individual firm that arise from agglomeration include greater proximity to customers and/or suppliers, better access to a wider and/or deeper labour pool which enables a better fit between jobs and skills, and access to ideas and information on technology and markets, which might generate more productive business activities such as shared ventures.<sup>4</sup> However, the relocating firm bases its choices on its own costs and benefits, and not on how it impacts on other firms. This is an example of a market failure where there is a divergence between costs and benefits to society and those perceived by an individual firm.<sup>5</sup> This market failure causes sub-optimal locational choices, including relocations by firms in response to a transport scheme.
- 4.3.3 Transport schemes improve accessibility between firms without firms actually having to move. In the absence of relocations, greater proximity through improvements in accessibility gives rise to impacts associated with clustering including greater interactions between firms. Over an area, enhanced accessibility increases the effective density of economic mass in that area, which leads to increases in productivity. These are known as static clustering impacts and are captured within the monetised Level 2 wider economic impacts reported in the Economic Appraisal Report.
- 4.3.4 The wider economic impacts of dynamic clustering includes static and dynamic clustering behaviour. The benefits to the relocating firm must be large enough to cover their costs because it will have to incur costs and carry financial risks in order to relocate closer to other firms. Other firms in the group that make up the cluster might also benefit through greater proximity to the relocating firm through the mechanisms of sharing, matching and learning.<sup>6</sup>
- 4.3.5 Dynamic clustering through the relocation of firms therefore increases the actual density of the economic mass in an area. There is a large body of evidence that shows that firms that work in, or join, clusters become more competitive and more productive. Level 3 analysis aims to capture the value of the productivity benefits that arise when firms relocate in response to a transport scheme.

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<sup>3</sup> The growth of a cluster will have other effects such as increases in land rents and traffic congestion, which will lead to the dispersal of firms for which the benefits of being in the cluster are less than the costs.

<sup>4</sup> The literature on agglomeration has largely settled on the model set out by Duranton and Puga based on sharing of resources and infrastructure, matching, especially between employers and employees and learning through the transmission of knowledge and ideas (Duranton and Puga, 2004). These effects, while easy to state in qualitative terms, are extremely hard to distinguish quantitatively.

<sup>5</sup> There is no market that would enable firms that benefit from having other firms close by to pay other firms to locate close to them.

<sup>6</sup> As outlined in footnote 4: note that there can also be dispersal forces, for example if additional density of activity leads to traffic congestion or increases in land rentals.

## 4.4 Moves to more or less productive jobs

- 4.4.1 TAG also considers changes that are referred to as moves to more or less productive jobs (M2MLPJ) (Department for Transport, a). M2MLPJ have two distinct elements, namely the movement of jobs that arise because of a move by a business as the employer of workers and the movement of workers. Both are important and how they interact depends on context and geography.
- 4.4.2 Where there is a change in job location that involves the displacement of employment from one location to another, with no net employment change at the UK level, there may still be a net national productivity impact due to spatial differences in productivity and therefore a change in welfare. The area to which activity relocates may become more or less productive; the extent of this impact depends on the strengths of agglomeration and disagglomeration effects.<sup>7</sup> M2MLPJ and dynamic clustering therefore operate together. The dynamic clustering impacts need to be distinguished and treated as described in the earlier part of this chapter.
- 4.4.3 Differences in productivity of firms exist between areas due to the types of industries located in different areas, factors such as the quality of management of individual firms and the extent to which businesses benefit from agglomeration impacts that arise due to physical proximity to other businesses and access to skills, suppliers and customers.
- 4.4.4 The productivity impacts of business relocations arise because they change the actual density of activity at different locations which impacts upon productivity at these various locations. When workers move to a location where productivity is higher or lower than they are moving to more, or less, productive jobs.
- 4.4.5 Where a transport project causes businesses to relocate and where relocation increases productivity in an area, the associated increase in commuting to that area generates a M2MLPJ benefit. The additional net benefit is equal to the increment in income tax revenues. The reverse is true when the transport project reduces the density of activity in an area from which businesses relocate.

## 4.5 Key factors for Level 3 wider economic impacts

- 4.5.1 Three key factors influence the realisation of Level 3 wider economic impacts assuming there are no other policy changes:
- The nature and diversity of an area's industrial structure
  - The potential for land use change due to transport improvements
  - The degree of displacement

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<sup>7</sup> Depending on location, a business relocating can benefit other businesses in proximity by increasing the economic mass (agglomeration), but counterforces, such as impacts on land prices and congestion, limit the net impact. Business reorganisations also move jobs spatially and even where a business simply expands in one location and decreases employment in another there will be an element of dynamic clustering due to the change in the density of economic activity in each area.

## The nature and diversity of industry structure

- 4.5.2 A key issue for Level 3 wider economic impacts is the nature and the level of diversity of industries in proximity to a transport scheme.
- 4.5.3 In the the case of the Project, some industries in the Lower Thames area are more reliant on the road network, in terms of the transport of inputs and final products, than other industries. Therefore, road reliant industries will be more impacted by the benefits of transport projects.
- 4.5.4 In terms of diversity of industrial structure, a similar structure is one in which the proportions of total employment accounted for by each industry are similar in areas both north and south of the Thames Estuary. Where the proportions of total employment accounted for by each industry are dissimilar on each side of the estuary, the Project is more likely to bring about structural changes in certain industries. For some industries the increased size of their customer market, supply chains and additional competitive pressure will have minimal impacts on firms because they are already operating efficiently.
- 4.5.5 If the economies are similar in structure, industries on each side of the estuary are likely to compete more strongly with each other as a consequence of the Project and, in the pursuit of cost savings, this could also lead to relocations and consolidations of activity including clustering to exploit external economies.
- 4.5.6 Evidence from the impacts of other estuarial road crossings points to instances where there have been separate patterns of industrial, commercial and residential development on each side of an estuary prior to the introduction of a new crossing. These patterns influenced the nature of wider economic impacts due to the new crossing. As discussed below, this is also found in the case of the Lower Thames area, reflecting the fact that the Local North and Local South areas have developed differently.
- 4.5.7 Where areas are well integrated, they contain locations where there is a degree of industrial specialisation, but where they are separated from each other, the degree of specialisation is likely to be less. In the case of the Lower Thames area, the larger hinterlands exhibit a degree of similarity, while London acts as a large market for products and inputs from both areas. However, the differences between the areas in terms of changes in manufacturing, and in public and private sector services employment show that factors underlying the development of the two areas are working in different ways.

## The potential for land use change due to transport improvements

- 4.5.8 The choice of location by a firm is necessarily complex and a change of location or land use intensity of existing sites will involve costs. These include the acquisition of a new site and premises, moving existing plant and/or investment in new plant and equipment, the loss of skills and knowledge if existing employees choose not to relocate and the costs of finding and training new employees. Relocation also involves risk, with the spectrum of costs and risks varying across industries. Firms in some sectors, such as manufacturing, tend to be relatively immobile. The initial location might have been chosen because of the need to access raw materials or skills found in only a few places, or to be close to customers or transport nodes such as ports. Once established, the

costs of moving may be very high especially where large amounts of plant are used. However, whole industries exhibit location changes as older firms die and new ones enter the market, possibly operating from new locations.<sup>8</sup> Other manufacturing industries and service firms may be more mobile.

- 4.5.9 A transport project changes the generalised costs of travel for both goods and people. Manufacturing firms purchase physical inputs to which they add value in order to produce physical outputs. Both inputs and outputs require freight transport. Manufacturing firms also need to employ people who use transport to access the manufacturing plant. Customers might also visit the plant and sales staff might need to visit customers with all such people movements involving the use of transport, largely by road.
- 4.5.10 Many service businesses and much of the public sector produce no, or very limited quantities, of physical outputs, but are highly people-intensive, requiring the movement of employees, sales staff and customers. These businesses respond to changes in transport costs based on their own business models and the context in which they operate. The theory of new economic geography (NEG), which provides insights into locational decisions in the context of imperfectly competitive markets, holds that business location decisions involve a trade-off between transport costs and the investment returns that a firm achieves from increasing the size of its output (or economies of scale). By extension, location can be seen as a trade-off between transport costs and both internal and external economies (the latter being agglomeration economies).
- 4.5.11 Where there are large economies of scale (internal and/or external) available at a specific location, the firm will concentrate activity at that location and bear the transport costs of accessing suppliers, customers and personnel, on the assumption that it seeks to maximise profits. Where these economies are weak in relation to transport costs, a firm might operate from multiple locations to be close to suppliers, customers and personnel.
- 4.5.12 A reduction in transport costs affects these trade-offs, and where there is a sufficiently large shift in the trade-off, a firm is likely to relocate entirely or change how it operates. For example, a firm that produces at multiple sites of similar size might decide, due to the transport intervention, to concentrate most of its activity at a single site, altering the intensity of land use, while retaining a presence elsewhere for purposes such as a sales outlet or a location for local distribution.<sup>9</sup> Alternately, a firm that only operates from one location without the transport intervention may decide, in response to the larger market size created due to the improved connectivity from the transport intervention, to open additional sites that are more closely located to its suppliers and customers.
- 4.5.13 Similar reasoning applies in the case of labour markets. Decisions to enter the labour market and the area which the job search covers are influenced by travel costs and by post tax earnings. A reduction in travel costs will widen the search area and will attract some people to become economically active. A willingness to travel across a larger geography and an increase in the size of the available workforce increases the likelihood of successfully matching skills to jobs, which enhances productivity. Where there is no change in land use, labour supply

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<sup>8</sup> Car manufacturing in the UK is an example of such change.

<sup>9</sup> NEG models would predict that firms would relocate to the larger market area. The forces that cause such movement would be stronger in the presence of agglomeration economies.



impacts are estimated as part of the Level 2 WEI appraisal, but when there is the expectation of a change in land use, labour supply impacts should be estimated using assumptions about land use changes.

### Degree of displacement

- 4.5.14 In any assessment of wider economic impacts, it is necessary to consider the scope for, and scale of, displacement. Displacement occurs where increases in employment or output in one area are offset by reductions elsewhere. In the case of Level 3 WEI, an expansion in labour supply would constitute an unambiguous supply-side increase in capacity.
- 4.5.15 Productivity gains due to dynamic clustering in the area of a Project could result in no net gain at the level of the UK if offset by productivity losses elsewhere. This could arise if firms relocate from one cluster to another. Individual firms would move because of the benefits to those firms, but the impacts on the cluster losing firms might be substantial. The disbenefits to the losing cluster would not be included in the calculations of the firms that decide to move, but the appraisal should include the impacts at the level of the affected clusters in order to determine the net additional impacts.
- 4.5.16 The default assumption in TAG for transport appraisals is 100% displacement. However, a net positive impact at the UK level will arise where strong agglomeration impacts and hence productivity gains arise in one area and when there are only small or no negative agglomeration impacts that offset these gains. In such instances firms that relocate and/or reorganise to access and exploit agglomeration benefits would become more competitive, and therefore would displace less competitive firms. While there would be a redistribution of economic activity (between firms but also spatially) there would be a net overall gain, as an assumed quantity of fixed resources would be employed to produce a net increase in output. Thus, net productivity gains are the equivalent of an increase in the supply of inputs, and therefore overall would yield displacement of less than 100%.

## 4.6 Appraising Level 3 wider economic impacts

- 4.6.1 The quantification of Level 3 WEI is challenging, requiring predictions of how firms and households will behave in response to changes in travel costs occasioned by the transport scheme being appraised.
- 4.6.2 TAG indicates that a transport-land use model could be used to assess changes as a basis for the quantitative appraisal of these wider economic impacts (Department for Transport, 2019c). However, as noted in Chapter 2 and discussed further in Chapter 5, an estuarial crossing is a highly specific context that presents further specific modelling challenges, with data and methodological uncertainties that are also compounded by the scale of this Project. Therefore, the approach to assessing Level 3 WEI for this Project is based on gathering socio-economic contextual information and stakeholder evidence, which TAG suggests should include surveys of businesses, to indicate the Project's likelihood of generating these impacts.
- 4.6.3 Chapter 5 sets out the Project's socio-economic context.

- 4.6.4 Chapters 6 and 7 then provide evidence about the Project's potential to generate dynamic clustering benefits and exchequer benefits as labour moves to more and less productive jobs.



## 5 Socio-economic context

### 5.1 Introduction

5.1.1 TAG guidance recognises that the type and magnitude of a transport scheme's economic impacts are context specific (Department for Transport, 2019a). This chapter first defines, and explains the importance of, context and presents evidence from other estuarial road crossings which inform the Project's context. An assessment is then presented of the Lower Thames area's socio-economic characteristics that includes:

- a. How the area's characteristics have been shaped by its historical development
- b. Its population
- c. Its industrial structure
- d. Its overall employment structure and those of its manufacturing and private sector services sectors
- e. The performance of individual industries
- f. The location of industries and their transport needs
- g. Skills, location and travel to work considerations
- h. Its productivity levels

5.1.2 The main conclusions from this contextual assessment are then presented.

### 5.2 Importance of context

5.2.1 The context for a transport scheme is a qualitative and quantitative assessment of an area's economic and social conditions and structures within which the scheme is located. The area being considered should be large enough to capture the scheme's principal impacts and any spillover and displacement impacts. Context is influenced by an area's physical geography and its social and economic history, which will have shaped key attributes that will affect the scheme's impacts. These attributes, some of which will be highly correlated, include an area's industries, where people live and work, local workforce skills, social conditions and housing, transport infrastructure and services, ease of access into and out of the area and the availability of land for development.

### 5.3 Evidence from other estuarial road crossings

5.3.1 An initial assessment of the Project's context concluded that estuarial road crossings have specific contexts in that:

- a. There are, typically, a limited number of road crossings of an estuary, due to the cost of constructing and maintaining bridges and tunnels.

- b. Accessibility across an estuary shapes attitudes of both businesses and people towards places across the estuary which may seem more remote. This can result in weaker economic relationships than those with places located along the estuary.
- c. Settlements close to an estuary have similarities with coastal towns, in that their hinterland and catchment is cropped by the estuary, in contrast to inland towns and cities.

5.3.2 To understand how the geography of estuaries shape economic activities and spatial relationships, the impacts of other estuarial road crossings built in the UK since the 1960s were reviewed. Three first, or only, road crossings assessed were the (with opening dates in brackets):

- a. Forth Road Bridge (1964)<sup>10</sup>
- b. Severn Bridge (1966)
- c. Humber Bridge (1981)

5.3.3 Six additional or replacement crossings considered were the:

- a. Queen Elizabeth II bridge (1991)
- b. Second Severn Crossing (1996)
- c. Second Tyne Tunnel (2011)
- d. Mersey Gateway Bridge (2017)
- e. Queensferry Crossing (2017)
- f. Silvertown Tunnel (due to open in 2025)

5.3.4 The specific context of each crossing was assessed along with evidence of its economic impacts, such as changes in travel to work patterns, the locations of businesses and other land uses, including residential developments, and how these interrelated impacts were generated.

5.3.5 The review of crossings included a mix of *ex ante* appraisals of anticipated impacts and *ex post* evaluation studies of actual impacts, although the scope of the latter was generally limited. The one exception was a rigorous three-year evaluation of the regional and national impacts undertaken for the first Severn Bridge. The main findings from that study published in 1973 were that:

- a. The level of actual economic change due to the bridge was much greater than that predicted before it was opened.
- b. Traffic growth and traffic redistribution impacts were spread over several years and were expected to continue after the study was published.

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<sup>10</sup> The Queensferry Crossing replaced the Forth Road Bridge which is still used by public transport, taxis and emergency vehicles.

- c. Private motorists were the quickest to react to the economic opportunities provided by the bridge, followed by commercial drivers – the slowest group to react were manufacturing firms.
- d. The areas affected by the economic impacts of the bridge were not confined to those immediately adjacent to the bridge.
- e. The advantages from the bridge were exploited most by those businesses with previous knowledge of, and relationships within, the new market areas that were opened up.

5.3.6 Some of the other studies identified that residential developments took advantage of better accessibility due to the new crossing, which changed where people lived, particularly where land was cheaper or planning consents for new developments were easier to obtain on one side of the estuary. This created new concentrations of people and skills, which in turn attracted industries that needed labour.<sup>11</sup> Annex A summarises the evidence from each of the crossings.

5.3.7 The review of other road crossings highlighted the need to understand the context of the Project, including how its economic history has shaped its present economic structure and performance, including cross-river relationships. More specifically, the review found that the size and nature of impacts are dependent on factors such as:

- a. The strength of cross-estuarial economic interactions prior to the new road crossing, for example by rail or ferry. Estuaries can act as a psychological as well as a physical barrier with, in some instances, places on the 'other side' viewed as being akin to a foreign country. In the case of the first Severn Crossing, businesses with existing cross-estuary relationships benefited most from the new crossing. In the case of the Forth Road Bridge there was already an established market for travelling to work in central Edinburgh by rail and there was a strong economic logic for creating better links for business, retail and leisure purposes
- b. The wider region's economic performance, including how the growth of populations and industries were spatially distributed and the pre-existence of established hierarchical relationships between towns and cities. In the case of the Humber Bridge, there were strong existing links westward to the large economic masses located in West and South Yorkshire and this was a factor that constrained the realisation of wider economic impacts due to the new bridge.
- c. The degree to which improved cross-river accessibility generated additional traffic. For example, while commuting initially increased following the opening of the Queen Elizabeth II bridge, increased congestion due to the

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<sup>11</sup> The severance of an estuary can create price differentials in the labour market; firms seeking cheaper labour and a less competitive labour market might then locate to the lower cost area while still being able to serve their markets due to the crossing.

growth in higher value business traffic has recently constrained commuting levels, as highlighted in Chapter 7.<sup>12</sup>

- d. The policy framework, particularly in relation to land use and conservation policies such as the Green Belt. Such policies affect the supply and price of land for commercial and residential use. In the case of the 1964 Forth Road Bridge, the bridgehead area of Fife was able to attract a share of the commercial and residential development that was locating outside Edinburgh's Green Belt area.
- e. The scope for businesses to reorganise and restructure their activities to better serve a single cross-river market making better use of labour and land, thereby delivering productivity benefits, which happened following the opening of the Humber Bridge.

- 5.3.8 In the case of the Lower Thames area, places north and south of the estuary have long established relationships with London. The capital's large economic mass offers a concentrated group of customers for businesses located along the estuary which exerts a strong influence on both sides of the estuary. London offers a wide range of employment opportunities, with good rail and road transport links north and south of the river enabling people to live in Kent and Essex and work in London. In addition, historical developments in the capital, which are summarised in the next section, have also had major impacts on the development of the Lower Thames area.
- 5.3.9 The additional road capacity provided by the Project provides new opportunities for local businesses to enter new cross-estuarial markets and workers to look further afield for employment. Complementary measures to support cross river interaction would help to break down barriers, increase cross-river business interactions and maximise the benefits from the Project because economic interactions between the Lower Thames area and London will continue to be the dominant economic factor in the area.
- 5.3.10 While the Project is expected to have the strongest economic impacts locally – as presented in the Economic Appraisal Report – it is also important to recognise its wider geographic context and likely impacts on trade flows between Europe and the UK's industrial heartlands in the Midlands and the north. The Project is located along the UK's principal road link between areas containing its major manufacturing and processing industries and continental Europe. Currently the Dartford Crossing is a congestion pinch point and the need for reduced congestion along the route, particularly across the River Thames, will become increasingly important for the UK in its post-Brexit environment where facilitating efficient trade flows is important.

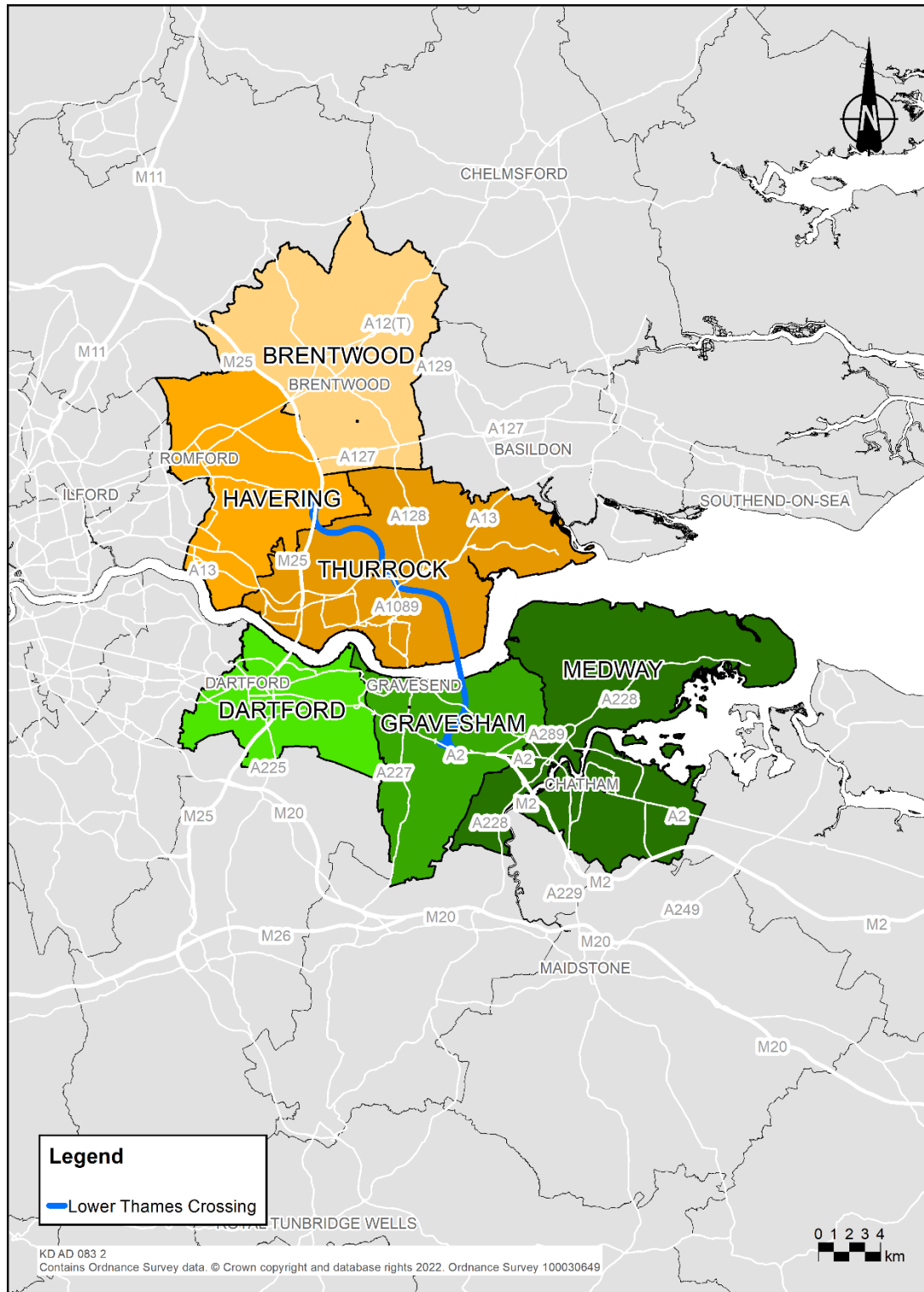
## 5.4 Socio-economic characteristics of the Lower Thames area

- 5.4.1 The review of other estuarial road crossings emphasised the need to understand an area's historical development, which has influenced its current

<sup>12</sup> For a detailed analysis of the physical barrier effects see Transport for London (2014).

socio-economic characteristics and will be a key factor in the realisation of a new crossing's wider economic impacts. Therefore, set out below is a brief historic assessment of the Lower Thames area and an analysis of the current socio-economic conditions of the six local authorities closest to the Project. The three authorities south of the river – Dartford, Gravesham and Medway – are termed the Local South area and the three to the north – Thurrock, Havering and Brentwood – are termed the Local North area, as shown in Plate 5.1. However, to understand the history of the Lower Thames area it is necessary to look beyond the socio-economic structure of just the six local authority areas closest to the Project because changes within London, as far westward as Tower Hamlets and Southwark, have strongly influenced the economies and populations of the Lower Thames area.

**Plate 5.1 The authorities of the Local North and Local South areas**





## Socio-economic history

- 5.4.2 From the mid-1800s, London's population grew rapidly with a clear socio-economic distinction between people living in its East End and the rest of the capital. The combination of the Thames estuary's eastern location, the high levels of smoke from homes and factories and other industrial pollution and the prevailing south-westerly winds, led to urban development whereby the affluent classes favoured the west side of the city while the less well-off gravitated to the much less pleasant, but cheaper, east side. As its Empire grew and the UK's trade rapidly expanded in the 19th century, this socio-economic division was reinforced by London's growing importance as a port, with the development of large enclosed docks on both sides of the river which remained operational until the 1960s. Dock work and associated activities, such as processing of raw materials, were poorly paid activities and so dock workers and associated trades lived close to their workplaces in the east of London, generally in very poor housing with accompanying poor health. For many the East End was a place to get away from and the area saw waves of change with high rates of migrants from low income backgrounds settling in the area, as people who were able to move out did so.
- 5.4.3 In the early part of this period east–west transport links were developed on both sides of the Thames, first rail and later by upgrading existing roads. North of the river, the A13 was developed as a route to connect Central London with the expanding docklands. South of the river the route of the A2, part of the historic Watling Street, was already well established for non-motorised travel. Better accessibility due to the railways and later from road transport changed where people could live while still having access to jobs in London. These improved links enabled strong east–west economic and social relationships to develop for over 100 years prior to the opening of the Dartford Crossing in 1963. Before this, many road bridges to the west of Tower Bridge had been constructed. However, as the river widened the only road crossings east of Tower Bridge were the Rotherhithe Tunnel (built in 1908) linking Tower Hamlets to Southwark and the Blackwall Tunnel (the first tunnel opened in 1897 and the second one opened in 1967) linking the Greenwich Peninsula with Tower Hamlets. The Dartford Crossing was the next fixed crossing, 16 miles east of the Blackwall Tunnel and today it is still the only road crossing to the east of London.
- 5.4.4 World War II inflicted extensive damage to London's East End, and this, together with moves to address sub-standard housing conditions, led to large scale resettlement of people to new residential areas to the east of London, with much of this movement being into Essex, but some also into Kent, with the establishment of new towns and expansion of existing settlements. The resettlements, combined with the development of port and other activities down river, gave rise to strong population growth in the Local North area from the 1940s to the 1970s, but more muted growth in the Local South area resulting, by 1971, in a smaller population compared to the Local North. The resettlement also contributed to a decline in London's population to a post-War low of 6.9 million in 1980 (Office for National Statistics, 2019).
- 5.4.5 However, a major turning point occurred in the 1980s. The move to containerisation, combined with the advent of much larger ships, led to the closures of London's traditional docks and the development of larger port

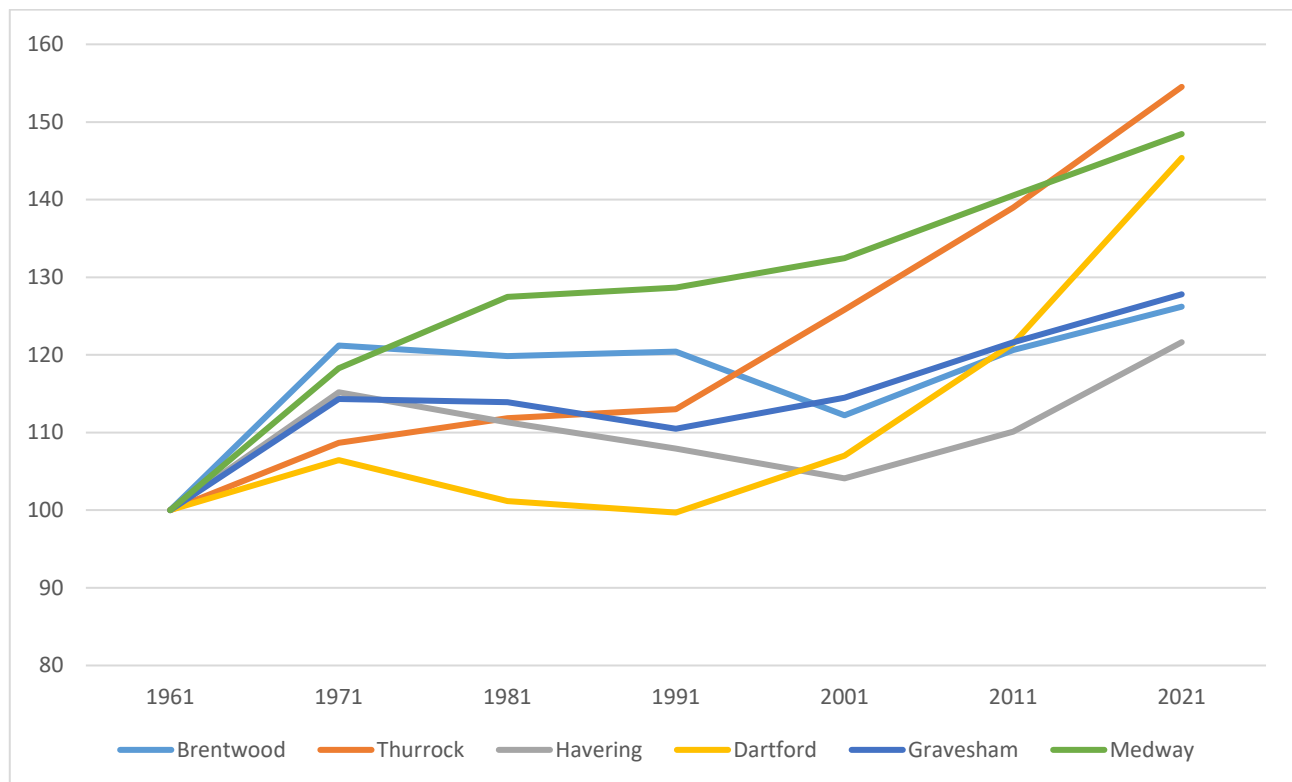


facilities further down river in the Lower Thames area. The closures of the docks in central London created large tracts of derelict land, which became the site of the development of London’s second financial district following deregulation of the financial services industry in the late 1980s. The development of London Docklands was accompanied by population growth in and around the new office developments. This led to a renaissance of East London, with a transformation in the location of employment centres and the composition, scale and Gross Value Added (GVA) contribution of employment.

## Population

5.4.6 As Docklands developed, Havering and Brentwood, which had previously attracted population away from the East End, experienced falling populations, while Thurrock saw growth after 1981 (see Plate 5.2). South of the river, population growth plateaued after 1981 following a period of slow but sustained growth from 1941. In total the populations of both Local North and Local South areas fell between 1981 and 1991 and then rose to 2011 to 469,000 and 464,000 respectively (ONS, n.d.). However, the Local North’s population has been more volatile than that of the Local South indicating that the factors that influence population change have played out differently in each area.

**Plate 5.2 Population growth in the Local North and Local South areas 1961–2021 (Index numbers 1961=100)**



**Sources:**

1961 For districts other than Havering and Medway, NOMIS data for pre-1974 districts reconfigured to 2015 local authority areas. For Havering 1961 [https://en.wikipedia.org/wiki/London\\_Borough\\_of\\_Havering](https://en.wikipedia.org/wiki/London_Borough_of_Havering). For Medway, estimated using CASWEB data and information relating to boundary changes in 1974  
 1971 CASWEB data for pre 1974 districts reconfigured to 2015 districts

1981, 1991, 2001, 2011 data from NOMIS

2021 data (Office for National Statistics, 2022)

- 5.4.7 Table 5.1 shows clear differences in more recent population growth in the different local authority areas (LAAs) between 2011 and 2021. Growth in Dartford, which had the highest percentage rate in the UK, was much greater than in other LAAs. Thurrock and Havering saw more modest growth, while growth in Brentwood and the other Local South areas of Gravesham and Medway was lower.
- 5.4.8 Dartford may be growing because it is attracting population from other places in North Kent due to the high speed rail link from Ebbsfleet to London and allowing new residential developments to be built. In contrast, high house prices in Brentwood, reflecting a surplus of demand over supply, indicate lower population growth, as shown in Table 5.1. Actual population change is, therefore, the working out of demand side factors, including accessibility and quality of life, and supply side constraints which include the policy framework within which developers have to operate.

**Table 5.1 Population in 2021 and percentage growth on 2011**

	Population in 2021	% change on 2011
Brentwood	77,000	4.6
Thurrock	176,000	11.6
Havering	262,000	10.4
<b>Local North</b>	<b>515,000</b>	<b>9.8</b>
Dartford	116,800	20.0
Gravesham	106,900	5.1
Medway	279,800	6.0
<b>Local South</b>	<b>503,500</b>	<b>8.7</b>

Source: Office for National Statistics (2022)

### Industrial structure

- 5.4.9 In assessing the Project’s likelihood for generating Level 3 WEIs, key issues are the extent to which the industries in the Local North and Local South areas are reliant on the road network and whether the two areas have similar, or diverse, industrial structures.
- 5.4.10 Road reliant sectors include those who rely on the road network for the transport of inputs to the production process, intermediate goods and finished goods. They include firms in transport and logistics, those involved with primary materials such as petroleum and mining products, manufacturing and construction (Highways England, 2017). These firms are more likely to benefit by the realisation of Level 3 wider economic impacts. In chapter 6, evidence is presented that the Lower Thames area already has existing clusters of firms in the transport and logistics and construction sectors which are reliant on the road network. These clusters are likely to be develop further as a result of the Project.

- 5.4.11 A similar industrial structure is one in which the mix and relative sizes of value adding activities are similar in both areas.<sup>13</sup> Competition is likely to be stronger as a consequence of the Project as similar firms will contest markets that are better connected due to the Project. Where economic activities are dissimilar on each side of the estuary, the Project is more likely to bring about structural changes, in which the larger industries on one side of the estuary attract their counterparts on the other side to relocate and form a larger cluster.<sup>14</sup>
- 5.4.12 Where both sides of the estuary have similar characteristics in terms of skills and markets, firm level competition rather than locational factors would largely determine how competitive forces would play out. Increased competition will force firms to pursue cost savings which could lead to relocations and consolidations of activity, especially where there are opportunities for clustering to exploit external economies.
- 5.4.13 Where the principal effect is likely to be structural changes, activities could be expected to migrate to the most advantageous locations for each industry. The ability to exploit external economies would also play a role in location choice, but businesses would also consider customer and supplier relationships and access to skills. Where the economy of each area has evolved separately, the spatial distribution of skills, suppliers, customers and resources would be less uniform than in the case where the areas were similar.
- 5.4.14 The review of other estuarial road crossings points to instances where there have been separate but similar patterns of industrial, commercial and residential development on each side of an estuary. As discussed below, this is also found in the case of the Local North and Local South areas, reflecting that although they have similar economic structures they have developed differently due to severance caused by the estuary.<sup>15</sup>
- 5.4.15 Where areas are well integrated, the expected pattern is generally one that exhibits a degree of specialisation, but where they are separated from each other, the degree of specialisation is likely to be less. In the case of the Local North and Local South areas, their larger hinterlands exhibit a degree of similarity, while London acts as a large market for products from both areas. However, differences between the areas in terms of changes in employment in manufacturing and in public and private sector services show that factors underlying the development of each area, and within the Local North area, have been and are working differently.
- 5.4.16 To explore this further, an analysis was undertaken of employment structures and performance, GVA and productivity.

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<sup>13</sup> Employment and GVA data provide indicators for the assessment of industrial structures.

<sup>14</sup> Alternatively, the more successful industries on one side of the estuary might kill off the weaker ones on the other side due to improved access to markets. In either case the larger industries would expand to meet market demand.

<sup>15</sup> Each area's development takes place within the UK economy and national factors play a role that limit the scope for radically different development patterns in most areas. The exception to this is London and specifically its financial services sector.

## Employment structures

**Table 5.2 Employment structure (percentage) 2010 to 2020**

	SIC codes	Local North		Local South	
		2010	2020	2010	2020
Primary and Utilities	1 to 9 and 33 to 38	2.1	2.2	2.6	2.5
Manufacturing	10 to 32	5.6	3.6	7.8	6.2
Construction	41 to 43	6.6	8.8	7.5	9.2
Private sector services	46 to 82	57.8	58.1	48.1	51.0
Public sector services	84 to 91	23.9	24.3	30.5	27.6
Other misc. services	92 to 96	4.2	3.1	3.4	3.5
<b>Total employment</b>		<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

**Table 5.3 Employment change 2010 to 2020**

	SIC codes	Local North			Local South		
		2010	2020	% change	2010	2020	% change
Primary and Utilities	1 to 9 and 33 to 38	3,400	4,260	25.3	4,235	4,785	13.0
Manufacturing	10 to 32	8,970	7,080	-21.1	12,890	12,005	-6.9
Construction	41 to 43	10,625	17,300	62.8	12,350	17,750	43.7
Private sector services	46 to 82	93,355	114,150	22.3	79,070	98,430	24.5
Public sector services	84 to 91	38,550	47,670	23.7	50,210	53,235	6.0
Other misc. services	92 to 96	6,715	6,040	-10.1	5,620	6,715	19.5
<b>Total employment</b>		<b>161,615</b>	<b>196,500</b>	<b>21.6</b>	<b>164,375</b>	<b>192,920</b>	<b>17.4</b>

Source: NOMIS Business Register and Employment Survey; employment count, 2010, 2020

5.4.17 Table 5.2 presents the employment structures in the Local North and Local South in terms of the percentage of total employment in each sector in 2010 and 2020. Key points to note that:

- a. the principal differences between the Local North and Local South areas are in the composition of the services sector
- b. private sector services account for the largest components of employment in both areas in both years. However the proportion of total employment in private sector services is larger in the Local North, in both years, than in the

Local South area. This is despite a period of restructuring in the Local South which has seen an increase in private sector services.

- c. Conversely, public sector services, in both years, account for a larger share of employment in the Local South than in the Local North area. This is the case despite an increase in public sector services employment in the Local North area and a decline in the Local South between 2010 and 2020
- d. when combined, private and public sector services account for about 80% of total employment in both local areas in both areas
- e. the construction and manufacturing sectors account for higher shares of employment in the Local South than the Local North in both areas
- f. Primary and utility sectors account for the smallest employment shares in both local areas in both years

5.4.18 Table 5.3 presents absolute employment numbers by sector and the rates of growth between 2010 and 2020.<sup>16</sup> Key points are:

- a. Manufacturing employment has declined in both areas and by a substantially greater degree in the Local North. This points to a greater degree of structural change in the Local North than in the Local South.
- b. Construction employment has grown strongly in both areas but by a much greater degree in the Local North area, which could indicate a stronger attraction to the Local North as the location for the clustering of construction activity.
- c. Growth in employment in private sector services was similar in both areas; however, this sector is much larger in the Local North than the Local South. This might reflect factors such as the size of its hinterland in terms of household disposable incomes and ease of access to households in that hinterland.<sup>17</sup>
- d. There was a very large difference in the growth of public sector services with the Local North growing by 24% compared to just 6% in the Local South. However, the number of public sector jobs per 1,000 of population remains 25% greater in the Local South despite the recent growth in the Local North.

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<sup>16</sup> For this analysis, manufacturing comprises Standard Industrial Classification (SICs) codes 10 to 32, construction SICs 41 to 43, public sector services comprise SICs 84 to 91, private sector services as SICs 46 to 82, primary and utilities comprises SICs 1 to 9 and 31 to 38 and other miscellaneous services comprises SICs 92 to 96. The division between public and private sector services is not one used in official statistics and it is recognised that some employment within the public sector group will in reality be provided by private sector firms acting for profit on contracts to the public sector.

<sup>17</sup> Using the SIC codes of economic activities, Other services comprises all service SICs except those treated as solely or principally public sector services. SICs allow analysis of employment at a high level of granularity. For an explanation of SICs and the alternative levels of detail, see NOMIS.

## Changes in employment structure

- 5.4.19 A disaggregation of the sectoral data found that the manufacturing sector is highly diversified in both the Local North and Local South areas, with no large dominant types of industry. The Local South has a stronger base of manufacturing compared with the Local North and there is some specialisation in the manufacture of machinery and equipment which are activities that are likely to draw upon a common skills-set found in the Local South.
- 5.4.20 Tests of industrial specialisation, namely the Krugman Specialisation Index and the Hirschman–Herfindahl Index, confirm that there is a more diversified manufacturing economy in the Local South, but overall the manufacturing sectors in both areas are not very different from the employment structure of manufacturing in England in aggregate. An ONS analysis using the Krugman Specialisation Index found that Kent had the most similar economic structure of any local authority to the structure of Essex (Office for National Statistics, 2017). Further details about the Hirschman–Herfindahl Index test are included in Chapter 6.
- 5.4.21 For private sector services the degree of dissimilarity between the Local North and Local South is relatively small. The Local North has a stronger base in private sector services and there is a strong concentration of transport and logistics related industries.
- 5.4.22 These comparisons suggest no clear patterns in the types of industries that are dominant in either region. The Local South appears to be stronger in metal based and engineering industries and the Local North in freight, transport and wholesale, but overall the similarities between the two Local areas are stronger than the differences.
- 5.4.23 As there are some differences in structures, but also strong similarities especially within private sector services between the two areas, the effects of the Project are likely to be a combination of increasing competition within some industries and stimulating structural and locational change within others. The outcomes are likely to depend upon the characteristics of each industry and on the capabilities of individual firms in each industry with some industries likely to benefit more directly from changes in road connectivity.
- 5.4.24 Analysis of changes in employment structures between 2010 and 2020 found that:
- a. In England, manufacturing industry became slightly more concentrated with fewer industries accounting for a given share of employment. Private sector services became slightly more diversified, but still less than manufacturing.
  - b. In the Local North and Local South, manufacturing also became more concentrated, particularly in the Local North despite having a smaller manufacturing sector than the Local South.
  - c. In the Local North and Local South, private sector services became more diversified with a shift towards a more uniform employment structure across the set of industry divisions, particularly in the Local South. Private sector



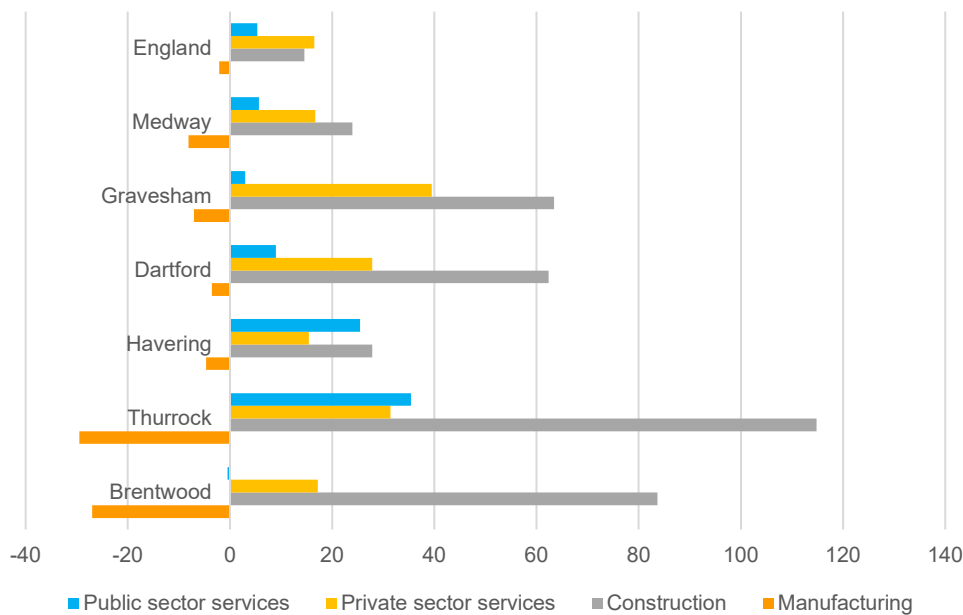
services were nonetheless much less diversified than manufacturing in both the Local South and Local North.

- 5.4.25 A number of manufacturing industries expanded more rapidly than in England in either the Local North or Local South, or in both areas in the case of the manufacture of food products, other non-metallic mineral products and furniture. There is no apparent pattern to the growth performance of these industries, although, as noted earlier, the Local South had a modest degree of specialisation in industries involving making machinery and equipment, possibly drawing on a locally available skills base. It seems reasonable to conclude that employment growth patterns are mainly the outcome of firm level competition because there is no indication that location factors played a strong role.
- 5.4.26 Overall, with the exception of parts of construction in the Local North, and land transport and related services, there are no industries that are clearly very strong in either area. There is nothing to suggest that location is major factor for manufacturing or most service industries, the exception being transport related activities and construction, for which the Lower Thames area is an attractive location.
- 5.4.27 A spatial disaggregation of the employment data between local authorities in the Local North and Local South areas finds that there are marked differences, as shown in Plate 5.3. Compared with the combined Local North and Local South areas:
- a. Havering and Medway have the largest numbers of jobs, Brentwood and Gravesham have the smallest.
  - b. Thurrock and Medway have a relatively large share of employment engaged in primary industries and utilities: this might reflect proximity to water or having sites suited to certain industry types.
  - c. Only Medway has a relatively large share of employment in manufacturing.
  - d. Brentwood and Dartford have relatively large shares of employment engaged in construction.
  - e. Thurrock has the largest proportion of employment in private sector services. Dartford also has a relatively large share of employment engaged in private sector services, while Medway has a very low share.
  - f. There are large variations in employment in public sector services which accounts for a relatively large share of employment in Havering and Medway, but a low share in Brentwood and Thurrock.
  - g. Manufacturing employment fell more in all six areas compared to England and more in Brentwood and Thurrock than elsewhere.
  - h. Growth in construction employment was stronger than in England in all areas, being greatest in Brentwood and Thurrock and smallest in Havering and Medway.



- i. Compared with England, Thurrock, Dartford and Gravesham (from a low base) experienced the strongest growth in private sector services.
- j. Thurrock and Havering experienced large growth in public sector services employment. This growth was from a low base in Thurrock, but in Havering employment in this sector was already large in 2010.

**Plate 5.3 Employment percentage changes by industry by local authority, 2010 to 2020**



Source: NOMIS Business Register and Employment Survey; employment count, 2010, 2020

### Findings on employment structure

- 5.4.28 The analysis shows that the employment structure in manufacturing in both the Local North and Local South is less uniform (more variable) across the industry divisions than in England, especially in the Local South. However, while there are some differences between areas, the overall differences in structure and performance are not dissimilar. This reflects similarities between the areas' geographic hinterlands of Essex and Kent and the role of London as a shared market.
- 5.4.29 Private sector services in both the Local North and Local South have a less uniform structure than in England, but the differences in 2020 between the two local areas are small. Both have become more uniform in structure between 2010 and 2020, especially the Local South. These changes might be due to population change and changes in household incomes which have impacted on services that principally serve local markets.
- 5.4.30 The findings confirm that the two local areas have no clear industry specialisations apart from construction and transport related activities which require locations with good access to the transport network and large areas of land for storage, warehousing and vehicle movements. There is the existence of specialisation in some areas of manufacturing and business support services

in the Local South. The spatial requirements of business support services are less clear, but are likely to include a base of buyers and access to London as firms act as back offices.

- 5.4.31 The lack of specialisations might reflect the weak influence that the physical characteristics of locations exert on where firms operate and the stronger effects of other factors, including access to skills, suppliers and customers. Given the relatively low transport costs, as a share of total production costs, and high transactions costs associated with relocation, it is understandable that many firms do not relocate their principal place of business from where they were established in response to various potential opportunities to increase profits, even if they do develop branches in other places in order to expand.<sup>18</sup> Similar considerations apply to people in that spatial migration within the UK population is very limited and much smaller than in the USA. This is a factor that restrains productivity growth alongside a lack of investment and a low level of upskilling over a person's career.
- 5.4.32 It should be noted that some firms might be strongly focused on local markets and suppliers, especially industries that primarily produce intermediate goods and services and who are located close to their customers.<sup>19</sup> In contrast other firms that supply consumer markets or export markets must address a much larger geography because their customers are more widely dispersed.

### Gross Value Added

- 5.4.33 The employment analysis is complemented by an analysis of GVA data for each local authority area split by broad industry sectors.<sup>20</sup> ONS published data in 2022 on industries at the local authority area level in current prices and provided GVA deflators which enable chained volume series to be calculated for each local authority area, expressed in 2019 prices.
- 5.4.34 Plate 5.4 shows GVA performance over the period 2010 to 2020, expressed in 2019 prices as index numbers, for all industries, manufacturing, construction and private sector services. Indices are relative to the average of the combined Local North and Local South in 2010 with a base value of 100.

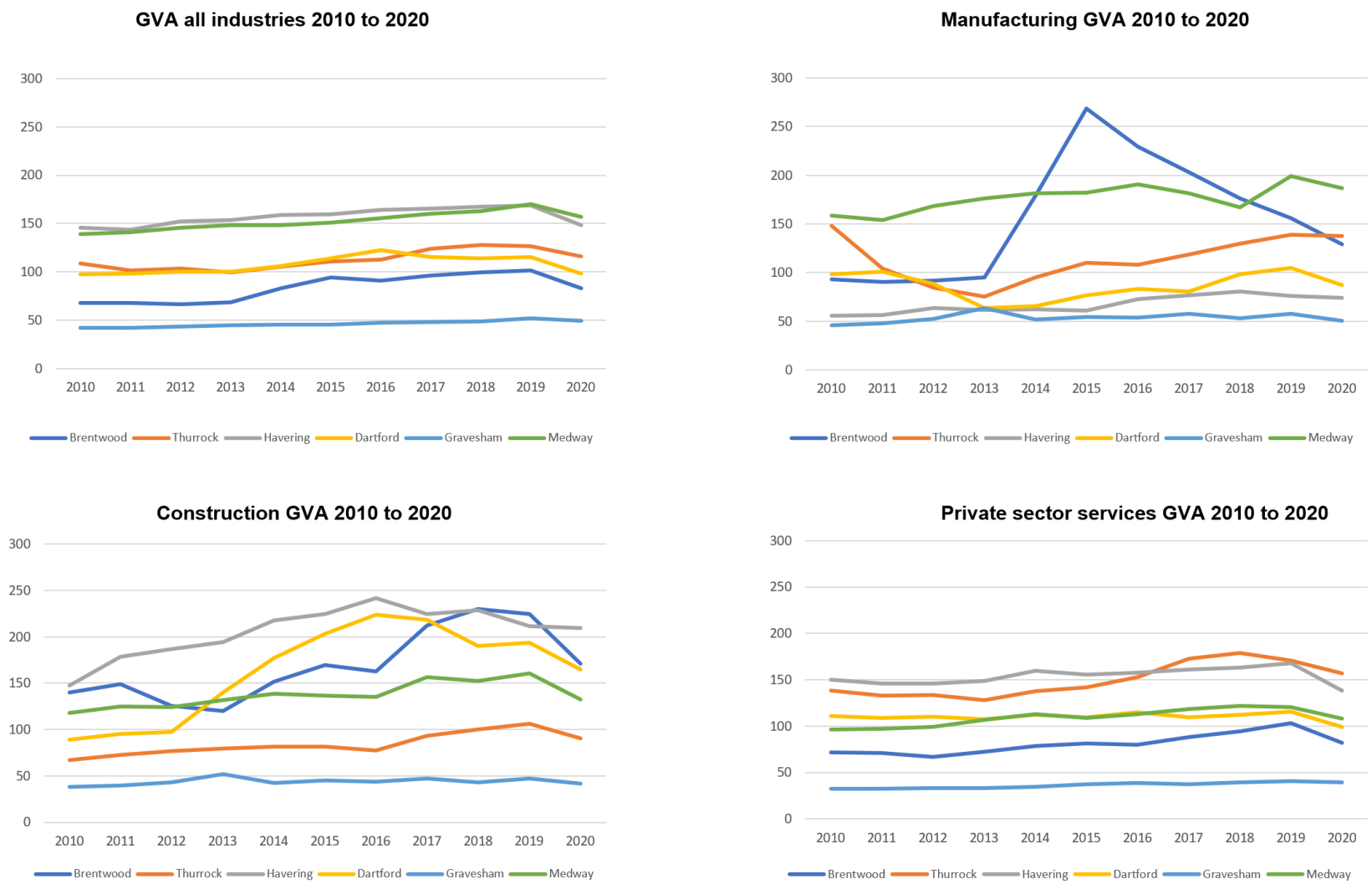
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<sup>18</sup> In the UK a radical relocation of the motor car industry took place, not through the relocation of firms but through closures of old firms and foreign investment by new firms in locations not traditionally associated by car manufacture. These new locations offered the availability of engineering skills.

<sup>19</sup> Intermediate goods tend to be sold in markets that are sensitive to price and delivery; closeness to buyers limits transport costs and enables deliveries to be controlled, an important factor in just-in-time systems.

<sup>20</sup> GVA measures the value of goods and services produced in an area, industry or sector of the economy.

### Plate 5.4 GVA for industry sectors by local authority area, 2010–2020 (2010=100)



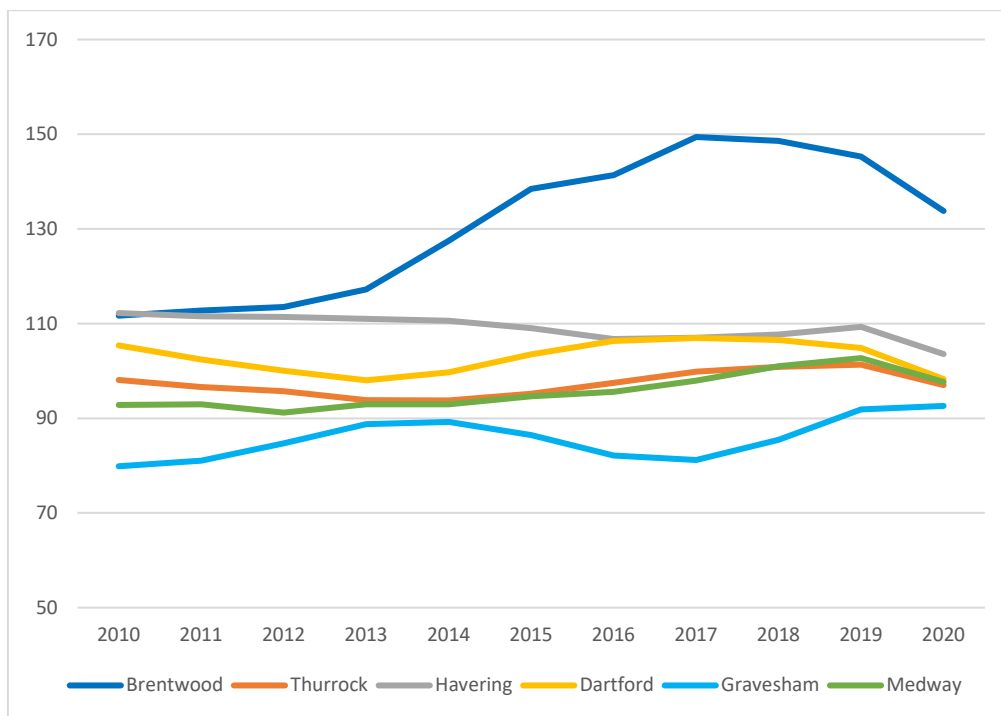
Source: Regional Gross Value Added (balanced) by industry: local authorities by International Territorial Level (ITL)1 region: ITL London, chained volume measures in 2019 money value, pounds million

- 5.4.35 For all industries (which includes manufacturing, construction and private sector services plus primary industries, utilities and the public sector), Havering, Thurrock, Medway and Gravesham showed modest and relatively steady growth in GVA from 2010 to 2019. This was followed by a sharp contraction to 2020 due to COVID-19 related lockdowns of activity. In Dartford, GVA peaked in 2016, while Brentwood experienced rapid growth in GVA between 2013 and 2019, but was not immune to the effects of the lockdowns in 2020.
- 5.4.36 Manufacturing GVA was highest in Medway and Thurrock in 2010 and lowest in Gravesham and Havering. Manufacturing GVA in Medway followed a modest upward trend to 2020, while in Thurrock manufacturing GVA decreased to 2013 and then followed an upward trend. In Dartford and Gravesham manufacturing GVA remained close to its 2010 levels, while Havering experienced modest growth over the period 2010 to 2020. Manufacturing GVA in Brentwood appears to have behaved erratically, with a large change in GVA between 2013 and 2015, possibly due to issues with the survey information provided by firms. With this exception noted, overall manufacturing GVA performance is characterised by weak positive growth from 2013 to 2019, followed by a decrease in 2019 to 2020 due to the impact of the lockdown on economic activity.
- 5.4.37 Construction GVA is partly dependent on the location of large construction projects and of firms that win contracts for such projects. GVA peaked in 2016 in Havering and Dartford, while construction GVA grew sharply in Brentwood from 2016 to 2018. As with manufacturing, GVA decreased in all areas from 2019 to 2020.
- 5.4.38 A similar trend can be seen for private sector services, with modest growth in GVA in 2010 to 2019 in Havering, Gravesham and Medway. Thurrock experienced relatively strong growth in GVA from 2013 to 2018, while Brentwood experienced relatively strong growth in private sector services GVA between 2016 and 2019. All areas except Gravesham experienced a sharp decrease in GVA between 2019 and 2020.

## Productivity

- 5.4.39 ONS's preferred measure of productivity is GVA per hour worked. Data for this measure was published in 2022 for local authority areas in current prices. ONS also published deflators which can be used to create chained volume values for GVA per hour worked for each local authority area. The series is expressed in real terms and does not include the effects of inflation.
- 5.4.40 Plate 5.5 shows GVA per hour worked as index numbers using the unweighted average of the six Lower Thames local authority areas in 2010 with a base value of 100. The GVA deflator provided by ONS has been applied to the GVA data, so the values and index numbers are in 2019 prices.

**Plate 5.5 GVA per hour worked, all industries (2019 prices) (2010=100)**

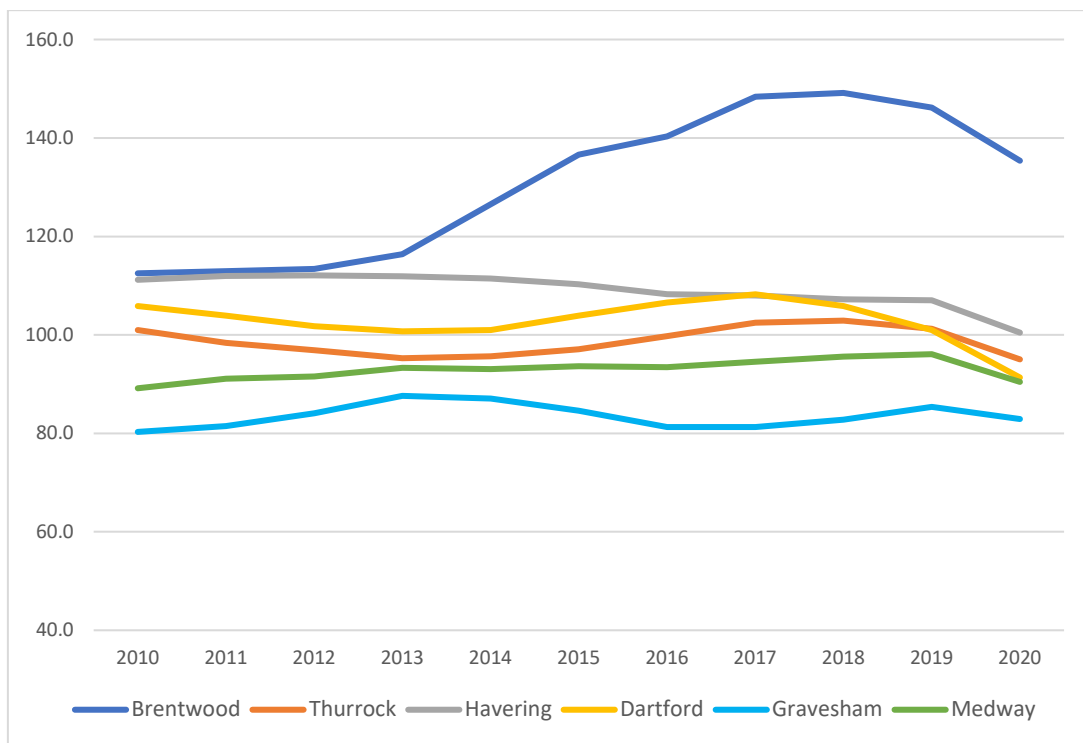


Source: Office for National Statistics Table A3: Current Price (smoothed) GVA (B) per hour worked (£); Local Authority District, 2004–2020. Table 8: Local Authority: Whole economy GVA implied deflators, 2019 equals 100

- 5.4.41 As GVA is the numerator in this measure, it is unsurprising to observe the similarities with trends in GVA at industry level as illustrated in the charts in Plate 5.4. The differences between trends show variations in hours worked. The key trend in Plate 5.5 is the large growth GVA per hour worked in Brentwood relative to the other local authority areas in the period to 2017.
- 5.4.42 ONS also publish a series of GVA per filled job in current prices. The ONS GVA deflators, which are specific to each local authority area, were used to convert the series to constant 2019 prices. Plate 5.6 shows GVA per filled job for each area as index numbers. The base data are in 2019 prices, where the average of the six Lower Thames areas in 2010 is used as the base for the index numbers.<sup>21</sup>
- 5.4.43 Plate 5.6 highlight variations in the performance of GVA per filled job and Table 5.4 shows the percentage growth since 2010 in 2015, 2019 and 2020. As can be seen, only Brentwood and Gravesham experienced growth in this measure, while Dartford in particular suffered a large decrease in GVA per filled job.

<sup>21</sup> For GVA per filled job, ONS present data that have been smoothed using a five-year rolling average (from 2004).

**Plate 5.6 GVA per filled job, average of six Lower Thames area, 2010 = 100**



Source: Calculated from Office for National Statistics Table B3: Current Price (smoothed) GVA (B) per filled job (£); Local Authority District, 2002 - 2020

**Table 5.4 Growth in GVA per job filled**

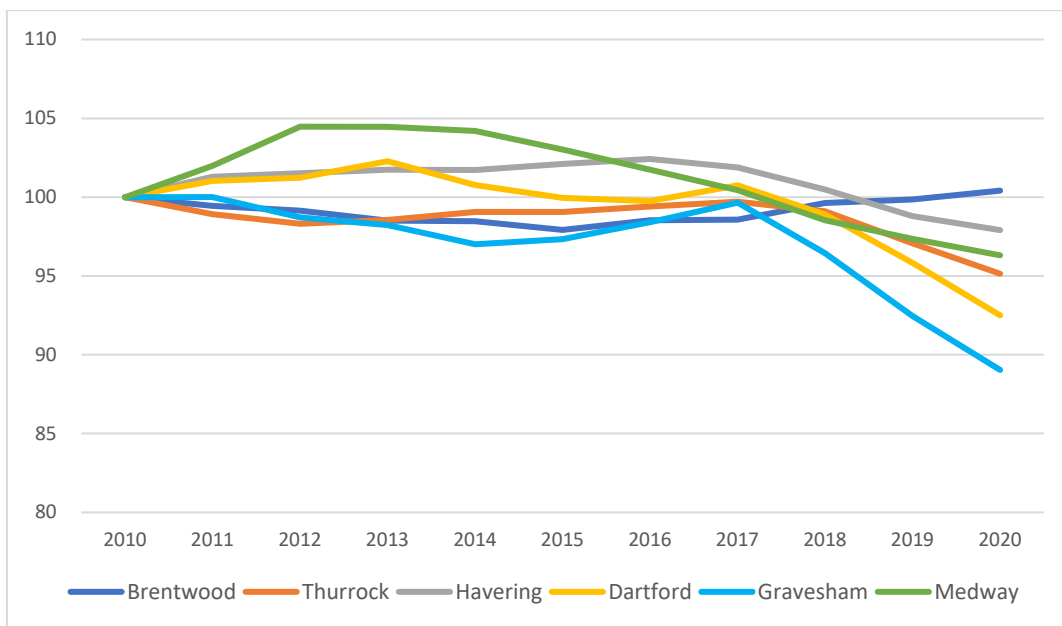
	Percentage growth in GVA per filled job from 2010		
	2015	2019	2020
Brentwood	21.4	29.9	20.3
Thurrock	-3.8	0.3	-5.9
Havering	-0.8	-3.8	-9.6
Dartford	-1.9	-4.7	-13.7
Gravesham	5.3	6.4	3.2
Medway	5.0	7.8	1.4

Source: Calculated from Office for National Statistics Table B3: Current Price (smoothed) GVA (B) per filled job (£); Local Authority District, 2002–2020

5.4.44 The difference in the growth rates in Table 5.6 are due to variations in a combination of GVA per hour worked and the numbers of paid hours worked. Hours worked per person (as implied within the data) can be estimated as GVA per filled job divided by GVA per hour worked. Plate 5.7 shows how the total of hours worked per person has changed over time.



**Plate 5.7 Estimates of hours worked per person, 2010=100**



*Source: Calculated by dividing GVA per hour worked by GVA per filled job*

5.4.45 This indicates a mixed picture in the period 2010 to 2016 with only Havering showing a small but consistent increase in hours worked per person. In contrast, in Medway hours worked per person increased in 2010 to 2012, but decreased in every period from 2012 to 2020. In Brentwood, Gravesham and Thurrock, hours worked per person decreased in the period 2010 to 2014 then increased in the period to 2017. In Dartford hours worked per person increased in the period 2010 to 2012 followed by a downward trend interrupted by a minor peak in 2017.

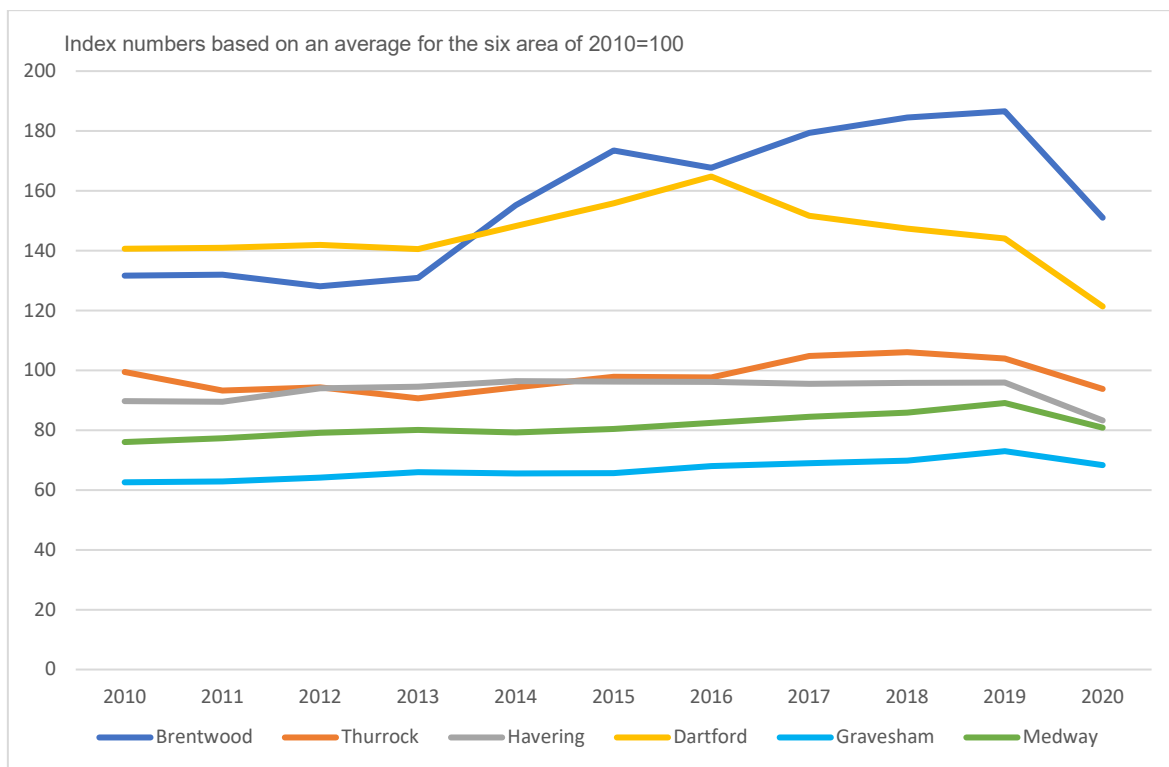
5.4.46 With the exception of Brentwood, from 2017 there was a decrease in hours worked in all areas. This period was characterised by labour market changes such as zero-hours contracts, part time and casual working and the growth of online sales in the retail sector. In Brentwood, in contrast, the number of hours worked per person increased steadily from 2015, following a small decrease in the number of hours worked per person in the period 2010 to 2015. Further analysis is needed to identify the specific factors in Brentwood that caused GVA per hour, hours worked and GVA per filled job to increase in contrast to the trends in the other five local authority areas.

## Gross Domestic Product

5.4.47 ONS has recently published GDP data for regions and local authority areas.<sup>22</sup> The base data can be converted to 2019 prices using GVA deflators also published by ONS. For the six Lower Thames local authority areas, GDP per head has been calculated from which index numbers have been generated with the unweighted average of the six areas in 2010 with a base of 100 in 2010. This data is shown in Plate 5.8. This illustrates much higher GDP per head for Brentwood, and to a lesser extent in Dartford, than in the other four local authority areas. Gravesham has consistently had the lowest GDP per head.

<sup>22</sup> GDP comprises GVA adjusted for taxes and subsidies on products.

**Plate 5.8 GDP per head (2019 prices) – index numbers**



Source: Office for National Statistics: Table 10: Local Authority: Gross Domestic Product (GDP) chained volume measures (CVM) in 2019 money value, pounds million

### Household disposable income

- 5.4.48 While GDP provides an indicator of the value of production within an area, that production is typically undertaken by a combination of people who reside in that area and by people travelling to work from outside that area. Data on household income provides an indicator of what households have available for spending, chiefly from employment income but also from benefits and other sources. A proportion of that income is earned locally while a proportion is money remitted from other areas when area residents work outside the area; in the case of the Local North and Local South that income is derived principally from employment in London.
- 5.4.49 GVA comprises principally compensation of employees and gross operating surpluses of firms, and therefore increases in GVA per filled job should feed through to primary pre-tax household income and benefits.
- 5.4.50 The standard measure of household income is gross disposable household income (GDHI). The components of GDHI are set out below:
- a. Primary resources
    - i. Operating surplus
    - ii. Mixed income
    - iii. Compensation of employees
    - iv. Property income received.

- b. Primary uses
  - i. Property income paid

5.4.51 Together these generate a measure of the balance of primary income.

5.4.52 Households also pay taxes and receive benefits and therefore it is necessary to include:

- a. Secondary resources
  - i. Imputed social contributions and social benefits
  - ii. Other current transfers received

- b. Secondary uses
  - i. Current taxes on income and wealth
  - ii. Social contributions/social benefits paid
  - iii. Other current transfers paid

5.4.53 The balance of secondary income comprises secondary income minus secondary uses. GDHI comprises the sum of the balance of primary and secondary incomes.

5.4.54 While GDHI is of interest from the perspective of incomes available for spending in an area, the relationship between GVA per filled job and compensation of employees is also of relevance here. It should be noted that GVA per filled job is a measure of what is produced within an area, whereas compensation of employees is a measure of income from employment from any area, and therefore includes incomes earned by people who commute to jobs elsewhere.

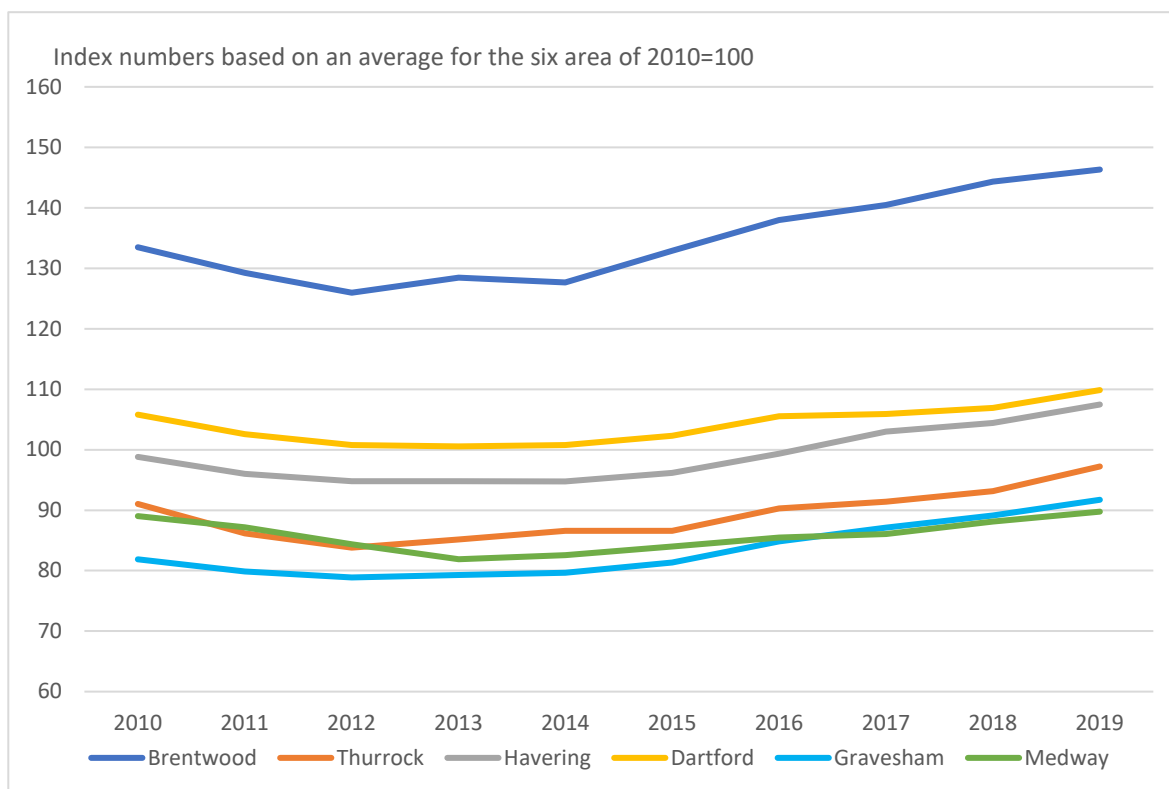
5.4.55 The dataset from NOMIS and ONS, and the GDHI data, is in current prices and covers the period to 2019. The GDP deflator can be used to convert the series to constant prices, but this deflator includes all domestically produced goods and services and therefore includes items not purchased directly by households. The alternative deflators are the Consumer Prices Index (CPI), the Consumer Prices Index including owner occupiers' housing costs (CPIH) and the Retail Prices Index (RPI). The following analysis uses the CPI as the deflator.

5.4.56 Plate 5.9 shows compensation of employees per head in 2019 prices. It is noticeable that, with the exception of Brentwood, compensation of employees (COE) has grown since 2013 or 2014, while GVA per filled job has been static or in some areas has decreased. In Brentwood both COE and GVA per filled job have increased since 2014. The disconnect between GVA per filled job and COE is principally due to people in the Lower Thames area commuting to better paid jobs elsewhere.<sup>23</sup>

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<sup>23</sup> It is possible that COE's share of GVA has been increasing over time, but the evidence of very low wages growth since 2010 suggests that this is not the principal cause of COE growth.

**Plate 5.9 Compensation of employees per head (2019 prices) – Index numbers**



Source: NOMIS: Regional gross disposable household income (GDHI) at current basic prices.  
 ONS: CPI indices all items: Table 20A

**The locations of industries and their transport needs**

- 5.4.57 The size and evolution of manufacturing industry in the Local North and Local South is important, because while it is a relatively small employer compared with services, manufacturing industry’s transport costs, and hence locations, could be strongly influenced by the Project. Where manufacturing firms can exploit economies of scale, there exists a trade-off between centralisation to gain economies of scale and a more dispersed pattern of production in which the firm aims to minimise all costs, including transport costs.
- 5.4.58 Construction similarly creates demands for the movements of bulk materials, both from producers to storage sites and from storage to construction projects. While storage locations are likely to be used on the basis of transport costs, the locations of construction projects are determined by market demand and by planning consents for development. Within construction there are also small firms based around specific trades such as bricklaying and electrical work. These trades typically use vans and light goods vehicles to move both personnel and materials. The location of specific construction activities such as steel making is tied to energy sources.
- 5.4.59 In contrast to manufacturing and construction, services generate demands for people movements, such as visiting customers, and for the movement of items such as office consumables, much of which is undertaken by light goods vehicles. Many services businesses operate with a dispersed pattern, possibly reflecting the presence of limited economies of scale and a need to be (or seen to be) close to the customer. Nonetheless, as transport costs are reduced the

degree of dispersal might be reduced, focusing on fewer locations and possibly shaving a layer or two of management in the process.

- 5.4.60 Some Level 3 WEIs are expected to be driven by how manufacturing, construction and transport related industries respond not only to cost savings but also to the scope the Project offers to enter new markets, form new customer-supplier links and to reorganise dispersed production locations.

### Skills, location and travel to work

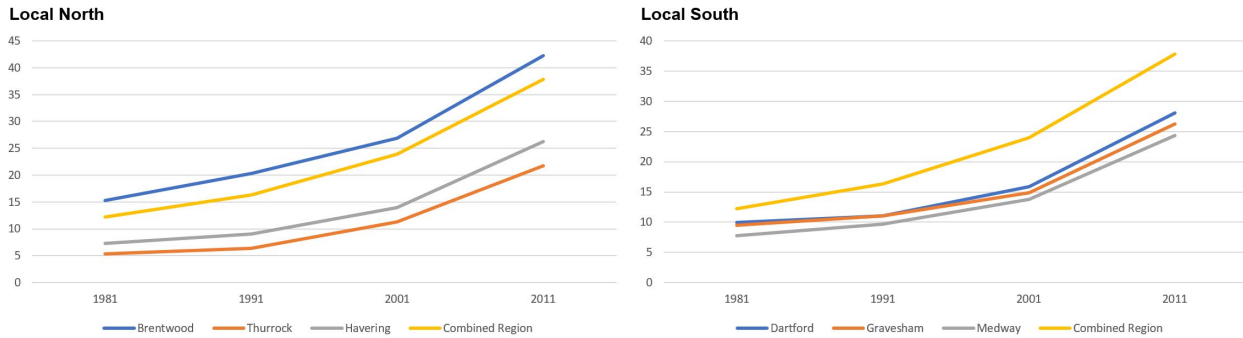
- 5.4.61 Like population, the scale and structure of employment in East London has undergone major changes since the early 1980s. As sites in London were increasingly used for high value commercial and residential purposes, with associated gains in productivity through agglomeration effects, more land intensive activities such as transport, logistics and construction located at transport nodes around the M25 including Thurrock and Dartford, which showed the greatest levels of population growth.
- 5.4.62 While both Local areas provide good access to Docklands and to London generally, they have not attracted high value services, which typically locate where there is access to large numbers of people with high skill levels and to other businesses in similar and related industries, as in the case of the revitalised East End.
- 5.4.63 Census 2011 data provides information on qualifications, which is a proxy for skills or capabilities available within the workforce.<sup>24</sup> Plate 5.10 shows the percentage of the working age population with National Vocational Qualifications (NVQ) Level 4 qualifications in the Local North and Local South respectively.<sup>25</sup> In each chart the percentages are compared with a Combined Region comprising the East of England and South-East England.
- 5.4.64 The proportion of the resident workforce with Level 4 and higher qualifications – here termed qualified workers – has been increasing over time in each LAA. In 1981 the Combined Region had a higher proportion of qualified workers than all of the Local North and Local South areas except Brentwood which has seen a slight decrease in its proportion of qualified workers. Across the two local areas, the growth rate of qualified workers lagged the Combined Region until 2001, when all LAAs saw an upturn in the growth of qualified residents. Except for Brentwood, the proportion of qualified workers in all LAAs remain well below those of the Combined Region. Given the importance of skills for high value industries, the skill base available in Havering, Thurrock and across the Local South seems likely to be a factor that has limited the attraction of high value activities. This is reflected in the GVA analysis.
- 5.4.65 The mix of industries and skills, access to jobs in London and quality of life are all factors that affect the scale and mix of industries that locate to different areas. It is well established that residential land in London has a higher value than for most commercial uses and that as a consequence low value and land intensive activities are either downsizing, relocating or ceasing trading. With the

<sup>24</sup> Census 2011 data is the latest available on qualifications.

<sup>25</sup> For consistency with 1981 definitions, the working age population is from age 18 to 64 for males and to 59 for females. The time series uses the best available equivalent to Level 4 (and higher) qualifications. In 1981 the highest level of qualification was degree or professional vocational qualification; in 1991 the corresponding level was higher degree, degree or diploma. Data for level four and higher qualifications were available for 2001 and 2010.

exception of Brentwood, which performs highly on skills and measures that are used to indicate quality of life, it is likely that the growth of industries such as transport and construction rather than advanced manufacturing and high value services in the Local North and South in part reflects the skills available locally.<sup>26</sup>

**Plate 5.10 Percentage of working age population with Level 4 and higher qualifications**



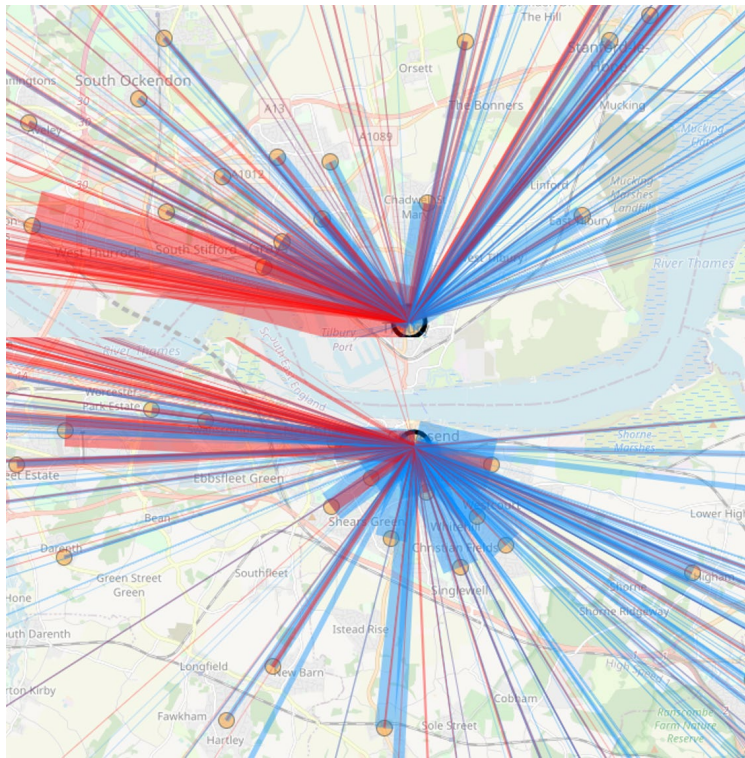
Source: Working age population calculated from Census population data (5 year age bands). Qualifications from Census small area statistics for respective years

- 5.4.66 Analysis of numbers of economically active residents and workplace jobs shows that all LAAs, except Dartford, are net exporters of workers, with Dartford a small net importer. Analysis of Census 2011 travel to work data shows that while there are flows of workers that result in net exporting of people, except in the case of Dartford, the level of travel to work flows across the Thames are minimal as shown in Plate 5.11 (O'Brien and Cheshire, 2016). The blue lines represent travel flows coming to work in Tilbury and Gravesham. The red lines show travel flows leaving Tilbury and Gravesham, to work elsewhere. This low level of travel to work flows is partly due to the cost of using the crossing deterring commuting, partly the similarity of the industries on both sides of the river not acting as a strong pull and partly the traffic conditions.
- 5.4.67 People in both the Local North and Local South travel to London in large numbers, but the other major flows are either intra-area, or into Essex from the Local North or into Kent from the Local South.

<sup>26</sup> See for example the UK Prosperity Index (Legatum, 2021).



### Plate 5.11 Travel to work patterns at the Dartford Crossing 2011



Source: O'Brien & Cheshire (2016)

## 6 Dynamic agglomeration

### 6.1 Introduction

- 6.1.1 This chapter sets out the evidence that the Project has both the potential and the transmission mechanisms to generate dynamic agglomeration impacts based on land use changes. It starts by presenting key findings from the review of other estuarial road crossings and the Project's context which indicates the presence of market failures. It then presents the following analysis:
- a. Location quotients (LQs) for the Lower Thames area which provide a relative measure of industry concentration
  - b. How these LQs have changed over the recent past, including evidence from shift-share analysis
  - c. Use of the Hirschman–Herfindahl Index of economic diversity<sup>27</sup>
  - d. An estimated input-output table for the two Local areas, to investigate inter-industry linkages
  - e. A more qualitative review of policy measures and industry clusters
  - f. Stakeholder views
- 6.1.2 Key conclusions about dynamic agglomeration are then presented.

### 6.2 Market failures

- 6.2.1 The key findings from the review of other estuarial crossings and the Project's context indicate that there are market failures in the Lower Thames area. These have arisen due to:
- a. Similarities in economic structures between the two Local areas which are in part due to how the physical and psychological barrier effect of the estuary and disincentive to explore cross-river markets has led to separate markets developing for manufacturing, private sector services and labour.
  - b. The costs for firms operating on one side of the river of getting information on cross-river opportunities, while the risks associated with entering and competing in cross-river markets are perceived to be high.
  - c. The barrier effect of the estuary which protects some firms from competition and enables less efficient firms to survive. Exposure to greater competition would drive firms to reduce costs and operate more efficiently.

<sup>27</sup> See for example The measurement of specialisation – the choice of indices (Palan N, 2010).

- d. Some firms operating in markets on both sides of the estuary which employ inefficient operating structures with duplication of production and/or service facilities. The economies of scale that would be delivered by having a larger hub operation are sacrificed because of the transport costs of crossing the estuary.
- e. The labour market being severed, as shown in travel to work data (see Plate 5.11), in that workers do not look for jobs across the river and there is some evidence that firms strongly prefer to hire workers who reside on the same side of the river as their business.

6.2.2 Therefore, in addition to the market failure that arises because firms do not fully take into account external impacts, in particular agglomeration effects that benefit other firms, there are market failures arising from limited information, risk perceptions and indivisibilities. The context of the estuary therefore limits the propensity for businesses to develop in co-located clusters to a much greater extent than happens in other places where:

- a. Transport costs are lower
- b. Information on non-local markets is either less costly or is perceived to be less costly
- c. Risks are perceived to be lower

6.2.3 Lower transport costs and traffic congestion due to the Project would make the Lower Thames area feel more like other places that are not physically separated and reduce the market failures associated with information and risk and enable firms to reorganise and avoid costly duplication of activities.

6.2.4 The analysis undertaken to identify dynamic agglomeration impacts considered:

- a. The existence of embryonic or emerging clusters within an industry (or localisation economies) that could develop more strongly
- b. The existence of embryonic or emerging clusters across industries (or urbanisation economies) that could develop more strongly
- c. Efficiency gains where a business could restructure its operations between locations by concentrating more activity at one location and closing other locations<sup>28</sup>

6.2.5 There are also likely to be impacts within the labour market that include changes in travel to work patterns and some migration in order to access employment opportunities.

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<sup>28</sup> The existence and survival of less efficient organisational structures arises because of the trade-off between the costs of operating at multiple dispersed locations and the cost of serving markets from fewer less dispersed locations. The market failure occurs when there are indivisibilities such as where a unit has a minimum size which makes it impossible to optimise the scale of operations at the margin and where operations cease, labour and land resources can be put to other better uses.

## 6.3 Location Quotients

- 6.3.1 Business clusters, or co-located groups of firms, within an industry usually exhibit a high concentration of employment in that industry which can be measured in relative terms using LQs. Clusters can also exist and be identified across related industries through business-to-business transactions and where transactional relationships are known or can be estimated from input-output tables as well as using LQ data.<sup>29</sup>
- 6.3.2 LQs provide a useful indicator of industries that may have already developed, or are developing, as local clusters. An LQ of over 1 shows a higher than average concentration of employment, with 2 representing double the national average and 0.5 half the national average.
- 6.3.3 Table 6.1 shows LQs of industry sectors within manufacturing, utilities and construction in 2010 and 2020 that have been identified as having more than 200 employees in either the Local North or Local South.<sup>30</sup> Table 6.2 shows LQs for the same years for private sector services industries that employ at least 1,000 persons in either the Local North or the Local South. The highest LQs in Table 6.1 and Table 6.2 are highlighted.
- 6.3.4 For the two local areas, the LQs show:
- a. Concentrations on both sides of the estuary in employment for sectors related to construction, transport and logistics and waste management, indicating some duplication of economic activities and evidence that business clusters exist or are beginning to emerge. Where industries can benefit from internal or external economies, such duplication is inefficient.
  - b. Other sectors have concentrations on one side only which indicates a degree of divergence in how local industry structures have developed. Other evidence confirms that manufacturing in the Local areas has tended to diverge with a less uniform recent structure than in 2010. The high LQs in both local areas in two sectors – waste collection, treatment and disposal activities; materials recovery and construction of buildings – reflect the degree to which these activities are transport and land intensive.
  - c. Private sector services exhibit a greater degree of similarity between activities in the Local North and Local South. Services are people businesses that, in many instances, interface with population centres and their locations reflect access to employees and/or to customers. For transport related services, locations close to transport nodes are important because they are both land and transport intensive.
- 6.3.5 While not all the industries in the Lower Thames area are at the cutting edge of technological developments or innovation, they are all fundamental to the wider functioning of the local, regional and national economy. Most clustering industries in the Lower Thames area have high transport costs and in some

<sup>29</sup> An example is agricultural production, food and beverage processing, product distribution and local food and beverage service.

<sup>30</sup> An employment threshold was used because very small industries are unlikely to be, or become, concentrations of employment

cases are specifically located in the area because of their connectivity requirements.

- 6.3.6 Rod Eddington identified in his 2006 Transport Study that journey reliability is particularly important to certain business sectors such as those dealing in perishable goods or those that rely on just in time delivery (Department for Transport, 2006). These industries are therefore likely to benefit from the Project and large journey time reliability benefits are included in the Project’s appraisal. In a competitive environment those benefits will be passed on to their customers through the supply chain linkages between businesses.<sup>31</sup>
- 6.3.7 The most notable example, where there is strong evidence of existing clustering in the Lower Thames area is the transport, logistics and storage sector, which has the highest concentration of local employment of any sector in the country. The importance of this cluster to the local area was also confirmed by qualitative evidence as described later in this chapter.

**Table 6.1 Location Quotients – manufacturing, utilities and construction**

Industry Sector	Local North		Local South	
	2010	2020	2010	2020
10 : Manufacture of food products	0.486	0.440	0.203	0.351
16 : Manufacture of wood and of products of wood and cork, except furniture <sup>32</sup>	0.692	0.616	0.373	0.244
17 : Manufacture of paper and paper products	1.194	0.665	3.110	1.134
18 : Printing and reproduction of recorded media	0.680	0.473	1.372	1.230
19 : Manufacture of coke and refined petroleum products	10.221	2.782	3.377	3.163
20 : Manufacture of chemicals and chemical products	1.223	1.215	0.854	0.719
21 : Manufacture of basic pharmaceutical products and pharmaceutical preparations	3.986	0.590	0.243	0.067
22 : Manufacture of rubber and plastic products	0.509	0.417	0.715	0.360
23 : Manufacture of other non-metallic mineral products	1.150	1.099	0.486	0.996
24 : Manufacture of basic metals	0.040	0.115	0.714	0.836
25 : Manufacture of fabricated metal products, except machinery and equipment	0.647	0.428	0.928	1.030
26 : Manufacture of computer, electronic and optical products	0.121	0.050	2.212	2.583
27 : Manufacture of electrical equipment	0.431	0.919	0.325	0.903
28 : Manufacture of machinery and equipment n.e.c.	0.565	0.213	1.519	0.853
29 : Manufacture of motor vehicles, trailers and semi-trailers	1.133	0.539	0.074	0.098
31 : Manufacture of furniture	1.236	1.082	0.637	0.976
32 : Other manufacturing	0.541	0.387	1.247	0.420

<sup>31</sup> Buyer-seller or input-output linkages occur both between industry sectors and within sectors.

<sup>32</sup> Includes manufacture of articles of straw and plaiting materials

Industry Sector	Local North		Local South	
	2010	2020	2010	2020
33 : Repair and installation of machinery and equipment	0.904	0.905	0.990	0.532
35 : Electricity, gas, steam and air conditioning supply	0.889	0.270	1.105	0.774
37 : Sewerage	2.635	2.978	1.064	1.009
38 : Waste collection, treatment and disposal activities; materials recovery	1.916	2.154	1.251	1.029
41 : Construction of buildings	1.324	1.345	0.995	1.373
42 : Civil engineering	0.849	1.030	1.485	1.259
43 : Specialised construction activities	1.663	2.124	1.454	1.657

Source: 2010: NOMIS Business Register and Employment Survey; 2020: NOMIS Business Register and Employment Survey

**Table 6.2 Location Quotients – private sector services<sup>33</sup>**

Industry sector	Local North		Local South	
	2010	2020	2010	2020
45 : Wholesale and retail trade and repair of motor vehicles and motorcycles	1.267	1.504	1.094	1.074
46 : Wholesale trade, except of motor vehicles and motorcycles	1.149	0.835	0.907	0.773
47 : Retail trade, except of motor vehicles and motorcycles	1.394	1.197	1.581	1.297
49 : Land transport and transport via pipelines	1.445	2.407	1.114	1.410
52 : Warehousing and support activities for transportation	1.879	3.330	1.604	1.812
53 : Postal and courier activities	1.262	1.052	1.328	1.729
55 : Accommodation	0.409	0.547	0.575	0.405
56 : Food and beverage service activities	0.941	0.912	1.143	1.154
61 : Telecommunications	0.907	0.755	0.553	0.667
62 : Computer programming, consultancy and related activities	0.484	0.684	0.496	0.675
64 : Financial service activities, except insurance and pension funding	0.643	0.395	0.828	0.872
66 : Activities auxiliary to financial services and insurance activities	0.900	0.875	0.454	0.650
68 : Real estate activities	0.673	0.484	0.994	0.771
69 : Legal and accounting activities	0.494	0.492	0.829	0.602
70 : Activities of head offices; management consultancy activities	0.395	0.683	0.412	0.521

<sup>33</sup> The focus of the analysis is on market-oriented services wholly or largely provided by the private sector. Public sector services are large employers, but the size and mix of their activities are determined by population size, by policy and budget factors, and by aspects such as levels of deprivation. Public sector organisations therefore operate within spatial areas that are not market based, in contrast to most private sector services that can be expected to respond to major accessibility changes.



Industry sector	Local North		Local South	
	2010	2020	2010	2020
71 : Architectural and engineering activities; technical testing and analysis	0.742	0.704	0.723	0.722
73 : Advertising and market research	1.445	0.162	0.278	0.199
77 : Rental and leasing activities	1.332	1.314	1.189	1.497
78 : Employment activities	0.908	0.704	0.960	0.942
80 : Security and investigation activities	0.583	1.230	1.238	1.916
81 : Services to buildings and landscape activities	1.682	1.473	1.074	1.885

Source: 2010: NOMIS Business Register and Employment Survey; 2020: NOMIS Business Register and Employment Survey

## 6.4 Changes in LQs over time

6.4.1 Where LQs are relatively high it is important to consider whether they have been increasing over time, as this will provide evidence that economic forces are conducive to cluster formation. This can be assessed for the two Local areas using the LQs in Table 6.1 and Table 6.2.

### Manufacturing, utilities and construction

6.4.2 Table 6.3 shows changes in LQs in manufacturing, utilities and construction.

6.4.3 LQs increased in both the Local North and Local South in four industries:

- a. Manufacture of basic metals (SIC 24)
- b. Manufacture of electrical equipment (SIC 27)
- c. Construction of buildings (SIC 41)
- d. Specialised construction activities (SIC 43)

6.4.4 The fact that LQs have increased in these industries in both the Local North and Local South could indicate that clusters are forming on both sides of the river, and therefore lacking a strong concentration of activity in a single area. This could indicate the formation of cross-river clusters, in which case it is unlikely that firms in these industries would relocate to either the Local North or Local South to create a single larger physical concentration of activity.

6.4.5 In a further 10 industries the LQs decreased on one side of the estuary while increasing on the other side. This might indicate that activities had been beginning to concentrate on one location in the eight industries in which total employment in the combined Local North and Local South grew in the period 2010 to 2020.

6.4.6 LQs rose in the Local North and fell in the Local South for:

- a. Repair and installation of machinery and equipment (SIC 33)
- b. Sewerage (SIC 37)

c. Waste collection, treatment and disposal activities; materials recovery (SIC 38)

d. Civil engineering (SIC 42)

6.4.7 LQs rose in the Local South and fell in the Local North for:

a. Manufacture of food products (SIC 10)

b. Manufacture of other non-metallic mineral products (SIC 23)

c. Manufacture of fabricated metal products, except machinery and equipment (SIC 25)

d. Manufacture of computer, electronic and optical products (SIC 26)

e. Manufacture of motor vehicles, trailers and semi-trailers (SIC 29)

f. Manufacture of furniture (SIC 31)

6.4.8 LQs in a further 10 industries fell in both the Local North and the Local South:

a. Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials (SIC 16)

b. Manufacture of paper and paper products (SIC 17)

c. Printing and reproduction of recorded media (SIC 18)

d. Manufacture of coke and refined petroleum products (SIC 19)

e. Manufacture of chemicals and chemical products (SIC 20)

f. Manufacture of basic pharmaceutical products and pharmaceutical preparations (SIC 21)

g. Manufacture of rubber and plastic products (SIC 22)

h. Manufacture of machinery and equipment (SIC 28)

i. Other manufacturing (SIC 32)

j. Electricity, gas, steam and air conditioning supply (SIC 35)

6.4.9 There may be a pattern here, in that a number of these industries are related to chemicals and associated processing. The LQ changes might signal a reduction in output as well as employment, which might be a sign of movement towards cleaner industries. Alternatively, these industries might have shed employment due to capital investment but without cutting output. The substitution of technology for labour inputs would deliver gains in labour productivity.

6.4.10 At face value the shifting geography of concentrations might indicate that there is scope for further concentrations of activity on either the north or south side of the estuary and therefore potential for land use changes that give rise to

productivity benefits. While there is no evidence that any developments are dependent on the Project, the attractiveness of land for development on either side of the River Thames is likely to increase facilitating the scope for Level 3 WEIs.

### Private sector services

- 6.4.11 Table 6.4 shows changes in LQs in Private sector services.
- 6.4.12 LQs increased in both the Local North and Local South in five industries:
- a. Land transport and transport via pipelines (SIC 49)
  - b. Warehousing and support activities for transportation (SIC 52)
  - c. Computer programming, consultancy and related activities (SIC 62)
  - d. Activities of head offices; management consultancy activities (SIC 70)
  - e. Security and investigation activities (SIC 80)
- 6.4.13 In nine industries either the Local North or Local South saw an increase in the LQ while the other area saw a decrease with the Local South experiencing more gains than the Local North.

**Table 6.3 Changes in LQs in manufacturing, utilities and construction**

Industry sector – manufacturing, utilities and construction	Change in LQ 2010 to 2020		
	Grew in one, decreased in other (showing area with growth)	Grew in both North and South	Decreased in both North and South
10: Manufacture of food products	TRUE Local South		
16 : Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials			TRUE
17: Manufacture of paper and paper products			TRUE
18: Printing and reproduction of recorded media			TRUE
19 : Manufacture of coke and refined petroleum products			TRUE
20: Manufacture of chemicals and chemical products			TRUE
21: Manufacture of basic pharmaceutical products and pharmaceutical preparations			TRUE
22: Manufacture of rubber and plastic products			TRUE

Industry sector – manufacturing, utilities and construction	Change in LQ 2010 to 2020		
	Grew in one, decreased in other (showing area with growth)	Grew in both North and South	Decreased in both North and South
23: Manufacture of other non-metallic mineral products	TRUE Local South		
24: Manufacture of basic metals		TRUE	
25: Manufacture of fabricated metal products, except machinery and equipment	TRUE Local South		
26: Manufacture of computer, electronic and optical products	TRUE Local South		
27: Manufacture of electrical equipment		TRUE	
28: Manufacture of machinery and equipment			TRUE
29: Manufacture of motor vehicles, trailers and semi-trailers	TRUE Local South		
31: Manufacture of furniture	TRUE Local South		
32: Other manufacturing			TRUE
33: Repair and installation of machinery and equipment	TRUE Local North		
35: Electricity, gas, steam and air conditioning supply			TRUE
37: Sewerage	TRUE Local North		
38: Waste collection, treatment and disposal activities; materials recovery	TRUE Local North		
41: Construction of buildings		TRUE	
42: Civil engineering	TRUE Local North		
43: Specialised construction activities		TRUE	

**Source:** Calculated from data in Table 6.1: 2010: NOMIS Business Register and Employment Survey; 2020: NOMIS Business Register and Employment Survey

**Table 6.4 Changes in LQs in private sector services**

Industry sector	Change in LQ 2010 to 2020		
	Grew in one, decreased in other (showing area with growth)	Grew in both North and South	Decreased in both North and South
45 : Wholesale and retail trade and repair of motor vehicles and motorcycles	TRUE Local North		
46: Wholesale trade, except of motor vehicles and motorcycles			TRUE
47: Retail trade, except of motor vehicles and motorcycles			TRUE
49: Land transport and transport via pipelines		TRUE	
52: Warehousing and support activities for transportation		TRUE	
53: Postal and courier activities	TRUE Local South		
55: Accommodation	TRUE Local North		
56: Food and beverage service activities	TRUE Local South		
61: Telecommunications	TRUE Local South		
62: Computer programming, consultancy and related activities		TRUE	
64: Financial service activities, except insurance and pension funding	TRUE Local South		
68: Real estate activities			TRUE
69: Legal and accounting activities			TRUE
70: Activities of head offices; management consultancy activities		TRUE	
71: Architectural and engineering activities; technical testing and analysis			TRUE
73 : Advertising and market research			TRUE
77: Rental and leasing activities	TRUE Local South		
78: Employment activities			TRUE
80: Security and investigation activities		TRUE	
81: Services to buildings and landscape activities	TRUE Local South		

Source: Calculated from data in Table 6.2: 2010: NOMIS Business Register and Employment Survey; 2020: NOMIS Business Register and Employment Survey

## 6.5 Interpreting changes in LQs

6.5.1 As an LQ is a ratio that depends upon changes both within the Local North and Local South and in England, LQs and changes in LQs are not unambiguous indicators of industry employment performance. Below, key concepts borrowed from shift-share analysis are used to interpret changes in LQs.<sup>34</sup>

6.5.2 Analysis of the underlying changes shows that the LQ of industry *i* in an area can increase even if its level of employment is shrinking. This would occur where employment in industry *i* is shrinking nationally but less so in the local area. While it might be possible to develop future clusters around industries in decline, this would require there to be unique local circumstances that would make an area successful as the location for such industries.

6.5.3 Where LQs are calculated using England as a base for the LQ of industry *i* to grow over time, the growth rate of that industry in an area divided by the average growth of all industries in that area must be greater than the growth rate of industry *i* in England divided by the growth rate of all industries in England. As an inequality:

$$g_i/g > G_i/G \dots\dots\dots(1)$$

where:

*g<sub>i</sub>* is the growth rate of industry *i* in an area

*g* is the average growth of all industries in that area

*G<sub>i</sub>* is the growth rate of industry *i* nationally

*G* is the average growth rate of all industries nationally

6.5.4 Therefore, in looking to identify cluster industries using data on changes in LQs, the following two tests should hold:

$$g_i/g > G_i/G \dots\dots\dots(2)$$

and

$$G_i/G > = 1 \dots\dots\dots(3)$$

6.5.5 In England, industry *i*'s growth rate should exceed or equal the average of all industries in England. This means that, at the level of England as a whole, it is an industry whose share of the economy is not declining.

### Manufacturing, utilities and construction

6.5.6 Table 6.5 shows those manufacturing, utilities and construction industries that meet test (3) above (i.e. they are not in decline nationally) and indicates whether test (2) (i.e. the industry's local employment growth exceeds that for the industry nationally) applies in either the Local North or Local South. Industries shown in bold are those that are not declining in England but where neither the Local North nor Local South pass test (2).

<sup>34</sup> A shift-share analysis, which determines the portion of regional economic growth or decline attributed to national, regional and industry factors, was undertaken using a model devised by Esteban-Marquillas (1972).



**Table 6.5 Manufacturing, utilities and construction industries not declining in England**

Industry	gi/g > Gi/G	
10 : Manufacture of food products		Local South
<b>11 : Manufacture of beverages</b>		
23 : Manufacture of other non-metallic mineral products		Local South
29 : Manufacture of motor vehicles, trailers and semi-trailers		Local South
<b>30 : Manufacture of other transport equipment</b>		
31 : Manufacture of furniture		Local South
33 : Repair and installation of machinery and equipment	Local North	
<b>35 : Electricity, gas, steam and air conditioning supply</b>		
36 : Water collection, treatment and supply		Local South
37 : Sewerage	Local North	
38 : Waste collection, treatment and disposal activities; materials recovery	Local North	
<b>39 : Remediation activities and other waste management services<sup>35</sup></b>		
41 : Construction of buildings	Local North	Local South
42 : Civil engineering	Local North	
43 : Specialised construction activities	Local North	Local South

Source: Calculated from data from: 2010: NOMIS Business Register and Employment Survey; 2020 NOMIS Business Register and Employment Survey

6.5.7 The analysis shows that:

- a. Four manufacturing industries in the Local South have increased their LQ while also outperforming the industry's employment growth in England.
- b. There are no manufacturing industries in the Local North that have increased their LQ and outperformed the industry's employment growth in England. The Local North is found to perform strongly in SIC 37: sewerage and SIC 38: waste collection.
- c. Only the construction of buildings (SIC 41) and specialised construction activities (SIC 43) show strong performance in both the Local North and Local South.

<sup>35</sup> This division includes the provision of remediation services, i.e. the clean-up of contaminated buildings and sites, soil, surface or ground water.

## Private sector services

- 6.5.8 Table 6.6 shows the equivalent data for private sector services.
- 6.5.9 Of the industries in Table 6.6, the following are small in employment terms:
- Motion picture, video and television programme production, sound recording and music publishing activities (SIC 59)
  - Programming and broadcasting activities (SIC 60)
  - Information service activities (SIC 63)
  - Veterinary activities (SIC 75)
- 6.5.10 These are unlikely to form clusters within the industry but might nonetheless be industries that support wider business functions including activities of head offices, office administration, business support activities and professional, scientific and technical activities, all of which pass the tests set out above.

**Table 6.6 Private sector service industries that are not declining in England**

Industry	g <i>i</i> /g > G <i>i</i> /G	
49 : Land transport and transport via pipelines	Local North	Local South
52 : Warehousing and support activities for transportation	Local North	Local South
56 : Food and beverage service activities		Local South
59 : Motion picture, video and television programme production, sound recording and music publishing activities		Local South
60 : Programming and broadcasting activities	Local North	Local South
62 : Computer programming, consultancy and related activities	Local North	Local South
63 : Information service activities	Local North	
<b>68 : Real estate activities</b>		
<b>69 : Legal and accounting activities</b>		
70 : Activities of head offices; management consultancy activities	Local North	Local South
<b>71 : Architectural and engineering activities; technical testing and analysis</b>		
74 : Other professional, scientific and technical activities	Local North	Local South
75 : Veterinary activities	Local North	
77 : Rental and leasing activities		Local South
<b>78 : Employment activities</b>		
81 : Services to buildings and landscape activities		Local South
82 : Office administrative, office support and other business support activities	Local North	Local South

Source: Calculated from data from: 2010: NOMIS Business Register and Employment Survey; 2020 NOMIS Business Register and Employment Survey

## Assessment

- 6.5.11 The above analysis provides strong support for the presence of concentrations of construction and transport industries all of which are transport dependent while also typically requiring large sites and access to transport links. It also provides support for the following embryonic clusters:
- a. Food production, with backward links to agriculture and forward links to retail, transport and food and beverage services activities
  - b. Business support services
- 6.5.12 The analysis of LQs (see Section 6.4) has identified that there is a cluster of transport and related businesses which is of a size from which further growth can be expected as more activities are attracted. Businesses in the transport and logistics cluster in the Lower Thames area include major retail distribution centres, ports and importers and exporters. For example, recent developments have included the London Gateway Logistics Park and planned further expansion of London Gateway port, the current construction of the Thames Enterprise Park, plans for Tilbury2 and the construction of the new 2.3 million square foot Amazon distribution centre (the largest in Europe) south of the Dartford Crossing.
- 6.5.13 An online search also identified major distribution centres for a range of businesses located close to the Project. These included: DVS, Tesco, Carpetright, Co-op, XPO Logistics, S&R Smith and Son, Wincanton Group, Asda, DHL, Europa, Sainsburys, Yodel, Amazon, Travis Perkins, Lidl, DPD, UPS, and TNT.
- 6.5.14 While the performances of individual industries matter, it is arguably more important to treat these industries as a group of interrelated activities in which there are co-location (or agglomeration) benefits. Taken as a group, transport and related businesses has a combined Local North and Local South LQ of 1.3. This, together with the performance of most of the group's component industries, indicates the presence of a cluster. Given improvements in transport links as an attractor, together with the location close to major ports and key routes to/from Europe, it is likely that the cluster will continue to grow.
- 6.5.15 While the Local North and Local South might not be immediately recognised as strongly business-oriented, the LQ data and especially the analysis of LQ growth indicate that there is at least an embryonic cluster of business activities. Activities such as financial services, accountancy and legal services and real estate do not figure in the findings. All of these have relatively low LQs, which might reflect the dominance of London and other large cities in these activities. Instead of the Lower Thames area developing back-office functions to serve large operations located in London, the area is seeing the emergence of its own group of business support services. It is unclear whether these can be regarded as an interrelated group of activities.

## 6.6 Hirschman–Herfindahl (HH) index of industry concentration

6.6.1 An alternative measure of industry concentration is the Hirschman–Herfindahl (HH) Index which provides an absolute measure of specialisation relative to a situation in which all industries employ the same number of persons. The higher the index the less uniform is the mix of industries. This index can be used to make comparisons over time, because the index is not affected by changes that take place in a reference area.<sup>36</sup>

6.6.2 The HH index is defined as:

$$HH = \sum_{i=1}^I b_i^a$$

where:

$b_i$  is the share of industry  $i$  in total employment

$a$  is a constant, which for the analysis was equal to 2

$i$  is the number of industries.

6.6.3 The index has a lower bound of  $1 / i$ , which for an economy with 25 industries is 0.040. This is the value of the index when every industry employs the same number of people. If, for example, 85% of employment in an industry was concentrated equally in 10 firms and the remaining 15% in a further 15 firms, the HH index would be 0.07375. The value of the index can also be divided by its lower bound where each area has the same number of industries, to provide a measure that is easy to interpret. The higher the value of the index the greater the degree of industry concentration or lower degree of uniformity of industries in an area.

6.6.4 Table 6.7 shows the value of HH indices (multiplied by 100) for four industry groups in the Local North and Local South in 2010 and 2020.

**Table 6.7 Hirschman-Herfindahl indices 2010 and 2020**

Industry group	Local North		Local South	
	2010	2020	2010	2020
Manufacturing	7.42	8.34	9.55	10.58
Manufacturing, utilities & construction	12.82	21.44	11.04	15.19
Private sector services	11.17	8.98	13.01	9.03
All of the above industries	7.76	6.63	7.84	6.04

Source: Calculated from data from: 2010: NOMIS Business Register and Employment Survey; 2020 NOMIS Business Register and Employment Survey

<sup>36</sup> This is in contrast to the Krugman Specialisation Index for which England, or some combination of the East, South East and London, would be used for reference.

- 6.6.5 The indices show that the industry structures of manufacturing, utilities and construction have in aggregate become less uniform between 2010 and 2020 in both the Local North and the Local South. This reflects, among other factors, closures and downsizing of some industries and growth of others, with overall specialisation in some industries. The increase in the index means that some industries have expanded their share of employment while others have reduced their share of employment.
- 6.6.6 In contrast, the private sector services group has become more uniform in structure between 2010 and 2020. This might reflect changes in consumer-facing sectors as household budgets expand but tastes remain, or become increasingly, similar in different areas.

## 6.7 Clusters based on groups of industries that trade with each other

- 6.7.1 The most appropriate tool for the analysis of economic linkages between industries is input-output analysis. However, there are no input-output tables based on data gathered from industries available for the Lower Thames area. In the absence of such tables, the next best alternative is to estimate a local input-output table using employment and LQ data which can then be used to explore the inter-industry relationships likely to exist at the local level.<sup>37</sup>
- 6.7.2 A regionalised input-output table has been generated using UK input-output tables (industry by industry), LQs and population data. A process of balancing the table by adjusting imports and exports was undertaken to create a final version of the table. As with all input-output analyses, there are assumptions regarding production technologies that involve constant returns to scale in all industries and that the use of these technologies at the local level is identical to those employed at the UK level.
- 6.7.3 Among the larger industries in terms of output:
- Warehousing and support activities for transportation, construction and wholesale trade (except of motor vehicles and motorcycles), rental and leasing activities and other business services purchased upwards of 70% of their inputs by value from industries in the Lower Thames area.<sup>38</sup>
  - Output multipliers calculated from the estimated tables show that legal activities, activities of head offices and management consultancies, accounting, bookkeeping, auditing, tax consultancy, architectural and engineering activities, wholesale trade (except of motor vehicles and motor cycles) and other professional scientific and technical activities had multipliers greater than the UK value for the industry, indicating strong local linkages.

<sup>37</sup> A number of approaches are available for the task of estimating regional input-output tables from national data. The approach used here was a simple transformation using LQs; a comprehensive discussion of available methods can be found in Szabo (2015).

<sup>38</sup> Other business services includes financial service activities (except insurance and pension funding), architectural and engineering activities and technical testing and analysis, computer programming, consultancy and related activities, employment activities and office administrative, office support and other business support activities.

- c. Other industries, while purchasing inputs from within the Local North and South area, were also export orientated, finding markets in the rest of the UK or internationally. These include construction, computer programming, consultancy and related activities, retail trade (except of motor vehicles and motorcycles), employment activities, and land transport services.

6.7.4 The analysis points to buying and selling linkages in the following industries: warehousing, employment activities, land transport services, wholesale trade (except motor vehicles), and construction, financial service activities and rental and leasing activities. Other industries either made large purchases of local inputs or sold a larger proportion of their outputs to local industries.

6.7.5 In Chapter 5 it was noted that some firms might be strongly focused on local markets and suppliers, especially industries that primarily produce intermediate goods and services and who are located close to their customers. With such a focus, firms in the Local North might not compete to any great extent with firms in the Local South, and vice versa. The psychological barrier effect of the estuary and a reluctance to risk stimulating competitive responses from other firms could be factors that deter firms from exploring new markets and increasing competition. In contrast, firms that supply consumer markets or export markets must address a much larger geography, as consumers are widely dispersed. Even if the river presents a barrier to labour movements, it seems unlikely to impact competition faced by firms selling consumer or intermediate goods in national or international markets. Some firms operate at, and from, units on both the north and south sides of the river in order to serve each severed market. It may be the case that because of the duplication of activities on each side of the river, the improved connectivity would, for certain road reliant industries, result in greater competitive pressure/potential for knowledge sharing, thereby encouraging reorganisation of activities as firms seek to respond.

6.7.6 The analysis supports the identification of clusters in transport related activities, construction across a range of business support services, while also identifying business and transport services that were selling to other parts of the UK, possibly on the basis of local comparative advantage.

## 6.8 Clusters and policy measures

6.8.1 While some clusters will emerge and develop based on the economic logic of co-location and location changes to maximise access to markets, suppliers and skills, others are more embryonic and require a sound policy framework to provide the conditions in which to grow. These embryonic clusters are not evident within historic economic data, but qualitatively their growth potential can be appreciated by information gained from business development professionals and others who have close contact with the region's small businesses.

6.8.2 There continues to be a concerted effort to develop a cluster of creative industries around the Thames Estuary. This is the goal of the Thames Area Production Corridor, supported by the South East Local Enterprise Partnership (SELEP) and the Mayor of London (Mayor of London, 2020). While this cluster does not appear in the economic data to date, the qualitative evidence suggests that it will be an important part of the area's future. Similarly, investments in life



sciences and environmental technology (benefiting from the area’s coastal proximity) in the Lower Thames area are growing and business clusters in these sectors are starting to form but are not yet of sufficient size to appear in economic data.

- 6.8.3 Kent has long been the ‘Garden of England’, but agriculture and farming businesses are, by nature, quite spread out and dispersed. In recent years these businesses have increased their level of automation, reducing their need for employment. Some employment is also seasonal and harder to track in the economic data. Therefore, the existence of such a cluster is not readily evident in the economic data. There is also evidence of a recent reduction in farming activity in the areas closest to the Project. This may well indicate land use change as other industries and housing are making more productive use of land. However, qualitative evidence suggests that farming, food production and distribution is still an important part of the wider area’s economy and the dependence of perishable goods on reliable transport for its distribution means that this sector is likely to be a key beneficiary of the Project.
- 6.8.4 The manufacture of food products is a sector that has been identified in the shift-share analysis as meeting the growth criteria in the Local South. However, its linkages with other industries appear relatively weak based on the input-output analysis. This is an important industry within a strong cross industry cluster. Food manufacture can be expected to have linkages to suppliers, including agriculture and paper and packaging and sales to the retail and wholesale sectors (via transport and warehousing), to hotels, restaurants and to the health and residential social care sectors.
- 6.8.5 Consultations and discussions have helped to identify emerging or embryonic clusters in addition to those identified in the analysis of the economic data. All existing and emerging clusters are shown in Table 6.8.

**Table 6.8 Business clusters in the Lower Thames area**

Cluster type	Cluster name	Area
Key clusters	Transport, logistics and storage	Thurrock and Dartford
	Construction	Lower Thames area
	Business support services	Lower Thames area
	Agri-food	Kent and Essex
Emerging clusters	Creative industries	Thames Estuary
	Maintenance and sale of motor vehicles	Lower Thames area
	Robotics and advanced manufacturing	Lower Thames area
	Ceramics	Lower Thames area
	Financial and insurance services	Brentwood and Havering

## 6.9 Stakeholder views

- 6.9.1 In addition to the quantitative and qualitative analysis set out above, transport and logistics stakeholders were interviewed in 2020 by National Highways about the likely impacts of the Project.
- 6.9.2 These discussions confirmed that the River Thames is seen as a major barrier to freight movement with high risks of delays and an absence of reasonable alternative routes. The stakeholders stated that the Project would improve reliability, reduce journey times, and provide a strategic choice of Thames crossings, allowing trucks to avoid major incidents without a large journey penalty. The immediate impact of the Project would, therefore, be to reduce average journey times and padding of journey times to compensate for delay, leading to reduced freight costs for most businesses in the study area.
- 6.9.3 In addition, National Highways carried out a survey of Dartford Crossing business users in May 2021, which generated responses from 2,299 Dart Charge business account holders (National Highways, 2021). This found that:
- a. 82% of respondents said that traffic congestion is a major challenge for their business.
  - b. 89% of respondents said that they would value an alternative road crossing of the River Thames east of the Dartford Crossing.
  - c. 49% of respondents stated that the Lower Thames Crossing will help their business grow when open.
  - d. Better access to new customers and transport hubs were the most popular ways the Lower Thames Crossing will help businesses.
- 6.9.4 For existing businesses, the Project would improve access to suppliers and customers, particularly those businesses located in South Essex or North Kent. This may help those businesses to expand. In some cases, this could result in changes to distribution territories, although the one major retailer interviewed felt that Essex and East London and Kent and South East London were major markets in their own right and might continue to be served from distribution centres on either side of the River Thames.
- 6.9.5 There continues to be pressure to develop distribution centres and other industrial land uses in Kent and Essex. The Project would improve the attractiveness of areas within its vicinity for developers. In both counties there is space available for development. Kent has large areas of land designated for distribution development and is perceived to have a better supply of labour than in Essex. There is evidence from face-to-face interviews with businesses, property developers and local development agencies, that the River Thames has acted as a deterrent to investment in Kent.
- 6.9.6 Property and regeneration organisations interviewed expressed the view that the Project would increase demand for logistics space in the area, and with a good supply of sites already designated there was an expectation that these sites would be put into productive use.

- 6.9.7 Meetings with industry stakeholders found that there is an expectation that the Project would transform the way that businesses view the River Thames as a barrier, leading to changed dynamics when planning investment, particularly in Kent, Thurrock and Essex. Research and interviews suggested that the Project would make the study area more attractive for logistics businesses, leading to increased demand for distribution space in the study area. Equally importantly, the study identified large areas of land in Essex and particularly in Kent which are suitable for logistics businesses and are available for development.
- 6.9.8 The combination of a step change in perception of reliability and reduced journey times with available land is likely to result in more logistics businesses (and other businesses depending on efficient logistics) locating in Kent, Thurrock and Essex, which provides confidence that dynamic agglomeration benefits can and will be delivered by the Project.
- 6.9.9 The Project will also have benefits for traffic travelling to or from Dover which is a major port for ro-ro (roll on–roll off) traffic. Goods traffic using ro-ro services comprises unaccompanied road trailers and road goods vehicles with or without accompanying trailers. Dover handles very little of the former as it is a short crossing to France and as such is best suited to carrying goods vehicles that are accompanied by their drivers. Accompanied services are used for more urgent shipments and for perishable goods, and are well suited to short crossings when driver down time is not a key factor.<sup>39</sup>
- 6.9.10 In 2020:
- a. 3.77 million units of road goods vehicles with or without accompanying trailers moved through UK ports (inbound and outbound movements), of which Dover handled 2.2 million units (58%) (Department for Transport, b).
  - b. In terms of tonnage, the UK total was 39.70 million tonnes, of which Dover handled 21.04 million tonnes (53%).
  - c. The UK totals include intra-UK traffic to and from Northern Ireland, and after adjusting for this Dover's share of traffic was 64% of units and 58% of tonnage carried as road goods vehicles with or without accompanying trailers.
  - d. In terms of traffic to the near Europe countries of France, the Netherlands, Belgium, Germany and Denmark, the total number of units carried as road goods vehicles with or without accompanying trailers was 2.65 million units, of which Dover alone handled 2.22 million units (84%). This traffic amounted to 26.7 million tonnes, of which Dover handled 21.04 million tonnes (79%).
- 6.9.11 Therefore, the route linking Dover to the major UK markets and centres of production is strategically important and particularly likely to incur economic impacts when there are major road network delays or routine unreliability.

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<sup>39</sup> Unaccompanied services tend to have longer journey times due to the need to drive the trailers on and off the ferries. While journey times are longer the driver does not have non-driving time as is the case when travelling with the vehicle.

## 6.10 Statutory Consultation

- 6.10.1 Access to jobs was a key concern for respondents to the Project's Statutory Consultation and there are multiple responses from people who have lost their jobs due to the unreliability of travel over the estuary (Highways England, 2018). Others have felt forced to leave a job which they liked and others say they would not apply for a job on the other side of the estuary due to the long and unpredictable journey times. This indicates that job matching is not currently optimised in the areas around the estuary. Jobs which are filled by employees with the right skills and aspirations are more likely to benefit the employer and the employee with higher productivity. This constraint on efficient job matching reduces the movement of people to more productive jobs.
- 6.10.2 Businesses report negative impacts on business activity due to the congestion at Dartford Crossing. This includes multiple references to the cost of time delays to the business and an inability to access customers. Separately, businesses also highlight the difficulty in accessing employees on the other side of the estuary. These impacts to existing business operations are captured as part of the Level 1 and 2 appraisal, but are also likely to constrain existing businesses with aspirations to grow in the area and deter other businesses from choosing the area as a good place to establish a presence. This will hinder dynamic clustering of business activity and constrain the agglomerative benefits to the economy. It is clear from the responses received that many people believe businesses would benefit from more efficient job matching and more efficient operation if the Project was in place.

## 6.11 Other survey evidence

- 6.11.1 A Federation of Small Businesses survey of its members located in Kent and Essex was conducted in 2020 (Federation of Small Businesses, 2020). Of the 144 respondents, 65% of respondent businesses were located in Kent and 34% in Essex (including Thurrock). Respondents cited transport congestion (54%), recruitment and retention of skilled employees (32%) and broadband and telephony (29%) as the major challenges they face.<sup>40</sup>
- 6.11.2 The Project was well known to respondents: 97% were aware of it and 83% supported it; 57% of respondents said the Project would help their businesses to grow. The Project was expected to help growth by providing:
- Better access to new customers (80%)
  - Better access to transport hubs (55%)
  - Better access to new markets (49%)
  - Better access to ports (29%)
  - Better access to a greater talent pool (28%)
- 6.11.3 Individual respondents noted the potential for lower congestion, lower environmental damage and the attraction of industries and development.

<sup>40</sup> Respondents were asked to cite all challenges that were relevant to their business.

- 6.11.4 These are considered to be high percentages, given that there is a large and diverse number of businesses in the Lower Thames area that have different demands from the road network.
- 6.11.5 The British Chamber of Commerce 2019 Infrastructure Survey found that while there was a low awareness of the Project among its members nationally, of those businesses who had some, or a lot of, knowledge of the Project, the most important wider economic impacts were expected to be as follows (British Chamber of Commerce, 2019):
- a. Increased access to new or existing customers (28% of respondents with awareness of the Project)
  - b. Increased access to seaports (22%)
  - c. Increased efficiency or productivity of their business (20%)
  - d. Increased access to new or existing suppliers (21%)
  - e. Increased access to airports (20%)

## 7 Moves to more or less productive jobs

### 7.1 Introduction

- 7.1.1 This chapter sets out the evidence that the Project has the potential to cause labour to move to more or less productive jobs (M2MLPJ). Such movements reflect two distinct responses to a transport investment, namely:
- The movement of jobs which arises because of location decisions by the firms. This can be regarded as a demand side effect, where decisions by employers change the spatial pattern of demand for labour inputs.<sup>41</sup>
  - The movement of workers in response to the transport scheme and to the decisions made by employers in response to the transport scheme.
- 7.1.2 A net loss or net gain from M2MLPJ arises only where there is a change in job location that involves the movement of employment from one location to another, with no net employment increase at the UK level.<sup>42</sup> M2MLPJ therefore involves land use changes, including the intensity of land use.
- 7.1.3 A net gain or loss arises because there are productivity differences between areas. The change in the location of employment also gives rise to increases or decreases in dynamic clustering: net gains or losses from M2MLPJ cannot occur without changes in dynamic clustering, which will make some areas more productive and others less productive, depending on the relative strengths of agglomeration and disagglomeration effects.<sup>43</sup>
- 7.1.4 M2MLPJ and dynamic clustering therefore operate together. Both responses are important, and how they interact depends on context and geography. This chapter focuses on the movement of workers that might occur in response to changes in the location of employment.

### 7.2 How businesses might change locations

- 7.2.1 The Project is expected to induce or enable different types of movements of employing businesses. Depending on the origins and destinations of relocations by businesses, these could cause workers to relocate their place of work, their place of residence or both.
- 7.2.2 The principal types of relocation that could be undertaken by businesses are:
- A change in location by a business currently located in the Local North (or South) to the Local South (or North) to take advantage of factors such as the benefits from being part of a cluster of firms, transport access for goods

<sup>41</sup> Note however that an employer might choose to relocate in order to have access to a larger/better qualified/lower cost labour pool. In the UK spatial mobility within the population is low, while businesses can relocate either wholly or partially, for example by opening a branch operation.

<sup>42</sup> There are scenarios in which the first round effect will be to reduce UK employment, for example when a move involves the rationalisation of sites or products. The assumption of full employment implies that a second round effect will involve the re-employment of people displaced in the first round.

<sup>43</sup> Business reorganisations also move jobs spatially, and even where a business simply expands in one location and decreases employment in another, there will be an element of dynamic clustering due to the change in the density of economic activity in each area.



movements, access to suppliers and customers, access to skills and the cost and availability of land and property.

- b. The movement of firms outwards from London that could be attracted into the Local North and Local South. The evidence from the land market is that some firms located closer to London, and typically those engaged in low value activities, are being displaced outwards because the owners of sites are able to obtain higher returns from residential use and from high value commercial development.<sup>44</sup>
- c. The changes in east–west accessibility due to the Project, which might attract firms currently located to the east of the Project into the Local North and Local South; such firms might relocate to exploit the benefits of proximity to the existing and developing clusters in the Local North and Local South.
- d. Relocation from elsewhere in the UK.
- e. The attraction of FDI which might choose to locate in proximity to the Project.

### Relocations within the Local North and Local South

- 7.2.3 Some businesses are expected to relocate some or all of their operations from the Local North to the Local South or vice versa. There are several permutations of relocation movements depending on the spatial distribution of a business' operations prior to the Project.<sup>45</sup> Table 7.1 illustrates this for a business with its sole or principal operations in the Local South and shows labour market responses (M2MLPJ) and highlights the need to distinguish short-term changes in the labour market from long-term ones.
- 7.2.4 Table 6.8 identifies actual and embryonic clusters in the Lower Thames area which confer external economies on members of those clusters. Some cross-river relocations will be undertaken to obtain private benefits from these external economies where they exceed additional transport and other costs.<sup>46,47</sup>
- 7.2.5 Without the Project a move to exploit cluster benefits was unattractive because the costs of serving the market from a cross-river location outweighed the cluster benefits. With the Project and its lowering of costs to access markets, it becomes attractive for some businesses to relocate to exploit the cluster benefits, even though this incurs additional transport costs.

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<sup>44</sup> A firm might own its site but the opportunity cost of remaining there might make it attractive to move outwards where land and labour are cheaper. In some instances, traffic congestion might be a further factor affecting choice of location.

<sup>45</sup> Not necessarily prior to the opening of the Project: if businesses believe that other firms will relocate and therefore drive up the price of land and/or labour, some businesses might relocate activities in anticipation of the opening of the Project.

<sup>46</sup> These are likely to increase as a cluster grows. However factors such as increasing land and labour costs and congestion tend to limit the size of clusters.

<sup>47</sup> There is no market mechanism that would enable a firm that benefits from clustering to pay (compensate) other firms to relocate in order to increase the benefits of the cluster.

7.2.6 In the case of a cross-river relocation, the enhanced accessibility created by the Project is expected also to reduce the barrier effect that currently severs the labour market (see Plate 5.11). Therefore, at least in the short term, a business that does relocate across the river might continue to employ many of the personnel it employed prior to its move.<sup>48</sup> The relocating business gains net benefits by moving, but employees who continue to work for that business incur disbenefits in the form of longer commutes and higher financial costs.<sup>49</sup>

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<sup>48</sup> TAG indicates that long-term changes need to be considered. It is possible that due to factors such as increasing future congestion and commuting fatigue employees will gradually look for and find employment on the side of the river in which they reside.

<sup>49</sup> A business might share some of its cluster benefits with employees in the form of higher wages so as to retain their services.

**Table 7.1 Business relocation responses and labour impacts**

Current locations	Business response to the Project	Rationale	Labour impacts
<b>Local South only</b>	Expand operations in the Local South	The Project enables the business to be competitive in the Local North without creating an operation in the Local North	Additional personnel required; limited/no recruitment from the Local North.
	Open a subsidiary operation in the Local North	The Project enables the business to be competitive in the Local North; an operation in the Local North is needed for proximity to customers <sup>50</sup>	Additional personnel required in Local North and recruitment mainly/wholly from within the Local North. Management staff might be recruited in the Local North or travel from Local South in the short term.
	Relocate the main operation to the Local North, retain subsidiary operation in the Local South	A location in the Local North offers large cluster-related benefits; the Project enables the business to manage an operation in the Local South that is needed to retain customers in that market	Personnel required in Local North; recruitment from within the Local North but some staff including management redeployed from Local South in short term. Long term mix of migration of staff from Local South to Local North, increased cross-river travel to work and staff finding alternative employers in Local South.
	Relocate all operations to the Local North	A location in the Local North offers large cluster-related benefits; the Project enables the business to serve customers in the Local South from the Local North	Personnel required in Local North; recruitment from within the Local North but some staff including management redeployed from Local South in short term. Long term mix of migration of staff from Local South to Local North, increased cross-river travel to work and staff finding alternative employers in Local South.

<sup>50</sup> The need to send ‘quality’ signals to customers emerged following Akerlof’s paper: The Market for Lemons: Quality Uncertainty and the Market Mechanism (Akerlof, 1970).

Current locations	Business response to the Project	Rationale	Labour impacts
<b>Main operations in Local South, subsidiary site(s) in Local North</b>	Expand operations in the Local South	The Project enables the business to be more competitive in the Local North without expanding its operation in the Local North	Additional personnel required; limited/no recruitment from the Local North.
	Expand operations in the Local South and close operations in the Local North	The Project enables the business to be more competitive in the Local North without needing an operation in the Local North	Additional personnel required in Local South, recruitment mainly/wholly from within the Local South. Management staff employed in the Local North might travel to the Local South in the short term.
	Relocate the main operation to the Local North, retain subsidiary operation in the Local South	A location in the Local North offers large cluster-related benefits; the Project enables the business to manage an operation in the Local South that is needed to retain customers in that market	Personnel required for Local North; recruitment from within the Local North but some staff including management redeployed from Local South in short term. Long term mix of migration of staff from Local South to Local North, increased cross-river travel to work and staff finding alternative employers in Local South.
	Relocate all operations to the Local North	A location in the Local North offers large cluster-related benefits; the Project enables the business to serve customers in the Local South from the Local North	Personnel required in Local North; recruitment from within the Local North but some staff including management will travel from the Local South in short term. Long term mix of migration of staff from Local South to Local North, increased cross-river travel to work and staff finding alternative employers in Local South.

- 7.2.7 In time it is likely that increasing proportions of personnel would reside in and travel to work from the same side of the river as the location of the employing business. This is likely to be a combination of two processes, namely migration by a worker to where the business has relocated and staff turnover in the relocated business as workers find new jobs closer to their place of residence, that is, on the side of the river from which the business moved.
- 7.2.8 While the level of job creation due to relocations is unknown, businesses that move would have to be more competitive in their new locations, otherwise they would not survive. The impact of the relocating firm on its competitors will depend on the extent to which the relocating firm expands output and the elasticity of demand for its products. While the move may result in some displacement, total industry output and productivity will increase, although the impact on employment is ambiguous depending on how the ratio of output to employment changes.

### Displacement of businesses from London

- 7.2.9 Similar considerations apply to businesses that relocate outwards from London.<sup>51</sup> Outcomes in terms of employment and travel to work would depend upon where the business located from. A long-distance relocation – for example from Hammersmith to Brentwood – might be expected to result in very few personnel moving and the business would largely recruit people from an area around its new location. Personnel who wish remain with the business might decide to relocate rather than face a long commute.
- 7.2.10 In contrast, a relocation from, for example, Barking and Dagenham to Thurrock would be more likely to result in the retention of existing personnel. If employees had been commuting inwards to London they might benefit from a shorter commute or one in the direction opposite to normal peak period flows of people and vehicles.<sup>52</sup> Where the relocation does not involve a large change in terms of geography and length of commute, some combination of retention of existing personnel and recruitment of new employees would be the most likely outcome.
- 7.2.11 Moves of businesses from London will be to less productive areas and in principle therefore would count as a disbenefit to the Project. However, the move of a business from London should not be considered without also looking at the knock-on effects of such a move. Land for business purposes is scarce and expensive even in most of Outer London, and the move of a business from London frees up a site that could be used for other productive purposes.<sup>53</sup>
- 7.2.12 This might involve the expansion of a business that would otherwise be constrained at its existing location in London.<sup>54</sup> Alternatively freeing up a site could enable a move towards London by a business that otherwise would be

<sup>51</sup> Note that to count as an impact of the Project the move itself has to be attributable to the Project; where the location of a move that would happen anyway is influenced by the Project the impact is the difference in productivity outcomes between the Project and the next most likely location.

<sup>52</sup> The agglomeration impacts of such moves also need to be considered: by moving, more productive activities can be located closer to the economic mass of London, while a less productive activity is relocated. While that activity might bring almost zero agglomeration benefits to the Local North and Local South, its relocation does bring land use closer to an optimum.

<sup>53</sup> Sites could also be used for residential purposes and land value uplifts provide an indicator of welfare gains from such change of use.

<sup>54</sup> Market failure in the land market brings about a situation in which output is lost due to constraints on businesses that could expand. A functioning land market would enable such firms to bid for sites for expansion.

unable to locate there. The inward moving business moves to a more productive area. These moves might involve no net job creation, but the net productivity outcomes and the M2MLPJ impacts could be large.

### Relocation from areas to the east of the Project

- 7.2.13 Businesses that relocate from areas to the east of the Project would do so from areas that overall exhibit lower productivity than the Local North and Local South.<sup>55</sup> This would be expected to give rise to M2MLPJ impacts as it involves displacement of employment from one location to another to an area with higher productivity.

### Foreign Direct Investment

- 7.2.14 FDI, such as the establishment of a manufacturing plant or a UK or European head office, is a source of new demand for labour which will impact on the economy into which it locates. FDI can have both direct and indirect impacts on productivity in the wider economy, for example through technology transfer and through increasing competition in product and factor markets.
- 7.2.15 The creation of areas around the Project as zones for investment could attract FDI, which would generate wider productivity benefits. However, to be attributed as a benefit to the Project the FDI would have to be clearly additional at the UK level, that is, it would not have come to the UK in the absence of the Project.
- 7.2.16 The arrival of a new foreign business would generate demand for skills; recruitment of personnel by the FDI businesses would therefore change the location of place of work for members of the accessible labour force that leave existing employers to work for the FDI business. For there to be no net job creation, other businesses would lose personnel through competitive processes in the labour market and in markets for products and services. If, as seems reasonable, the incoming business is more productive than the average for its labour catchment, moves by people to work in the FDI business would be a move to a more productive job.
- 7.2.17 It should also be noted that one impact of a new FDI business would be to adjust the productivity of its location relative to all other areas. Therefore, while jobs moving to the area of the Project might otherwise give rise to moves to less productive jobs, the advent of a FDI could reduce or reverse the extent to which moving to a job in the area of the Project is a move to a less productive job.
- 7.2.18 This impact of the Project is recognised as a Level 3 International Trade impact in the Economic Appraisal Report.

## 7.3 Accessibility changes generated by the Project

- 7.3.1 While some workers will relocate their places of residence when businesses relocate, generally the level of such employee migration in the UK (and much of Europe) is very low, especially when compared with the USA. Nonetheless in certain contexts workers' relocation of their places of residence is a response to the relocation of jobs. However, employment change would be only one of

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<sup>55</sup> From an analysis of the Nomenclature of Territorial Units for Statistics (NUTS) 3 data which provide a hierarchical classification of administrative areas in the EU. The former NUTS classifications have been replaced by ITLs which mirror the former NUTS 1, 2 and 3 areas.



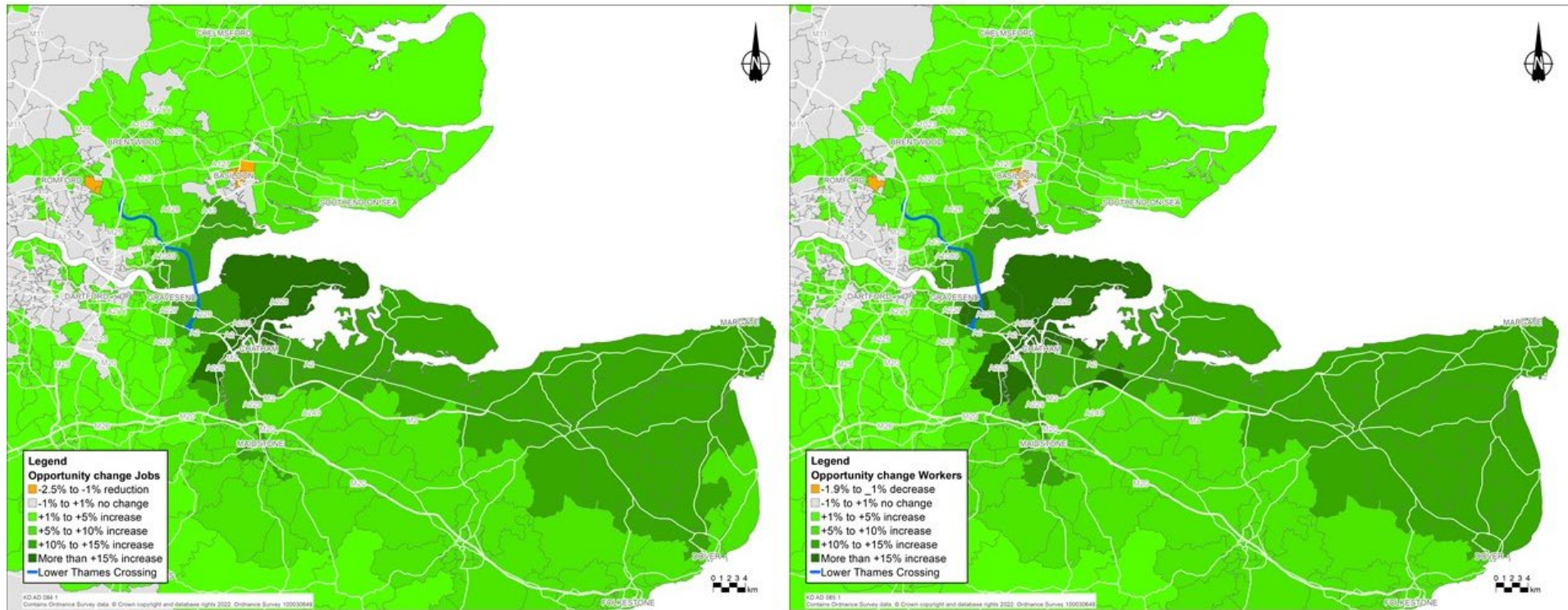
several factors that a household considers when assessing the advantages and disadvantages of relocating.

- 7.3.2 The more likely outcome of a relocation by a business is a change in job search behaviour that would be undertaken by workers who choose not to travel to the employer's new location. This could include extending the spatial area of job search activity. To assess this, an analysis of accessibility was undertaken in order to assess the extent to which the Project changes the ease with which workers can move jobs and employers can hire new staff.

### Access to jobs and workers

- 7.3.3 The improvement in accessibility due to the Project was calculated using a continuous weighted opportunity measure based upon modelled highway travel times from the LTAM model. This shows the impacts of the Project on available jobs (for workers) and available workers (for employers). The calculation used an exponential deterrence parameter, which reduces the attractiveness of a producer/attractor as travel time increases (upon an exponential curve). Therefore, this enabled the number of opportunities in terms of numbers of jobs and workers to be calculated.
- 7.3.4 Opportunity is defined as a function of highway travel time and destination attractiveness (which may be weighted) and measured using a Hansen weighted calculation (time multiplied by an exponential function). Deterrence values are taken from advice produced by the Department for Transport on how travel time calculations are carried out (Department for Transport, 2014b).
- 7.3.5 The exponential function represents distance decay, that is, the longer you need to travel, the less likelihood there is that travel occurs. The exponential value differs by destination type; people are more likely to travel further to employment than to a supermarket.
- 7.3.6 Key inputs to the analysis were travel times from the LTAM model and data on population, jobs and the number of workers.
- 7.3.7 Plate 7.1 visually shows the change in accessibility as a result of the Project at a zonal level. The map on the left shows the change in access to jobs and the map on the right shows the change in access to workers. It is clear that most Lower Thames areas are expected to see improvements in accessibility to jobs and workers with the greatest improvements in Grays, Tilbury, Rochester, Gillingham and the Hoo Peninsula in Medway.
- 7.3.8 Improved accessibility will enable workers to look for and secure employment opportunities across the river. Where this behaviour is a response to businesses moving and changing productivity through dynamic clustering, there is an expectation that it will be accompanied by a better matching of skills to jobs and would represent a productivity benefit.

**Plate 7.1 Change in number of jobs (left) and number of workers (right)**



## 7.4 Migration

- 7.4.1 The extent to which people migration will take place in response to relocations by businesses depends upon a combination of demand and supply side factors.
- 7.4.2 On the demand side, when a business relocates it is reasonable to expect that some of that business' personnel will wish to continue to work for that employer, and consequently will continue to do so in the short term by changing travel to work behaviour and in the longer term by changing place of residence. Depending on the distance over which the business relocation takes place and how accessible the new location is from where existing personnel live, the changed travel to work pattern might be sustainable in the long term. However, especially where the journey to work is longer or more expensive than previously, the relocation of the businesses could give rise to personnel facing decisions about changing employer or changing place of residence.
- 7.4.3 People are more likely to change employer if they have to change their place of residence and factors such as schooling, family ties and access to social and leisure opportunities play a key role. The data on changes in place of residence lend support to this: it is known that, in the UK, changes in place of residence are largely made over short distances. Nonetheless it is likely that a proportion of personnel will prefer to relocate.<sup>56</sup>
- 7.4.4 The supply side also affects how many people can actually relocate in a given year. Construction completions play a major role, alongside the turnover of the existing housing stock due to factors such as retirements and deaths within the elderly population. These changes allow people to move within, but also into and out of an area over time.
- 7.4.5 For any move, the choice of location will be influenced by, among other things, employment opportunities locally and in a wider commuting area. The size of the commuting area as seen by individuals depends upon the cost of access to different work locations. It is well established that the distance an individual is willing to travel to work increases with the person's level of skill or occupation.
- 7.4.6 Quality of life factors also play a role. Places which score highly on indices of quality of life attract the most bids for housing and tend to be the most expensive. Restrictions in the supply of developable land will also increase the price at which the market for residential property clears.

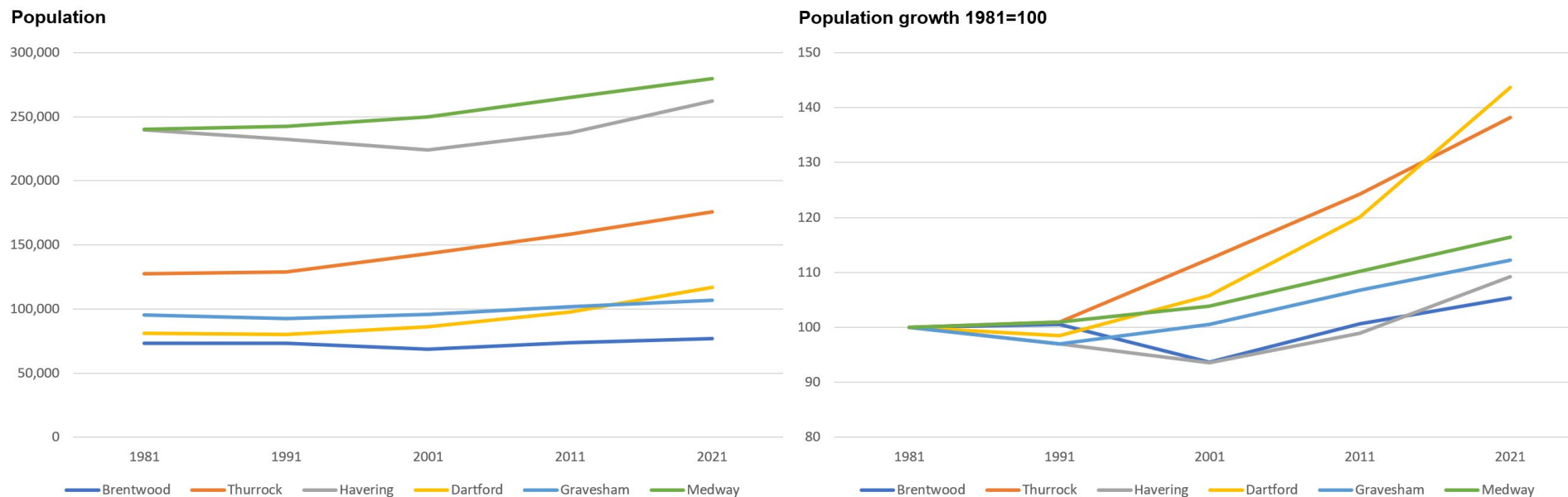
### Evidence on population change

- 7.4.7 The review of estuarial crossings identified population changes following the 1991 opening of the Queen Elizabeth II bridge, which is the closest comparator in terms of impacts to the Project, as is clearly evident in Plate 7.2. It should be noted that the Queen Elizabeth II bridge was but one factor affecting population change: other factors include population and the population age structure, which affects the demand for new household formation; the Greater London property market and changes in relative property values in different areas; and the supply of and demand for housing within the Local North and Local South.

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<sup>56</sup> Factors such as seniority, level of responsibility and access to pension funds could make relocation the more attractive option for some personnel.

**Plate 7.2 Population and population growth 1981 to 2021**



**Sources:**

1981, 1991, 2001, 2011 data from NOMIS

2021 data (Office for National Statistics, 2022)



- 7.4.8 From 1981 to 1991 population decreased in Havering and Gravesham and to a lesser degree in Brentwood, while the population of Dartford was virtually unchanged between the Census dates.
- 7.4.9 Following the opening of the Queen Elizabeth II bridge, the downward trend in population continued to 2001 in Brentwood and Havering, while Thurrock and Dartford saw a larger increase in population. From 2001, population has increased in all six local authority areas.
- 7.4.10 Housing supply is critical to enabling population change, and within population change inward or outward migration. Migration to an area is a response to changing job opportunities, including the relocation of employment undertaken as a response to the Project. However, inward migrants compete for housing with new household formation, and the numbers who secure housing in their preferred locations depends largely on the ability to bid for property and therefore principally on earnings and the ability to borrow.
- 7.4.11 To assess the likelihood of population change and migration, a review was undertaken of the plans of the relevant local authorities. The land use strategies of each Local Planning Authority (LPA) seek to promote land use changes of the sort associated with Level 3 WEI and to enable people to move to more productive jobs.
- 7.4.12 The principal findings of the review of these plans were as follows:
- a. Growing populations: LPAs forecast increases in population during their respective local plan periods. Thurrock Council, for example, is a designated growth area within the Thames Gateway, with future growth projected to continue to outstrip national and regional rates (Thurrock Council, 2015). Dartford's Core Strategy forecasts that the area's population will increase by 43% by 2026 (Dartford Borough Council, 2011).
  - b. Increases in housing provision: The policies and plans set out the increases in required dwelling numbers in order to meet their predictions of housing need. Notably, Thurrock Council aims to provide 23,250 new dwellings up to 2026 (Thurrock Council, 2015), the London Borough of Havering expects 17,550 new dwellings (London Borough of Havering, 2021) and Medway Council plans 13,000 new dwellings during their respective plan periods (Medway Council, 2003). Dartford has identified land for up to 17,300 homes to be built between 2006 and 2026 (Dartford Borough Council, 2011). These increases, in four areas, sum to over 70,000 new dwellings.
- 7.4.13 As noted above, where people might wish to relocate to depends upon a variety of factors. On the demand side, quality of life, low crime rates, access to schools and the ability to commute to a range of job opportunities are generally seen to be important. On the supply side, the rate of (net) new construction is important, but supply is also influenced by the propensity of homeowners to hold on to their properties rather than relocating in response to factors such as retirement and other life stage changes.

7.4.14 The places to which people can relocate in response to employment changes are therefore affected by changes in the housing stock in each local authority area, which in turn is a factor that affects house prices and ultimately land values.<sup>57</sup> Table 7.2 shows official land values from the Valuation Office Agency for 2019.<sup>58</sup>

**Table 7.2 Land values by local authority area**

Local authority area	Residential £000 per ha
Brentwood	7,000
Thurrock	3,510
Havering	7,610
Dartford	4,100
Gravesham	3,850
Medway	3,370

Source: Valuation Office Agency: residential land value data April 2019

7.4.15 Table 7.3 and Table 7.4 show the housing stock by local authority area in 2010 and 2020 and the changes in that stock between 2010 and 2020.

**Table 7.3 Size of the housing stock by local authority area**

	2010		2020	
	All private	Total	All private	Total
Brentwood	27,771	31,660	30,270	33,757
Thurrock	51,999	63,668	56,416	68,292
Havering	84,867	98,805	88,998	102,967
Dartford	34,748	40,826	41,583	47,849
Gravesham	34,323	41,514	36,269	43,733
Medway	101,717	109,367	107,782	116,287

Source: Office for National Statistics Housing statistics: Live Table 100

<sup>57</sup> Every house location is unique, which gives rise to a spectrum of substitutes that range from close substitutes to poor substitutes. The market can be regarded as an auction in which those able and willing to pay for the 'best' locations outbid others. The ability to bid is closely related to household income and hence to occupations and levels of wages and salaries by occupation: willingness to bid is affected by beliefs about future values, as houses act as a store of value as well as a place to live.

<sup>58</sup> All non-London developments are calculated on the basis of 35 units for a total floorspace of 3,150 sq. meters: Havering data might not be strictly comparable with other local authority areas.



**Table 7.4 Changes in the housing stock by local authority area, 2010 to 2020**

	All private	Total
Brentwood	2,499	2,097
Thurrock	4,417	4,624
Havering	4,131	4,162
Dartford	6,835	7,023
Gravesham	1,946	2,219
Medway	6,065	6,920

Source: calculated from ONS Housing statistics: Live Table 100

- 7.4.16 The data show that there were very large changes in the housing stock in Dartford and Medway, smaller increases in Thurrock and Havering, and very small increases in Brentwood and Gravesham. In Brentwood the total increase was smaller than the increase in the private housing stock, which indicates an absolute decrease in the stock owned by the local authority, by housing associations and by other public sector bodies.
- 7.4.17 The scope for job-induced migration in the period 2010 to 2020 appears to have varied by local authority area and by North and South, as the increase in the housing stock in the Local South was almost 50% greater than the increase in the Local North.
- 7.4.18 If this pattern were to continue and if the Local North were to be the location of increasing sizes of clusters in labour intensive industries such as construction and transport, there could be only limited cross-river migrations of workers but higher levels of cross-river travel to work. The Project clearly has an important role to play in enabling changes in business locations and travel to work, while factors in the housing market limit the extent to which people will relocate.

## 8 Conclusions

### 8.1 Introduction

8.1.1 This chapter draws together the conclusions about the Project's context and the evidence presented about the Project's potential to generate Level 3 wider economic impacts.

### 8.2 Socio-economic context

8.2.1 Geography and physical access arguably matter more in the Lower Thames area than in most of Great Britain. The Project is located on the main trade route between the UK's industrial heartlands and Europe which experiences congestion at Dartford. That congestion, which is partly due to longer distance movements, is a factor that limits the ability to create a single Lower Thames market for goods, services and skills.

8.2.2 The contextual evidence indicates that the Local North and Local South have similar economic structures but have developed separately. This seems to be primarily due to the barriers imposed by the estuary and the availability of markets that do not involve crossing the Thames. The similarity in structure in part reflects the influence of London as a 'common' market for some businesses. Both areas also have similar hinterlands. Analysis by the ONS shows that Kent and Essex are the most similar areas in the UK.<sup>59</sup> A lack of any strong specialisations or comparative advantages plus an apparent lack of cross-river competition indicates that there is duplication of economic activity and inefficiencies in businesses that operate both north and south of the river.

8.2.3 The labour market is also highly separated, with very little cross-river travel to work but strong links into the London job market and links into the Essex and Kent employment centres respectively from the Local North and Local South.

8.2.4 While at the aggregate level their structures are similar, the Local North and Local South are not homogenous entities. In the Local North, Brentwood performs much better than Havering and Thurrock on a number of indicators, including skills, which is reflected in the estimates of GVA and productivity discussed above. However, Brentwood has seen very limited growth in its working age population and its relatively strong economic performance could be drawing on inward commuting to augment its own skills base.

8.2.5 Havering, Thurrock and all of the Local South have a relatively weak skills base, but offer road, rail and sea links and scope for land intensive developments. As land intensive activities seem likely to continue to be displaced from London in favour of high value residential and commercial uses, the Local North and South are expected to attract a share of those businesses moving outwards from London. As discussed in Chapter 6, breaking down barriers is expected to promote competition, greater specialisation, clustering and moves to more efficient business structures.

<sup>59</sup> ONS has published an analysis of UK ITL level 2 regions (previously NUTS 2 regions) using the Krugman Specialisation Index.

## 8.3 Dynamic Agglomeration

- 8.3.1 The evidence on dynamic clustering points to the Project's impact on increased intensity of clustering in transport and logistics, construction and business support services. Dynamic clustering will come about as the barrier effects of the estuary are reduced by the Project.
- 8.3.2 There is evidence that the presence of an estuary leads to additional sources of market failure. The context of the Project is also such that changes in transport costs will be important and therefore capable of changing firms' and household's trade-offs between transport costs and the location and scale of activities. Large Level 3 impacts could arise as a result of the Project because changes in the costs of making the crossing of an estuary could strongly influence the locational choices and organisational structures of firms and travel to work by members of households.
- 8.3.3 The analysis of the Project's socio-economic content found that in aggregate the two Local areas have similar economic structures with no clear specialisms that would point to strong comparative advantage. However, in assessing the scope for dynamic clustering benefits, it can be seen that when disaggregated a sector comprising manufacturing, utilities and construction had few industries in which LQs were high in both areas in 2010 and that this sector has become more diverse over time in both areas. The industries that were strongly represented in both areas are land and transport intensive and both Local areas are able to attract and sustain such activities.
- 8.3.4 The analysis of how LQs changed over time reveals a limited degree of spatial concentration of manufacturing activities, where LQs have grown in one area while declining in the other. On balance such changes have tended to favour the Local South. The LQs of construction of buildings and specialised construction activities have increased in both Local areas. The changes in manufacturing may lead to some clustering, but the evidence about further clustering of the construction sector is much stronger and is arguably more in keeping with the land and transport intensiveness of the industry.
- 8.3.5 When disaggregated to focus on service activities that are market-oriented, the data show that the mix and scale of service industries have become more similar in the Local North and Local South in recent years. There is some evidence of duplications of activities which mean that skills such as business management might be better used if businesses can reorganise operations. There is some evidence that this happened in the case of other estuarial crossings.
- 8.3.6 Analysis of LQs and LQ growth, and an estimation of input-output relationships, indicate the presence of a cluster based around transport and logistics. There is also some evidence of a cluster of business support services. Past performance in terms of LQs and their changes need not point to how industries will evolve in the future. Factors such as their adjustment to post-Brexit environment, how they take advantage of UK trade deals, their recovery from the COVID-19 pandemic and the impact of current geopolitical events mean that data and economic logic must be tested when looking ahead.
- 8.3.7 One source of such testing comes from the qualitative evidence that comes from contacts with businesses, which usefully confirms most of the findings on

existing and embryonic clusters, while pointing to emerging clusters that will come into being within a supportive policy framework that includes enhanced accessibility to related businesses and to skills.

- 8.3.8 The Project represents a step change in cross-river accessibility that offers opportunities for beneficial relocations and business reorganisations and changes in travel to work patterns. Changes in location and in the intensity of land use are expected to take place to reduce costs, expand output and improve competitiveness, all of which yield productivity and labour supply benefits.
- 8.3.9 Existing and embryonic clusters could grow and develop further, based on a number of past changes and trends. These trends are supported by economic logic, especially in the case of construction and transport and logistics activities. Where businesses see opportunities to enhance performance by greater physical proximity, that proximity enables greater scope for business-to-business collaboration as well as enhanced competition. The policy framework has to accommodate this in order to maximise the economic impacts that will arise.
- 8.3.10 The intensity of land use will change in many locations where businesses undertake the reorganisation of functions. In some instances, activities will be relocated because with better accessibility businesses can reorganise and relocate to serve markets from fewer locations, reducing costs and increasing competitiveness. The adoption of more efficient organisational structures will release land and people for other productive uses, which will generate net additional output.
- 8.3.11 Reducing the barrier effect of the estuary will also bring about the development of new buyer-supplier relationships which will reduce input costs and increase competitiveness. Buyer-supplier relationships within sectors such as food and businesses support services constitute another form of clustering. Some businesses are expected to relocate to maximise the benefits they can derive from such relationships.
- 8.3.12 The Lower Thames area is likely to attract some firms that will be displaced from places closer to London. The context is one in which many lower value but relatively land-intensive activities are being displaced from London due to the much higher values of sites for residential development. The attraction of businesses that are land and/or transport intensive will create a stronger mass of activities in sectors such as construction and transport and logistics. Such an enhanced mass of activity will deliver productivity benefits.
- 8.3.13 One of the factors that attracts firms to locations is access to skills. Better cross-river accessibility will enable skills and jobs to be better matched and cluster growth will be constrained if skills are hard to find. Transport accessibility is a critical factor, but a range of factors affect the skills that will be available in the wider area so that cluster growth can be sustained.
- 8.3.14 Displacement occurs when there is no net increase in the supply of resources. The growth of the existing and embryonic clusters in the Local North and Local South will not necessarily increase the physical resource count, such as number of people available for employment or the number of hours worked.

However, clustering makes each hour worked more productive, meaning more output can be achieved with the same input of labour.

- 8.3.15 If all of the additional output is consumed, the value of net additional output is a welfare gain to society and is equivalent to an expansion in resources. In some instances, not all of the additional output from productivity improvements will be consumed. Fewer inputs will therefore be required to produce a given level of output; this is likely to arise (at least in the short to medium term) where a firm reorganises activities to serve markets from fewer locations and with less duplication of resources such as managers. Land, premises and people are therefore released in this process but save for some frictional unemployment these resources will be redeployed in other firms or other industries. Again, the productivity gains due to enhanced accessibility do not result in net displacement.
- 8.3.16 The Project is likely to give rise to many adjustments in location and in how activities are organised spatially. Together the quantitative and qualitative evidence indicate that the Project creates the conditions in which dynamic agglomeration will take place in the Local North and Local South. Transport and land intensive industries are the most likely sectors to respond to the Project by changing where they are located and by making organisational changes. The net outcomes of these changes in terms of productivity will be positive in that the local productivity gains would not be eroded by displacement.

## 8.4 Moves to more or less productive jobs

- 8.4.1 For there to be a net loss or net gain from M2MLPJ, there must be a change in job location that involves the displacement of employment from one location to another, with no net employment increase or decrease at the UK level. The change in the location of employment must involve an increase or decrease in dynamic clustering: net gains or losses from M2MLPJ cannot occur without dynamic clustering.
- 8.4.2 As discussed above, the evidence on dynamic clustering points to increased intensity of clustering in transport and logistics, construction and business support services, with M2MLPJ being a consequence of this dynamic clustering. Cluster growth is expected to occur due to businesses moving from the Local South to the Local North but also from the Local North to the Local South. While further investigation is needed to assess the likely direction of change in those industries most likely to move, the Local North is the larger market and other things being equal, agglomeration will take place in the larger market.<sup>60</sup>
- 8.4.3 However, there have also been industries that have decreased employment in the Local North while expanding in the Local South, and these changes might be an indication of clustering in the Local South, either in industries that have relocated or within industries where operations in the Local South provide cost savings compared with the Local North, while being able to serve markets in the Local North. The Project can clearly play a role in this spatial reworking of

<sup>60</sup> This is a clear outcome in New Economic Geography analyses, except where transport costs are very low so that location does not matter. There are however, counter forces of dis-agglomeration such as impacts on land costs and congestion.

activities that will confer productivity benefits through clustering and cost savings by enabling a more optimal spatial distribution of activity.

- 8.4.4 There may also be businesses that relocate from places closer to London, where rising site values continue to change the optimum location for land-intensive activities. The Local North and Local South are places that would be attractive to businesses that are displaced due to factors in the land market.<sup>61</sup> Such relocations are likely to enable land to be used more productively.
- 8.4.5 The Project could also attract businesses that are presently located to the east of the route of the Project. These are generally areas of lower productivity, so such moves would be a relocation of jobs to a more productive area. The scale of the impact would in part depend on how much more productive the Local North and Local South become because of dynamic clustering.
- 8.4.6 The evidence on travel to work and accessibility changes that will be generated by the Project indicates that the Project would bring about a spatial expansion of the labour market, which might lead to displacement of employment within that wider area. The evidence on housing plans and strategies points to housing being an enabler of relocations by households, although this effect is likely to be muted given the context of the labour market, which will continue to have access to jobs in London

## 8.5 Robustness of the evidence

- 8.5.1 The quantitative evidence in this report is drawn from official sources, principally NOMIS and the ONS.<sup>62</sup> Data from these sources has been subject to a range of analyses, from the creation of time series that have been used in charts and tables, to more complex analyses involving calculations that provide greater insight into economic structures and performance into how economic indicators have changed over time and into the factors underlying observed changes.
- 8.5.2 A range of established analytical models has been used including:
- The calculation of LQs and the analyses of how these have changed over time, drawing on concepts used in shift-share analysis
  - The use of Krugman Specialisation Indices and the Hirschman–Herfindahl Index to examine relative and absolute concentrations of industries and to assess whether economic structures have become more or less uniform over time
  - The estimation of business-to-business transactions (interactions) within the Local North and Local South using local LQs and population data mapped onto the UK input-output table

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<sup>61</sup> Note that the Project is not the cause of the actual displacement of businesses from closer to London. There is however scope for displacement where the Project attracts businesses that would otherwise locate elsewhere, for example around the M25. If these businesses were spatially dispersed, the dynamic clustering that would arise by co-locating close to the Project would not occur.

<sup>62</sup> NOMIS is the source of UK labour market statistics provided by the Office for National Statistics (ONS)

<https://www.nomisweb.co.uk>



- d. Use of ONS data on productivity combined with data on GVA by industry sector, employment data and household incomes to identify variations in productivity by area

8.5.3 The outputs from each of these analyses combine to produce a balanced and consistent economic assessment, the principal element of which is the identification of current and embryonic clusters of industries including both intra-industry and cross-industry clusters.

8.5.4 These findings are reinforced by a range of qualitative evidence that includes findings from contact with businesses and from research that examined the impacts at other estuarial crossings. This evidence points to the role of the estuary in limiting the development of clusters and the constraining of competitive forces, both of which are associated with limited exploitation of internal and external economies and the persistence of inefficient operating structures in a range of businesses.

## References

- Akerlof G (1970). The Market for Lemons: Quality Uncertainty and the Market Mechanism  
The Quarterly Journal of Economics Vol 84
- Amion Consulting (2009). Mersey Gateway – Wider Economic Impact Report: Halton  
Borough Council
- BBC News (2019). Severn Bridge travel to Wales rises after tolls end. Accessed  
September 2022. [REDACTED]
- Bradley D, Coombes M and Strickland T (2012). The New Tyne Crossing: An economic  
impact assessment. CURDS University of Newcastle
- British Chamber of Commerce (2019). Infrastructure Survey. Accessed July 2022.
- Casweb. UK Data Service Census Support. Accessed October 2022.  
[REDACTED]
- Cleary EJ and Thomas RE (1973). The economic consequences of the Severn Bridge and  
its associated motorways. Bath University Press.
- Dartford Borough Council (2011). Core Strategy. Accessed October 2022.  
<https://windmz.dartford.gov.uk/media/Inspector%20Approved%20Core%20Strategy.pdf>
- Department for Transport (a). Transport Analysis Guidance. Accessed July 2022.  
<https://www.gov.uk/guidance/transport-analysis-guidance-tag>
- Department for Transport (b). DfT UK port freight annual statistics: interactive dashboard.  
Accessed September 2022. [https://maps.dft.gov.uk/port-freight-statistics/interactive-  
dashboard/index.html](https://maps.dft.gov.uk/port-freight-statistics/interactive-dashboard/index.html)
- Department for Transport (2006). Eddington Transport Study. Accessed September 2022.  
<https://commonslibrary.parliament.uk/research-briefings/sn04208/>
- Department for Transport (2014a). National Networks National Policy Statement.  
Accessed September 2022. [https://www.gov.uk/government/publications/national-policy-  
statement-for-national-networks](https://www.gov.uk/government/publications/national-policy-statement-for-national-networks)
- Department for Transport (2014b). Accessibility Statistics: Travel time calculation  
methodology. Accessed October 2022.  
[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_  
data/file/372138/accessibility-statistics-methodology.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/372138/accessibility-statistics-methodology.pdf)
- Department for Transport (2015). Value for Money Framework. Accessed September  
2022.  
[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_  
data/file/908296/value-for-money-framework-document.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/908296/value-for-money-framework-document.pdf)
- Department for Transport (2019a). Transport Analysis Guidance Unit A2.1 Wider  
Economic Impacts Appraisal. Accessed September 2022.  
[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_  
data/file/940810/tag-a2-1-wider-economic-impacts-appraisal.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/940810/tag-a2-1-wider-economic-impacts-appraisal.pdf)
- Department for Transport (2019b). Transport Analysis Guidance Unit A2.3 Employment  
Effects. Accessed September 2022.  
[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_  
data/file/940845/tag-a2-3-employment-effects.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/940845/tag-a2-3-employment-effects.pdf)

Department for Transport (2019c). Transport Analysis Guidance Unit M5.3 Supplementary Economic Modelling. Accessed September 2022.

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/938921/tag-m5-3-supplementary-economic-modelling-unit.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/938921/tag-m5-3-supplementary-economic-modelling-unit.pdf)

Department for Transport (2020a). Transport Analysis Guidance Unit A2.2 Induced Investment. Accessed September 2022.

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/940820/tag-a2-2-induced-investment-unit.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/940820/tag-a2-2-induced-investment-unit.pdf)

Department for Transport (2020b). Transport Analysis Guidance Unit A2.4 Productivity Impacts. Accessed September 2022.

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/940945/tag-a2-4-productivity-impacts.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/940945/tag-a2-4-productivity-impacts.pdf)

Duranton and Puga (2004). Micro-foundations of Urban Agglomeration Economies. Amsterdam: Handbook of Urban and Regional Economics.

Esteban-Marquillas, J.M. (1972). A reinterpretation of shift share analysis. Regional and Urban Economics. Volume 2, Issues 3, October 1972, Pages 249-255.

Federation of Small Businesses (2020). Lower Thames Crossing 2020 Survey.

HM Treasury (2022). The Green Book: appraisal and evaluation in central government. Accessed September 2022. <https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government>

Highways England (2017): The Road to Growth. Accessed October 2022.

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/600275/m160503\\_the\\_road\\_to\\_growth\\_Our\\_strategic\\_economic\\_growth\\_plan.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/600275/m160503_the_road_to_growth_Our_strategic_economic_growth_plan.pdf)

Highways England (2018). Lower Thames Crossing Statutory Consultation. Accessed September 2022. [REDACTED]

Legatum (2021). The Legatum Prosperity Index. Accessed September 2022. [REDACTED]

London Borough of Havering (2021). LBHLP.1 - Proposed Submission Local Plan 2016–2031. Accessed October 2022. [https://www.havering.gov.uk/downloads/file/1909/lbhlp1\\_-\\_proposed\\_submission\\_local\\_plan\\_2016-2031](https://www.havering.gov.uk/downloads/file/1909/lbhlp1_-_proposed_submission_local_plan_2016-2031)

Macgregor D R (1966). A survey of the social and economic effects of the Forth road bridge with particular reference to the county of Fife, Scottish Geographical Magazine, 82:2, 78-92, DOI: 10.1080/00369226608736007. Accessed September 2022. [REDACTED]

Mackie P.J and Simon D (1986). Do road projects benefit industry? A case study of the Humber Bridge Journal of Transport Economics and Policy

Mayor of London (2020). Production Corridor. Accessed July 2022

Medway Council (2003). Local Plan. Accessed October 2022.

[https://www.medway.gov.uk/info/200149/planning\\_policy/146/current\\_planning\\_policies/3](https://www.medway.gov.uk/info/200149/planning_policy/146/current_planning_policies/3)

National Highways (2021). Dartford Crossing Survey. Accessed October 2022.

NOMIS. Official census and labour market statistics. Accessed October 2022. [REDACTED]

NOMIS. Business Register and Employment Survey. Accessed September 2022.

NOMIS. Regional gross disposable household income (GDHI) Accessed September 2022.

O'Brien, Oliver & Cheshire, James (2016). Interactive mapping for large, open demographic data sets using familiar geographical features, *Journal of Maps*, 12:4, 676-683, DOI: 10.1080/17445647.2015.1060183. Accessed October 2022.

Office for National Statistics (n.d.). Census 2011. Accessed September 2022.

<https://www.ons.gov.uk/census/2011census> Office for National Statistics (2017). Krugman Index Matrix Nuts 1 and Nuts 2. Accessed October 2022.

<https://www.ons.gov.uk/file?uri=/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/datasets/krugmanindexmatrix/current/krugmanindexmatrixnuts1andnuts2.xls>

Office for National Statistics (2019). Population estimates from 1971 to 1980. Accessed September 2022.

<https://www.ons.gov.uk/aboutus/transparencyandgovernance/freedomofinformationfoi/populationestimatesfrom1972to1980>

Office for National Statistics (2022). First results from Census 2021 in England and Wales. Accessed September 2022.

<https://www.ons.gov.uk/releases/initialfindingsfromthe2021censusinenglandandwales>

Office for National Statistics Housing statistics. Number of Dwellings by tenure and district 2009 to 2021. Accessed September 2022.

Palan N (2010). Measurement of Specialisation – the Choice of Indices; Graz Schumpeter Centre, Graz, Austria.

Planning Inspectorate (n.d.) Silvertown Tunnel. Accessed September 2022.

<https://infrastructure.planninginspectorate.gov.uk/projects/london/silvertown-tunnel/?ipcsection=docs>

Szabo N (2015). Methods regionalizing input-output tables. *Regional Statistics 2015*.

Thurrock Council (2015). Core Strategy and Policies for Management of Development (as amended). Accessed October 2022.

[https://www.thurrock.gov.uk/sites/default/files/assets/documents/core\\_strategy\\_adopted\\_2011\\_amended\\_2015.pdf](https://www.thurrock.gov.uk/sites/default/files/assets/documents/core_strategy_adopted_2011_amended_2015.pdf)

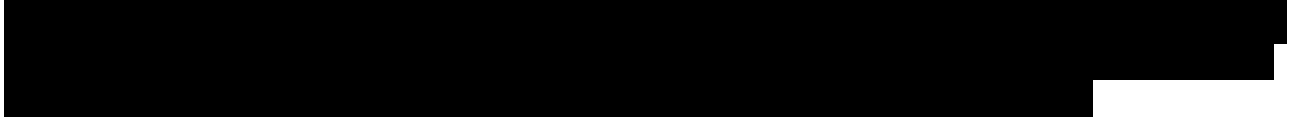
Transport for London (n.d.) Silvertown Tunnel. Accessed September 2022.

<https://tfl.gov.uk/travel-information/improvements-and-projects/silvertown-tunnel>

Transport for London: (2012). East London River Crossings: Assessment of Needs

Transport for London (2014). Task 126, River Crossings Development Study Final Report. Accessed September 2022. <https://content.tfl.gov.uk/st-river-crossings-development-study-final-report.pdf>

Valuation Office Agency. Residential Land April 2019. Accessed September 2022.



Wikipedia. London Borough of Havering. Accessed October 2022.



## Glossary

Term	Abbreviation	Explanation
<b>100-year appraisal period</b>		A sensitivity test used to appraise benefits and costs of the Project over a 100-year appraisal period.
<b>2010 prices and values</b>		The price base and present value year used to present and compare monetised costs and benefits of a transport project.
<b>2030 opening year</b>		A modelled year in the Project's LTAM traffic model in which traffic flows and costs are estimated when the Project is opened.
<b>2045 design year</b>		A modelled year in the Project's LTAM traffic model in which traffic flows and costs are estimated on which the Project design is based.
<b>A-weighted decibel</b>	dB(A)	An expression of the relative loudness of sounds as perceived by the human ear. A-weighting gives more value to frequencies in the middle of human hearing and less value to frequencies at the edges of human hearing.
<b>A122 Lower Thames Crossing</b>	Project	A proposed new crossing of the Thames Estuary linking the county of Kent with the county of Essex, at or east of the existing Dartford Crossing.
<b>AM peak hour</b>		The hour between 07:00–08:00 in in the Project traffic model LTAM.
<b>AM peak period</b>		The period between 06:00–09:00 in in the Project traffic model LTAM.
<b>Acute Myocardial Infarction</b>	AMI	Commonly known as a heart attack, this occurs when blood flow decreases or stops to the coronary artery of the heart, causing damage to the heart muscle.
<b>Active Mode Appraisal Toolkit</b>	AMAT	A DfT toolkit for appraising the physical activity impacts of transport projects.
<b>Adjusted Benefit Cost Ratio</b>	Adjusted BCR	The ratio of the sum of Level 1 and 2 PVBs to PVC
<b>Affected Road Network</b>	ARN	In air quality assessment, the network of roads to be considered within the air quality model (selection of the roads within the model depends on a number of criteria such as changes in Heavy Duty Vehicle flows).
<b>Agglomeration</b>		In traffic and economics assessment, benefits which come when firms and/or people locate near one another in geographical clusters
<b>Air quality management area</b>	AQMA	An area, declared by a local authority, where air quality monitoring does not meet Defra's national air quality objectives.
<b>Air Quality Strategy Objective</b>	AQSO	An objective set by the Air Quality Strategy for England, Scotland, Wales and Northern Ireland to improve air quality in the UK in the medium term. Objectives are focused on the main air pollutants to protect health.
<b>Analysis of Monetised Costs and Benefits</b>	AMCB	In transport and economic assessment, the conversion of changes due to a project into an estimated monetary value.
<b>Ancient Semi-Natural Woodland</b>	ANSW	A type of ancient woodland, acknowledged as non-statutory designated sites and protected under the National Planning Policy Framework.



Term	Abbreviation	Explanation
<b>Annual Average Daily Traffic</b>	AADT	An estimate of the average daily traffic along a defined segment of roadway. This value is calculated from short-term counts taken along the same section, which are then factored to produce the estimate of AADT. Because of this process, the most recent AADT for any given roadway will always be for the previous year.
<b>Annual Average Weekday Traffic</b>	AAWT	The average weekly flow of vehicles on a road or section of a road
<b>Appraisal</b>		The process of defining objectives, examining options and weighing up the relevant costs, benefits, risks and uncertainties.
<b>Appraisal period</b>		The period of time over which benefits, costs and revenues are appraised. For a road scheme this includes benefits and costs before scheme opening and all impacts for 60 years from scheme opening.
<b>Appraisal Summary Table</b>	AST	A table that appraises the performance of each option against economic, environmental, social and distributional sub-impacts and is used to directly inform the Value for Money assessment for the economic case.
<b>Appraisal year</b>		The year in which an appraisal is undertaken and is used to determine when changes to the discount rate are applied
<b>Area of Outstanding Natural Beauty</b>	AONB	Statutory designation intended to conserve and enhance the ecology, natural heritage and landscape value of an area of countryside.
<b>Balance of payments</b>	BoP	The difference between all money flowing into a country in a particular period of time (e.g. a quarter or a year) and the outflow of money to the rest of the world.
<b>Base cost</b>		A category of project costs that covers the material and labour inputs.
<b>Benefit</b>		An increase in the welfare of society from a project, programme or policy.
<b>Benefit Cost Ratio</b>	BCR	The ratio of a project's benefits to its costs.
<b>Biodiversity Action Plan</b>	BAP	National, local and sector-specific plans established under the UK Biodiversity Action Plan, with the intention of securing the conservation and sustainable use of biodiversity.
<b>Black, Asian and Minority Ethnic</b>	BAME	A collective term for the minority ethnic population.
<b>Building Cost Information Service</b>	BCIS	A provider of cost and price information for the UK construction industry and part of RICS.
<b>CM45</b>		Core traffic growth without scheme scenario used to appraise noise, air quality and greenhouse gases.
<b>CM49</b>		Core traffic growth without scheme scenario used to appraise all impacts except noise, air quality and greenhouse gases.
<b>Capital expenditure</b>	CAPEX	The cost of developing or providing non-consumable parts of the product or system.
<b>Carbon Budget</b>	CB	Carbon budgets are a simplified way to measure the additional emissions that can enter the atmosphere, whilst limiting global warming to defined levels, such as 1.5°C. Carbon budgets are based on the fact that the amount of warming that will occur can be approximated by total CO2 emissions

Term	Abbreviation	Explanation
<b>Carbon dioxide equivalent</b>	CO <sub>2</sub> e	A standard unit for measuring carbon footprints that describes, for a given amount of greenhouse gas emissions, the amount of CO <sub>2</sub> that would have the same Global Warming Potential (GWP) when measured over a timescale of 100 years.
<b>Central case appraisal</b>		The expected benefits and costs of the Project being submitted for development consent
<b>Closed Circuit Television</b>	CCTV	National Highways CCTV cameras are used to monitor traffic flows on the English motorway and trunk road network primarily for the purposes of traffic management.
<b>Combined Modelling and Appraisal Report</b>	ComMA	The purpose of the Combined Modelling and Appraisal Report is to inform decision makers and stakeholders on how the evidence underpinning the business case has been developed, from the initial identification of the underlying problem through the collection of data and the production of any supporting traffic models and forecast impacts of the Project on traffic to the eventual economic appraisal.
<b>Compensation of employees</b>	COE	A statistical measure of the total gross (pre-tax) wages paid by employers to employees for work done in an accounting period, such as a quarter or a year.
<b>Conservation area</b>		An area of special environmental or historic interest or importance, of which the character or appearance is protected by law against undesirable changes (Section 69 of the Planning (Listed Buildings and Conservation Areas) Act 1990).
<b>Consumer Price Index</b>	CPI	A measure that examines the weighted average of prices of a basket of consumer goods and services, such as transportation, food and medical care. It is calculated by taking price changes for each item in the predetermined basket of goods and averaging them.
<b>Consumer Prices Index including owner occupiers' housing costs</b>	CPIH	A price index that measures the price of a weighted average market basket of consumer goods and services purchased by households including owner occupiers housing costs.
<b>Core traffic growth</b>		The central traffic growth forecast
<b>COst and Benefit to Accidents – Light Touch</b>	COBALT	DfT's software used to appraise the change in accidents due to a transport project.
<b>CS67</b>		Core traffic growth with scheme scenario used to appraise noise, air quality and greenhouse gases
<b>CS72</b>		Core traffic growth with scheme scenario used to appraise all impacts except noise, air quality and greenhouse gas
<b>Day to day variability</b>	DTDV	The daily variability in travel times excluding the impact of incidents
<b>Decibel</b>	dB	The unit of measurement used for sound pressure levels and noise levels.
<b>Department for Business, Energy and Industrial Strategy</b>	BEIS	A department of the UK government, with responsibility for business, industrial strategy, and science and innovation with energy and climate change policy.

Term	Abbreviation	Explanation
<b>Department for Environment, Food and Rural Affairs</b>	Defra	The government department responsible for environmental protection, food production and standards, agriculture, fisheries and rural communities in the United Kingdom of Great Britain and Northern Ireland.
<b>Department for Transport</b>	DfT	The government department responsible for the English transport network and a limited number of transport matters in Scotland, Wales and Northern Ireland that have not been devolved.
<b>DfT Value for Money Framework</b>		Outlines the Department's approach to Value for Money assessments and provides guidance on how the outputs of these assessments should be communicated to decision-makers.
<b>Design Manual for Roads and Bridges</b>	DMRB	Design Manual for Roads and Bridges: A comprehensive manual which contains requirements, advice and other published documents relating to works on motorway and all-purpose trunk roads for which one of the Overseeing Organisations (National Highways, Transport Scotland, the Welsh Government or the Department for Regional Development (Northern Ireland)) is the highway authority. For the A122 Lower Thames Crossing, the Overseeing Organisation is National Highways.
<b>Development Consent Order</b>	DCO	Means of obtaining permission for developments categorised as Nationally Significant Infrastructure Projects (NSIPs) under the Planning Act 2008.
<b>Disbenefits</b>		Negative benefits.
<b>Discounting</b>		A technique used to compare costs and benefits occurring at different points of time
<b>Displacement</b>		An increase in employment in one firm, locality or region which is offset by reductions elsewhere
<b>Distributional impact</b>	DI	The variance of transport intervention impacts across different social groups. The appraisal of DIs is mandatory in the appraisal process and is a constituent of the Appraisal Summary Table (AST)
<b>Distributional Impact Appraisal</b>	DIA	An appraisal of Distributional Impacts.
<b>Dynamic clustering</b>		Benefits come when firms and/or people locate near one another in geographical clusters by changing their spatial location
<b>Dynamic Integrated Assignment and Demand Model</b>	DIADDEM	DfT software for finding equilibrium between demand and supply in a transport model
<b>Economic Appraisal Report</b>	EAR	A report that presents the appraisal methods and results for a transport project
<b>Emissions Factor Toolkit</b>	EFT	The Emissions Factors Toolkit (EFT) is published by Defra and the Devolved Administrations to assist local authorities in carrying out review and assessment of local air quality as part of their duties under the Environment Act 1995.

Term	Abbreviation	Explanation
<b>Environment Agency</b>	EA	A non-departmental public body of Defra, established under the Environment Act 1995. It is the leading public body for protecting and improving the environment in England and Wales. The organisation is responsible for wide-ranging matters, including the management of all forms of flood risk, water resources, water quality, waste regulation, pollution control, inland fisheries, recreation, conservation and navigation of inland waterways.
<b>Environmental Impact Assessment</b>	EIA	A process by which information about environmental effects of a proposed development is collected, assessed and used to inform decision making. For certain projects, EIA is a statutory requirement, reported in an Environmental Statement.
<b>Environmental Quality Standards</b>	EQS	The standards set out in the Environmental Quality Standards Directive (2008/105/EC) which concern the presence in surface water of certain pollutants and substances or groups of substances identified as priority or 'priority hazardous', on account of the substantial risk they pose to or via the aquatic environment.
<b>Environmental Statement</b>	ES	A document produced to support an application for development consent that is subject to Environmental Impact Assessment (EIA), which sets out the likely impacts on the environment arising from the proposed development.
<b>Essex Red Data List</b>	ERDL	Endangered species in Essex included in the Red Data Book which is a public document created to record endangered and rare species of plants, animals, fungi as well as some local subspecies which are present in a particular region.
<b>Foreign Direct Investment</b>	FDI	Investment into the UK economy by overseas companies and governments.
<b>GDP deflator</b>		A measure of the level of prices of all new, domestically produced, final goods and services in an economy in a year.
<b>Geographic Information System</b>	GIS	An integrated collection of computer software and data used to view and manage information about geographic places, analyse spatial relationships and model spatial processes.
<b>Great Crested Newt</b>	GCN	Great crested newts are a European protected species. The animals and their eggs, breeding sites and resting places are protected by law.
<b>Greenhouse gas</b>	GHG	Gases able to absorb infrared radiation emitted from Earth's surface and reradiate it back to Earth's surface, thus contributing to the greenhouse effect. Carbon dioxide, methane, and water vapour are the most important greenhouse gases.
<b>Green Belt</b>		A policy and land use zone designation used in land use planning to retain areas of undeveloped land surrounding urban areas.
<b>Green Book</b>		HM Treasury's guidance on how publicly funded projects, programmes and policies should be appraised and evaluated.
<b>Gross Disposable Household Income</b>	GDHI	The standard measure of household income
<b>Gross Domestic Product</b>	GDP	Total value of all goods and services produced within an economy in one year.
<b>Gross Domestic Product per worker</b>		A measure of productivity.

Term	Abbreviation	Explanation
<b>Gross Value Added</b>	GVA	The measure of the value of goods and services produced in an area, industry or sector of an economy.
<b>Groundwater and Groundwater Dependent Terrestrial Ecosystems</b>	GWDTE	A wetland that critically depends on groundwater flows and chemistries to support sensitive ecosystems.
<b>Habitat of Principal Importance</b>	HoPI	Habitats listed in section 41 of the Natural Environment and Rural Communities (NERC) Act 2006, considered to be the UK's most important habitats for wildlife.
<b>Hectare</b>	ha	The hectare is an SI unit of area primarily used in the measurement of land as a metric replacement for the imperial acre. An acre is about 0.405ha and 1ha is about 2.47 acres.
<b>Herfindahl–Hirschman Index</b>	HH index	An economic measure of market concentration.
<b>Heavy Goods Vehicle</b>	HGV	A large, heavy motor vehicle used for transporting cargo.
<b>High Speed 1</b>	HS1	A 109km high-speed railway between London and the UK end of the Channel Tunnel. The line carries international passenger traffic between the UK and continental Europe; it also carries domestic passenger traffic to and from stations in Kent and east London, as well as Berne gauge freight traffic.
<b>Highways England Water Risk Assessment Tool</b>	HEWRAT	A water risk assessment tool produced by National Highways
<b>HM49</b>		High traffic growth without scheme scenario
<b>HM Treasury</b>	HMT	The government's economic and finance ministry which maintains control over public spending, setting the direction of the UK's economic policy.
<b>HS72</b>		High traffic growth with scheme scenario
<b>Income Domain</b>		One of components of the Index of Multiple Deprivation that measures the proportion of the population in an area experiencing deprivation in terms of low income
<b>Index of Multiple Deprivation</b>	IMD	Official measure of relative deprivation for 32,844 small census areas in England. A rank of 1 is the most deprived area.
<b>Indices of deprivation</b>	IOD	A measure of the relative levels of deprivation. In England this considers 32,844 small areas or neighbourhoods, called Lower Layer Super Output Areas. The IOD 2019 is based on 39 separate indicators, organised across seven distinct domains of deprivation; these relate to income, employment, education, health, crime, living environment and barriers to housing and services.
<b>Indirect tax revenue</b>		Revenues from indirect taxes, such as fuel duty, paid by road users
<b>Industrial structure</b>		The categorisation of industries with an economy
<b>Inflation</b>		A measure of the increase in prices within the economy

Term	Abbreviation	Explanation
<b>Initial BCR</b>		The BCR that includes Level 1 benefits
<b>Inter-peak</b>	IP	An average hour within LTAM to represent an hour within the period 09:00–15:00
<b>International Union for Conservation of Nature</b>	IUCN	The International Union for Conservation of Nature is the global authority on the status of the natural world and the measures needed to safeguard it.
<b>International Territorial Level</b>	ITL	A geocode standard for referencing the subdivisions of the United Kingdom for statistical purposes, used by the Office for National Statistics (ONS). Within the UK it replaced the EU's NUTS system after Brexit.
<b>Journey time reliability</b>	JTR	The variation in journey times that travellers are unable to predict due to incidents and other factors
<b>Krugman Specialisation Index</b>	KSI	An economic measure of regional industrial specialisation
<b>Land Use Transport Interaction model</b>	LUTI	An economic model used to estimate the wider economic impacts based on variable land uses
<b>Landscape Character Area</b>	LCA	The discrete geographical areas of a particular landscape type. Also referred to as Local Landscape Character Area (LLCA)
<b>Level 1 benefits</b>		Monetised benefits estimated using established methodologies that are included in the Level 1 PVB when calculating the Initial and Adjusted BCRs
<b>Level 2 benefits</b>		Monetised benefits estimated using less established methodologies that are included in the Level 2 PVB when calculating the Adjusted BCR
<b>Level 3 benefits</b>		Either monetised or qualitatively appraised benefits that are not included in BCRs but which are taken into account in assessing a project's Value for Money
<b>Light Goods Vehicle</b>	LGV	Vehicles meeting the Department for Transport VEH04 criteria.
<b>LM49</b>		Low traffic growth without scheme scenario
<b>Local authority areas</b>	LAA	Several local authorities
<b>Local Nature Reserve</b>	LNR	Locally designated nature site protected through the planning system.
<b>Local Planning Authority</b>	LPA	A local planning authority is the local authority or council that is empowered by law to exercise statutory town planning functions for a particular area of the UK. May also be referred to as 'local authority'.
<b>Local North</b>		The Lower Thames local authorities of Havering, Thurrock and Brentwood
<b>Local South</b>		The Lower Thames local authorities of Dartford, Gravesham and Medway
<b>Local Wildlife Site</b>	LWS	Locally designated nature site protected through the planning system.
<b>Location Quotient</b>	LQ	An economic concept used as a relative measure of industry concentration



Term	Abbreviation	Explanation
<b>Lower Layer Super Output Area</b>	LSOA	A geographical area defined by the ONS used to produce neighbourhood statistics for small areas with a typical population of around 1,500 people
<b>Lower Thames Area Model</b>	LTAM	Transport model designed to forecast impacts of providing additional road based capacity across the River Thames at locations at or east of the existing Dartford Crossing.
<b>LS72</b>		Low traffic growth with scheme scenario
<b>M25 motorway</b>		Orbital motorway that encircles most of Greater London
<b>Marginal external costs</b>	MEC	The additional cost imposed on third parties by producing an extra unit of a good or service. In the case of transport projects it includes congestion, air pollution, noise, infrastructure impacts and accidents.
<b>Market failure</b>		A situation where the allocation of goods and services is inefficient resulting from a divergence between the private costs and benefits experienced by individuals, businesses and society.
<b>Monte-Carlo simulation</b>		A computational algorithm based on repeated random sampling to obtain cost estimates.
<b>Most Likely</b>		The expected level of CAPEX costs expressed as a probability (P) level.
<b>Motorway Reliability Incidents And Delays</b>	MyRIAD	Motorway Reliability Incidents And Delays appraisal software.
<b>Moves to more or less productive jobs</b>	M2MLPJ	A Level 3 wider economic impact that reflects the distortionary effect of taxes on the labour market and is measured by the change in tax revenues to Government due to a transport scheme
<b>National Character Area</b>	NCA	NCA's divide England into 159 distinct natural areas. Each NCA is defined by a unique combination of landscape, biodiversity, geodiversity, history, and cultural and economic activity. Their boundaries follow natural lines in the landscape rather than administrative boundaries.
<b>National Highways Carbon Valuation Toolkit v1.4.2</b>		National Highways appraisal tool used to present and value in monetary terms all greenhouse gas emissions of a road project.
<b>National Highways Commercial Services Division</b>	CSD	National Highways division responsible for commercial services.
<b>National Planning Policy Framework</b>	NPPF	The National Planning Policy Framework was published in March 2012 by the UK's Department of Communities and Local Government, consolidating over two dozen previously issued documents called Planning Policy Statements (PPS) and Planning Practice Guidance Notes (PPG) for use in England. The NPPF was updated in February 2019 and again in July 2021 by the Ministry of Housing, Communities and Local Government.

Term	Abbreviation	Explanation
<b>National Policy Statement for National Networks</b>	NPSNN	The NPSNN sets out the need for, and Government's policies to deliver, development of Nationally Significant Infrastructure Projects on the national road and rail networks in England. It provides planning guidance for promoters of Nationally Significant Infrastructure Projects on the road and rail networks, and the basis for the examination by the Examining Authority and decisions by the Secretary of State.
<b>National Trip-End Model</b>	NTEM	A DfT model that forecasts the growth in trip origin-destinations (or productions-attractions) up to 2051 for use in transport modelling. The forecasts take into account national projections of population, employment, housing, car ownership and trip rates.
<b>National Vocational Qualifications (NVQ) Level 4</b>	NVQ4	National Vocational Qualifications are work-based awards in England, Wales and Northern Ireland that are achieved through assessment and training. NVQ level 4 is equivalent to a degree level education.
<b>Net Present Value</b>	NPV	A measure of the total impact of a scheme upon society, in monetary terms, expressed in 2010 prices.
<b>New Economic Geography</b>	NEG	A theoretical framework for locational decisions in the context of imperfectly competitive markets.
<b>Nitrogen dioxide</b>	NO <sub>2</sub>	A reactive gas introduced into the environment by natural causes, including entry from the stratosphere, bacterial respiration, volcanos, and lightning. It is also introduced by the emissions of internal combustion engines burning fossil fuels.
<b>NOMIS</b>		An ONS web site that publishes official census and labour market statistics for the UK
<b>NOMIS Business Register and Employment Survey</b>	BRES	An employer survey of the number of jobs held by employees at the location of their workplace broken down by full/part-time and detailed industry classification using five digit SIC codes
<b>Nomenclature of Territorial Units for Statistics</b>	NUTS	A standard for referencing the subdivisions of countries for statistical purposes. The standard is developed and regulated by the European Union, and thus only covers the member states of the EU in detail.
<b>Non-Motorised Users</b>	NMU	Users of non-motorised vehicles (eg cyclists, horse riders) and pedestrians.
<b>Non-recoverable VAT</b>	NR VAT	Value added tax that has been paid but cannot be reclaimed by a business.
<b>Non-traded carbon</b>		Carbon emissions in sectors not included in Emission Trading Systems such as those from road vehicles
<b>O&amp;M model</b>		National Highways model for estimating operating, maintenance and renewals costs of road projects
<b>Office for National Statistics</b>	ONS	The executive office of the UK Statistics Authority, a non-ministerial Government department responsible for the collection and publication of statistics related to the economy, population and society of the UK
<b>Off-peak period</b>	OP period	The hours between 18:00-06:00 within the Project traffic model (LTAM).
<b>Operating, maintenance and renewals expenditure</b>	OMR	Operating, maintenance and renewal expenditure.

Term	Abbreviation	Explanation
<b>Origin-destination</b>	OD	Origin-destination data (also known as flow data) includes the travel-to-work and migration patterns of individuals, cross-tabulated by variables of interest (for example occupation).
<b>OSPAR</b>		The mechanism by which 15 governments (including the UK) and the EU cooperate to protect the marine environment of the North-East Atlantic.
<b>Other Goods Vehicle 1</b>	OGV1	All rigid vehicles over 3.5 tonnes gross vehicle weight including all large vehicles on a single frame: trucks, tow trucks, campers, motor homes, large ambulances, etc.
<b>Other Goods Vehicle 2</b>	OGV2	All articulated vehicles including multi-unit goods-carrying vehicles with a tractor or straight truck power unit, including goods-carrying rigid trucks pulling trailers and rigid vehicles with four or more axles.
<b>P10</b>		Costs for which there is a 10% chance that they will not be exceeded.
<b>P90</b>		Costs for which there is a 90% chance that they will not be exceeded.
<b>PM peak hour</b>		The hour between 17:00–18:00 within LTAM
<b>PM peak period</b>		The hours between 15:00–18:00 within LTAM
<b>Particulate matter</b>	PM <sub>2.5</sub>	Particulate matter with a diameter smaller than 2.5 micrometers
<b>Passenger car unit</b>	PCU	A metric to allow different vehicle types within traffic flows in a traffic model to be assessed in a consistent manner. PCU factors used within the Project's transport model are: 1 for a car or Light Goods Vehicle; 2 for a bus, 2.5 for a Heavy Goods Vehicle.
<b>Pence per hour</b>	PPH	Travel cost per hour
<b>Pence per kilometre</b>	PPK	Travel cost per kilometre
<b>Pence per minute</b>	PPM	Travel cost per minute
<b>Personal Injury Accident</b>	PIA	An accident that involves personal injury occurring on the public highway (including footways) in which at least one road vehicle or a vehicle in collision with a pedestrian is involved and which becomes known to the police within 30 days of its occurrence.
<b>Present Value</b>	PV	The result of discounting a stream of benefits or costs
<b>Present Value of Benefits</b>	PVB	The sum of discounted benefits
<b>Present Value of Costs</b>	PVC	The sum of discounted costs
<b>Public Accounts table</b>	PA table	A TAG appraisal table that reports the impacts of the Project on the public finances
<b>Public Rights of Way</b>	PRoW	A right possessed by the public, to pass along routes over land at all times. Although the land may be owned by a private individual, the public may still gain access across that land along a specific route. The mode of transport allowed differs according to the type of Public Right of Way which consist of footpaths, bridleways and open and restricted byways
<b>Public Transport</b>	PT	A system of vehicles such as buses and trains that operate at regular times on fixed routes and are used by the public

Term	Abbreviation	Explanation
<b>Quantitative Risk Assessment</b>	QRA	A formal and systematic risk analysis approach to quantifying the risks associated with the operation of an engineering process.
<b>Quarter 1</b>	Q1	The first three month period in a financial year.
<b>Queen Elizabeth II bridge</b>	QEII bridge	Queen Elizabeth II Bridge, part of the Dartford-Thurrock crossing.
<b>QUEues And Delays at Roadworks maintenance delays appraisal software</b>	QUADRO	A National Highways sponsored computer program to estimate the effects of roadworks in terms of time, vehicle operating and accident costs on the users of the road
<b>Quality Index</b>	QI	A measure of the robustness of TRIS traffic data
<b>RAMSAR site</b>		A wetland of international importance, designated under the Ramsar convention
<b>Real terms</b>		A data series for costs and benefits excluding the effect of the general level of price increases
<b>Reliability ratio</b>		A ratio used to calculate Journey Time Reliability benefits
<b>Retail Prices Index</b>	RPI	A price index that measures the change in the cost of a representative sample of retail goods and services. No longer classified as a national statistic in the UK
<b>Revenue</b>		Income from road users that are included in the PVC
<b>Risk (costs)</b>		A category of costs associated with events that may arise or may not arise due to a road project
<b>River Basin Management Plan</b>	RBMP	A planning document published by the Department for Environment, Food and Rural Affairs and the Environment Agency which sets out how organisations, stakeholders and communities will work together to improve the water environment.
<b>Road user charging</b>	RUC	A road user fee for the use of the tunnel.
<b>Roll on – roll off</b>	Ro-ro	Freight that can be driven on and off ships using their own wheels or a platform vehicle such as a self-propelled modular transporter
<b>Sensitivity test</b>		A test carried out to investigate the dependency in the model outputs to the values input into the model. Often a single input value is changed in turn and the resulting model outputs examined.
<b>Simulation and Assignment of Traffic to Urban Road Networks, software</b>	SATURN	Software used to build transport models
<b>Site of Importance for Nature Conservation</b>	SINC	Locally designated nature site protected through the planning system.
<b>Site of Special Scientific Interest</b>	SSSI	A conservation designation denoting an area of particular ecological or geological importance

Term	Abbreviation	Explanation
<b>Social cost benefit analysis</b>	CBA	A technique used to assess and compare the costs and socio-economic benefits of different options
<b>Social impact appraisal</b>		Social impacts cover the human experience of the transport system and its impact on social factors, not considered as part of economic or environmental impacts
<b>South East Local Enterprise Partnership</b>	SELEP	The business-led, public-private body established to drive economic growth across East Sussex, Essex, Kent, Medway, Southend and Thurrock
<b>South East Regional Traffic Model</b>	SERTM	National Highways South East Regional Traffic Model
<b>Spatial Computable General Equilibrium model</b>	SCGE	A methodology that can be used in the appraisal of the wider economic impacts of a transport intervention.
<b>Special Area of Conservation</b>	SAC	A designation under EU Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora, also known as the Habitats Directive.
<b>Special Protection Area</b>	SPA	A designation under EU Directive 2009/147/EC on the Conservation of Wild Birds.
<b>Standard Industrial Classification</b>	SIC	A system used to classify business establishments and other statistical units by the type of economic activity in which they are engaged.
<b>Strategic Road Network</b>	SRN	The core road network in England managed by National Highways
<b>Static clustering</b>		Benefits that come when firms and/or people locate near one another in geographical clusters but do not change their spatial location
<b>STATS19</b>		A database of all road traffic accidents that resulted in a personal injury and were reported to the police within 30 days of the accident. The data are collected by the police at the roadside or when the accident is reported to them by a member of the public in a police station.
<b>Teletrac</b>		DfT traffic dataset
<b>Tender Price Index</b>	TPI	An index of the prices for which contractor offer to carry out projects
<b>Thames Estuary 2100</b>	TE2100	An Environment Agency project (formed November 2012) to develop a comprehensive action plan to manage flood risk for the Tidal Thames from Teddington in West London, through to Sheerness and Shoeburyness in Kent and Essex.
<b>Transport Analysis Guidance</b>	TAG	Transport Analysis Guidance published by DfT which provides methods to model and appraise the impacts of transport projects
<b>TAG data book</b>		The data book of appraisal parameters used in transport appraisals for DfT
<b>Transport Decarbonisation Plan</b>	TDP	The government's commitments and actions needed to decarbonise the entire transport system in the UK

Term	Abbreviation	Explanation
<b>Transport Economic Efficiency</b>	TEE	An appraisal table used to report the Level 1 benefits that measure the impact of a transport scheme on the efficiency of the transport system
<b>Transport User Benefits Appraisal</b>	TUBA	DfT's transport user benefits appraisal software
<b>TRIS</b>		National Highways Traffic Count Database
<b>Traded carbon</b>		Carbon emissions in the traded sectors covered by Emission Trading Systems such as the power and industrial sectors
<b>Travel time variability</b>	TTV	The daily variation in travel times not due to incidents
<b>Tunnel Boring Machine</b>	TBM	A large machine used to excavate tunnels with a circular cross-section.
<b>Uncertainty (costs)</b>		A category of project costs that are unpredictable
<b>User class</b>	UC	Categorisation of different transport users based on their journey purposes
<b>Value Added Tax</b>	VAT	A consumption tax levied in the UK which was introduced in 1973. It is administered and collected by HM Revenue and Customs. VAT is levied on most goods and services provided by registered businesses in the UK and some goods and services imported from outside the European Union. The default VAT rate is the standard rate, 20% since 4 January 2011. Some goods and services are subject to VAT at a reduced rate of 5% (such as domestic fuel) or 0% (such as most food and children's clothing).
<b>Value for Money</b>	VfM	Value for Money, being the optimum combination of whole-life costs and quality to meet the user requirement.
<b>Value of time</b>	VOT	The opportunity cost of the time that a traveller spends on their journey and would be the amount that a traveller would be willing to pay in order to save time
<b>Variable demand model</b>	VDM	A transport model that represents how people respond to changes in travel times and costs
<b>Vehicle operating costs</b>	VOC	Costs that vary with vehicle usage, including fuel, tyres, maintenance, repairs, and mileage-dependent depreciation costs.
<b>VISUM</b>		Strategic car and rail modelling software
<b>Volume over capacity</b>	V/C	The ratio of a road's current or projected traffic volumes to its saturation flow or capacity
<b>Water Framework Directive</b>	WFD	Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy. The Directive establishes a framework for the protection of inland surface waters, estuaries, coastal waters and groundwater. The framework for delivering the WFD is through river basin management planning. The UK has been split into several river basin districts. Each river basin district has been characterised into smaller management units known as water bodies. The surface water bodies may be rivers, lakes, estuary or coastal.
<b>Weekend</b>	WE	A time period included in the transport model that covers travel on Saturdays and Sundays



Term	Abbreviation	Explanation
<b>Wider Economic Impacts</b>	WEI	Land use-related economic consequences of transport interventions, not directly related to impacts on users of the transport network, such as increased productivity. There are two Levels of Wider Economic Impacts, Level 2 and Level 3 benefits, that vary depending on whether land use is assumed to change.
<b>WITA v2.2</b>		DfT Wider Impacts Transport Appraisal Version 2.2 software used to appraise Level 2 wider economic impacts
<b>With Scheme</b>		Appraisal scenario that includes a proposed intervention such as a project, programme or policy. Also referred to as With Project
<b>Without Scheme</b>		Appraisal scenario that excludes a proposed intervention such as a project, programme or policy. Also referred to as Without Project
<b>World War II</b>	WWII	World War 2

## Annexes

## Annex A Other estuarial road crossings

### A.1 Introduction

A.1.1 This Annex provides more information about the findings in respect of wider economic impacts from the review of other estuarial road crossings that has been undertaken.

### A.2 Forth Road Bridge

A.2.1 Where there was a strong economic logic for the link and the presence of some existing economic interactions, the new crossing had major local impacts. The 1964 Forth Road Bridge is an example of this, where there was already a rail link heavily used for commuting from Fife to central Edinburgh. Edinburgh's Green Belt was also a factor that affected how Fife developed as both a commercial and residential location, as the Green Belt limited the scale of development on the edge of the city. The role of the existing links and Edinburgh's Green Belt are discussed in a 1966 study (Macgregor, 1966).

A.2.2 From the 1960s Edinburgh expanded steadily as a services-based location, latterly developing a strong cluster in financial services. Prior to the opening of the Bridge travel to work from Fife was limited to the areas close to the railway stations in the city centre. The Bridge enabled people to travel from Fife to a much larger geography on the south side of the River Forth. The expanded travel to work area included commercial developments that grew up further from the city centre and industrial and commercial developments in the New Town of Livingston in West Lothian.

A.2.3 In the 1980s the bridgehead area in Fife attracted back-office functions as well as stand-alone commercial developments, and more recently has seen large growth in housing numbers. As these developments were, and are, highly dependent on access to Edinburgh, the scale of development that has taken place would not have happened in the absence of the crossing.<sup>63</sup>

### A.3 First Severn Bridge

A.3.1 A review was undertaken of a detailed 1973 academic study carried out over a three-year period, by E.J. Cleary and R.E. Thomas from University College Swansea and Bath University into the economic consequences of the Severn Bridge and its associated motorways (Cleary and Thomas, 1973). It was undertaken to inform the then Government and provide advice for future schemes.

<sup>63</sup> In the absence of access to Edinburgh, the other large economic masses accessible from the main centres of Fife are Glasgow (40 miles) and Dundee (50 miles).

- A.3.2 The study begins by describing the economic structures and characteristics of South Wales and South West England before the bridge opened in 1966.
- A.3.3 The study found little evidence from other previous studies about the economic effects of large transport improvements. Therefore, the study set out some theoretical hypotheses about the likely economic impacts of the bridge on: inter-regional trade; industrial location; transport demand; land values; and the behaviour of people and firms, referred to as behavioural responses.
- A.3.4 The study noted that the assessment of impacts was partial due to the low level of national economic growth when the bridge was opened and because parts of the connecting M4 and M5 motorways were still to be completed.
- A.3.5 The key benefit of the scheme was that it provided the economic mass, due to the improved access to London, the M4 corridor and the Greater Bristol area, that would generate new economic relationships and grow employment in South Wales. The study report is based on sound economic analysis and represents one of the most detailed and rigorous assessments undertaken in the UK of the economic impacts of estuarial road crossings.
- A.3.6 The main findings of the study were that:
- a. The level of actual economic change due to the bridge was much greater than that predicted before it was opened.
  - b. Private motorists were the quickest to react to the economic opportunities provided by the bridge, followed by commercial drivers; the slowest group to react were manufacturing firms.
  - c. The areas affected by the economic impacts of the bridge were not confined to those immediately adjacent to the bridge.
  - d. The advantages from the bridge were exploited most by those businesses with previous knowledge of, and relationships within, the new market areas that were opened up.
- A.3.7 Many of the economic hypotheses and actual findings of the study reflect economic impacts that are included within TAG, which are used to appraise schemes today. Therefore, the insights from the study are still valuable in assessing the potential for the Project to generate WEIs. While the Project is located in a different part of the country and has its own particular socio-economic context, the study highlights impacts that reflect both similarities and differences between the Severn Bridge and the Project.

## A.4 Humber Bridge

- A.4.1 The economic case for the Humber Bridge was weaker than that for the Forth and Severn crossings and it was consequently found that the Humber Bridge had relatively limited economic impacts. This almost certainly reflects the existence of historically strong economic east–west linkages on both the north and south sides of the Humber, rather than across the river. These east–west linkages included labour markets and buyer–seller relationships. Given these established linkages and the limited cross-river interaction prior to the crossing, there were limited reasons to cross the river. Consequently, the established linkages continued to dominate while only limited cross-river interactions developed.
- A.4.2 A study of the Humber Bridge did, however, identify one important piece of evidence, namely that some businesses responded to the crossing by reorganising their operating structures (Mackie and Simon, 1986). For example, instead of replicating offices or plant on both sides of the river, a market that spanned both sides of the river could be more efficiently served by a hub and spoke structure.<sup>64</sup> The better use of resources that results from such a reorganisation is a clear productivity gain, and one that is important for the Project.

## A.5 Second Tyne Tunnel

- A.5.1 Evidence of the economic impacts of additional crossings is more limited. The second Tyne Tunnel addressed traffic issues, but survey evidence suggests that only minor local economic impacts have occurred. Some firms have reported cost savings, but there has been little impact on employment levels. However, there is evidence that the matching of jobs and skills had improved as firms become more willing to hire people who live on the opposite side of the river (Bradley, Coombes and Strickland, 2012).

## A.6 Second Severn Bridge

- A.6.1 There is no evaluation evidence relating to the construction of the second Severn Bridge. However, traffic levels increased by more than 10% following the removal of the tolls in 2018 and local evidence suggests that this increased land values in South Wales (BBC News, 2019). This might presage growth in interactions in the cross-river markets for labour, goods and services.

## A.7 Queen Elizabeth II Bridge

- A.7.1 The Queen Elizabeth II bridge is the closest comparator, in terms of impacts, to the Project. The crossings share a similar context, although the immediate

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<sup>64</sup> Involving a single HQ located either north or south of the river, with branch offices or plants on both sides of the river.

hinterlands of the Project are located further from London. A study for Transport for London (TfL) found that the great majority of traffic using the Dartford Crossing has both its origin and its destination outside London, befitting its role as a bypass route around the capital (Transport for London, 2012). Accordingly, the study concluded that the crossing appears to cater principally for inter-regional, national and international travel demand and is of relatively minor importance for local, sub-regional or London-wide trips. However, the findings of a further TfL study reported the following (Transport for London, 2014):

- a. Improved connectivity from river crossings can have large impacts on employment growth, with the authorities in close proximity to the Dartford Crossing seeing growth rates of 20% above those of the wider sub-region during the past 20 years.
- b. Analysis of the spatial distribution of the Dartford Crossing employment impacts suggests that these are most likely to be felt in authorities directly linked by the new crossing (in this case Dartford and Thurrock). However, there may be some displacement effects with new employment choosing to locate closer to the crossing at the expense of other authorities in reasonable proximity to the crossing.
- c. Analysis of the impacts on particular sectors from the Dartford Crossing suggests that the construction, retail and distribution sectors are most likely to benefit from the improved road connectivity, although smaller scale positive impacts on office based sectors may also occur.
- d. The impact of new crossings on housing growth is less certain and is much more aligned to local authority planning policy. However, analysis from the Dartford Crossing suggests that dwelling growth rates in both Thurrock and Dartford have been above the regional averages by 28% and 34% respectively since the crossing opened.

## A.8 Mersey Gateway

- A.8.1 The Mersey Gateway bridge, which opened in 2017, provides a strategic crossing of the Mersey and the Manchester Ship Canal between Runcorn and Widnes. The older Silver Jubilee Bridge reopened in 2021 to provide a link for local traffic. Both crossings are tolled.
- A.8.2 A Wider Economic Impact report was completed early in 2009 and the approvals process began in 2010 (Amion Consulting, 2009). In 2014 the then Government agreed to fund any shortfall in toll revenues and construction began shortly afterwards. The 2009 study claimed a range of positive impacts, including:



- a. Business transport cost savings, reduced congestion and easier travel to work.
- b. Increased business investment and innovation – new logistics space was expected to attract 5,500 jobs over 10–15 years.<sup>65</sup>
- c. Clusters and agglomeration impacts, modelled using the DfT's Wider Economic Impacts methodology at that time.
- d. Limited labour market impacts due to the limited skills base. A package of education, skills and employment initiatives was planned to enhance labour market impacts.
- e. Domestic and international trade benefits. Constraints in the transport network were found to have a negative impact on port developments in the region.
- f. Globally mobile investment benefits. The project was considered to enhance the appeal of the wider region by providing better accessibility to UK markets and to the workforce.

A.8.3 In addition, the project was expected to benefit regeneration areas close to its bridgeheads. It was, however, noted that the labour market could become more competitive due to a two-way street effect whereby the labour market would be more accessible from surrounding areas.

A.8.4 While there have been positive press statements about the crossing and its impacts, there appears to be no *ex post* monitoring or evaluation.

## A.9 Silvertown Tunnel

A.9.1 Permission was granted in May 2018 for the construction of the Silvertown Tunnel which will link the Greenwich Peninsula and Silvertown in East London. The project will deliver a 1.4km twin-bore road tunnel under the Thames with a planned opening in 2025. It will be the first new road crossing in East London in over 30 years.

A.9.2 The business case for the project highlighted the paucity of road crossings east of Tower Bridge and the constraints imposed by the Blackwall Tunnel, where high levels of congestion and the frequency of unplanned closures affect travel between residential areas south of the Thames and employment sites north of the river. Public transport use of the tunnel is limited by both physical constraints and by lack of resilience of the road network east of Tower Bridge. Freight movements are also affected by constraints at the Blackwall Tunnel (Planning Inspectorate, n.d.), (Transport for London, n.d.).

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<sup>65</sup> The amount of net new job creation was not indicated.

- A.9.3 The business case pointed to the barrier effect of the river and the lack of road crossings, which it argued restricted labour and business access to business catchments in what are some of England’s most deprived areas. The barrier effect was also believed to be a contributing factor to lower levels of inward investment and lower land values in east London. This in turn made the delivery of new housing and jobs more difficult in areas where there is further development potential.
- A.9.4 The project is expected to support improved economic performance. The results of land use transport modelling indicated that in 2041 there would be a net increase of 3,000 jobs within East London as a result of the scheme, with 70% of these jobs expected to be taken up by regeneration area residents.
- A.9.5 By bringing firms closer together and closer to their workforce, the project’s agglomeration benefits over 60 years were estimated to be £37.9m (2010 prices and values).

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