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M4 Corridor around Newport

Wider Economic Impact Assessment



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Assessment

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Executive Summary

The economy of South Wales is highly reliant on the M4 as the primary east-west road link. The M4 is the main route in and out of the country for over 70% of the country's population and economy¹².

In economic terms, the M4 Corridor around Newport (M4 CaN) plays multiple roles. The M4 facilitates the movements of goods and people between Wales and the rest of the UK, enabling firms in South Wales to access domestic and international markets. The M4 is the most heavily used transport link between the main urban centres in the Severn Estuary of Swansea, Bridgend, Cardiff, Newport and Bristol. The M4 Corridor around Newport also plays a key role in facilitating the movement of commuters through South Wales. For many users, there is no feasible alternative to the M4.

Traffic congestion on the M4 Corridor around Newport results in longer journey times for users. Traffic incidents can exacerbate delays and cause disruption to businesses and other users, resulting in poor journey time reliability. Given the reliance on the M4, any disruption to the smooth operation of the motorway in South Wales imposes costs on individuals and businesses and has a negative impact on the economy. Furthermore, as the primary route in and out of South and South West Wales, the current state of the M4 has negative impacts on the perceptions of Wales as a place to visit and do business. The Brynglas Tunnels, for example, have been described by the Prime Minister as a *'foot on the windpipe of the Welsh economy'*³.

Concerns over the functioning of the M4 corridor have been expressed by the business community in South Wales. These concerns are highlighted in a recent open letter from members of the business community in relation to the M4 CaN proposals. They state: *'The constant disruption and delay along the main motorway route across South and West Wales caused by the Brynglas tunnel bottleneck around Newport significantly damages the Welsh economy and negatively impacts upon Wales' standing as a globally competitive business location.'*⁴

Previous research by the University of the West of England (UWE) has established the link between transport, accessibility and the economic performance of South Wales⁵. South Wales exhibits lower levels of GDP per head than neighbouring areas in the South West of England or indeed the UK average. Notably, GDP per head in Cardiff and the Vale of Glamorgan is less than that of its counterpart in the South West, Bristol. In large part, Wales' poor relative economic performance is explained by a longstanding 'productivity gap' between Wales and the UK average. This research has indicated that spatial factors – the lack of economic mass or density and the relative peripherality of Wales (based on travel times to London) – play a role in determining Wales'

¹ Based on the population and economies of Local Authorities in South West and South East Wales.

² As measured by Gross Value Added.

³ Prime Minister David Cameron

⁴ Open letter from CBI Wales and leading Welsh businesses to Welsh politicians - Delivery of M4 Black Route is vital for the Welsh economy

⁵ Understanding the productivity variations between Wales and the UK (2006). University of the West of England and the University of Bath. Re-stated in Productivity in Wales: the impacts of peripherality on spatial patterns of productivity (2010). University of the West of England.

relative performance. This hypothesis is supported by UK and international evidence on the link between transport and economic performance.

The demands placed on the transport network are set to increase. The population of South Wales is projected to increase by over 10% between 2011 and 2036⁶. Within the study area defined for this assessment, car travel accounts for 73% of commuter movements, a proportion which actually increased between 1991 and 2011. Inadequate transport infrastructure will make it more difficult to accommodate such growth. Increased highway congestion, resulting from higher demand, notwithstanding public transport improvements, will increase the costs of doing business in South Wales, making it more difficult for local firms to compete in external markets further afield. Increased congestion will also affect the functioning of the labour market by increasing the costs of commuting, acting to effectively reduce the area over which people can access employment and firms can recruit workers.

In the absence of intervention, growing traffic demand will increase the severity of traffic problems on the M4 around Newport leading to longer journey times and more frequent delays. Logically, this would also reinforce the negative perceptions of the quality of the transport network in and out of South and South West Wales amongst people and businesses.

The M4 CaN proposals seek to improve the functioning of the road network by providing a faster and more reliable route for strategic journeys, whilst also strengthening the resilience of the road network in South Wales. The Economic Appraisal Report (EAR) demonstrates that the economic benefits to users of the improvements, consisting of the reduction in time and costs of journeys under typical operating conditions brought about by the scheme, outweigh its costs such that the scheme offers value for money. However, it is also important to consider how changes in transport conditions – by influencing the decisions of firms and individuals – can impact on economic performance and competitiveness at a local and regional level.

The EAR sets out that the M4 CaN scheme will result in lower journey times and reduce transport costs for businesses in the study area defined for this assessment. Even before the effects of traffic incidents and abnormal delays are considered, cost savings for businesses in the study area are estimated to be £40m (2014 prices) each year by the design year of 2037. In practice, however, the scheme will also improve journey time reliability and will reduce the delays associated with traffic incidents which will result in further cost savings and efficiency benefits for businesses.

In addition to the *direct* cost savings set out in the EAR, the scheme is also expected to contribute to higher levels of productivity in the study area by enabling improved interaction between businesses and widening the effective pool of labour and skills available to firms. Such effects are termed agglomeration effects. Agglomeration effects resulting from the scheme are expected to contribute a further £39m (2014 prices) to the GVA of the study area.

As noted, research suggests that economic performance in Wales is also influenced by Wales' relative peripherality. By improving access between South Wales and the rest of the UK, further productivity benefits might be expected. Whilst it is difficult to be precise about the magnitude of such benefits, applying

⁶ Welsh Government / Office for National Statistics

evidence from UWE's research would suggest that further productivity benefits in the region of £20m (2014 prices) per annum could be expected in South Wales by 2037 as a result of lower travel times between South Wales and the rest of the UK.

Combining these impacts together, the scheme is expected to deliver higher GVA (Gross Value Added⁷) of £99m (2014 prices) per annum in the study area in 2037 or £2.1bn (Present Value 2010) over a 60 year appraisal period. In South Wales specifically, the impact on GVA would be £74m per annum by 2037 or £1.6bn (PV 2010) over 60 years.

It should be noted that the GVA estimates above underestimate the total impact of the scheme given that they are based on changes in average journey times under typical operational conditions on the highway network in terms of average flows and speeds on a normal day of operation. Disruption and delays will impose further costs on the economy. Therefore, the additional capacity and resilience afforded by the scheme will further reduce the costs to businesses of unreliable journeys and incident related delays with resultant higher productivity gains than those quantified above.

It is also important to consider how transport conditions affect the location of economic activity and employment. The vast majority (88%) of firms describe the quality and reliability of transport infrastructure as a significant influence on business investment decisions⁸. The importance of access to the motorway network is demonstrated in the clustering of employment around existing junctions of the M4 in South Wales.

The M4 CaN scheme, by creating two new junctions to the south of Newport (Docks Way Junction and Glan Llyn Junction), will provide improved access to a number of currently allocated employment sites in Newport and Monmouthshire. It has been estimated that these sites have the capacity to cater for in the region of 15,000 jobs. The M4 CaN proposals will make these sites more attractive for investment whilst also improving access to sites located in close proximity to the existing route.

The proposals include a new bridge crossing of the River Usk, which has several commercially operated wharves. The bridge and approach viaducts also cross the Newport Docks, owned and operated by Associated British Ports (ABP), between North and South Dock. Impacts on the operation of the Docks need to be considered alongside the benefits of the improved access to the Docks and the by the provision of a junction at Docks Way. The Welsh Government has carried out a detailed assessment of the impacts on the Docks⁹. This analysis indicates that, of unique vessels using the North Dock for the study period (June 2010 to February 2015), 88.4% of ships would be unimpeded to access the North Dock beneath the proposed new motorway bridge. The report also highlights the opportunity for alternative vessels to be chartered or for vessels to berth at alternative wharfs within Newport Dock and the River Usk.

⁷ Gross Value Added (GVA) is often used as a measure of economic performance at a regional level. GVA is closely related to GDP. GVA is the value the output of an industry or region, less the value of intermediate inputs.

⁸ CB1 2014

⁹ M4 Corridor around Newport: Shipping Analysis (Draft, July 2015), Global Maritime Consultancy Ltd.

Based on the assessment carried out on behalf of the Welsh Government, it is concluded that the impact of the Scheme on Docks operations is likely to be relatively slight and therefore the implications for the wider economy would be limited.

More generally, the M4 CaN is expected to contribute positively to perceptions of South and South West Wales as a location for investment. This conclusion is supported by many in the business community. Furthermore, the vast majority of overnight holidaymakers to Wales travel by car. Therefore, it would be reasonable to assume that the majority of tourists visiting South and South West Wales will experience the M4 around Newport during their visit. Delays caused by disruption on the M4 corridor will impact negatively on visitor's perceptions of South and South West Wales as a place to visit.

Whilst the *direct* measurable impacts of M4 CaN are likely to be concentrated in South East Wales, the economies of a much wider area are dependent on the route for the movement of people and goods. Although more difficult to measure, the benefits that the scheme will deliver in improving perceptions of the ease of access to Wales will be felt more widely across the whole of South and South West Wales.

Summary Impact Assessment

Impact	Assessment
Lower transport costs for businesses	<ul style="list-style-type: none"> • Direct impact on the GVA of £40m (£0.8bn) in the study area as a whole.
Efficiency benefits of improved reliability and network resilience	<ul style="list-style-type: none"> • Easier to plan journeys and reduced costs of disruption for logistics firms and 'just in time' operators.
Improved access to markets	<ul style="list-style-type: none"> • Average journey time savings of 10 minutes for journeys between South Wales and England.
Improved access to employment for residents	<ul style="list-style-type: none"> • Improved access to employment for large parts of the study area (for example, a resident of Magor would be able to access 7% more jobs by car as a result of the scheme).
Widened access to a labour force for firms	<ul style="list-style-type: none"> • Scheme results in an expansion in the size of the accessible workforce for large parts of the study area (for example, a business located in Newport would experience an effective increase in labour force catchment of between 3% and 5%).
Productivity benefits of strengthened agglomeration effects	<ul style="list-style-type: none"> • Positive impact on GVA of £39m per annum (£0.7bn PV 2010) in the study area as a whole.
Productivity benefits of reduced peripherality	<ul style="list-style-type: none"> • Further GVA impact of approximately £20m per annum in 2037 (£0.5bn PV 2010) in South Wales.
Increased investment and employment	<ul style="list-style-type: none"> • New motorway access to employment sites to the south of Newport with capacity for 15,000 jobs (equivalent to approximately £0.6bn of GVA per annum); • Improved access to sites adjacent to the existing M4 corridor; • Improved perceptions of Wales as a location for investment.

1 The Project

1.1 Context

- 1.1.1** The Welsh Government has awarded a Professional Services Contract for the current stage of scheme development and environmental surveys for the M4 Corridor around Newport (M4CAN) up to publication of draft Orders and an Environmental Statement. The contract has been awarded to a Joint Venture of Costain, Vinci and Taylor Woodrow with consultants Arup and Atkins, supported by sub-consultant RPS. The team has developed proposals in anticipation of publishing draft Orders and an Environmental Statement in Spring 2016 and a Public Local Inquiry later this year. This process will then inform the next stage of Ministerial decision making.
- 1.1.2** Since 1989 there have been various studies to identify the problems and propose possible solutions. The M4 Corridor around Newport WelTAG Stage 1 (Strategy Level) Appraisal concluded that a new section of 3-lane motorway to the south of Newport following a protected (TR111) route, in addition to complementary measures, would best achieve the goals and address the problems of the M4 Corridor around Newport and should be progressed for further appraisal. These options have subsequently formed the basis for the development of the draft Plan, which was published in September 2013 and was the subject of public consultation from September to December 2013.
- 1.1.3** Having taken into account the responses to this participation process, as well as the assessments of the draft Plan, the Welsh Government has decided to publish a Plan for the M4 Corridor around Newport. Alongside this Plan, the Welsh Government has published updated strategy-level reports, including a Strategic Environmental Assessment Statement, to demonstrate how the participation process has informed its decision making. It also announced in July 2014 a revised preferred route, which protects a corridor for planning purposes. These documents can be accessed from the website <http://m4newport.com>.

1.2 Scheme objectives and reason for the scheme

- 1.2.1** The aims of the Welsh Government for the M4 Corridor around Newport are to:
- a) Make it easier and safer for people to access their homes, workplaces and services by walking, cycling, public transport or road.
 - b) Deliver a more efficient and sustainable transport network supporting and encouraging long-term prosperity in the region, across Wales, and enabling access to international markets.

- c) To produce positive effects overall on people and the environment, making a positive contribution to the over-arching Welsh Government goals to reduce greenhouse gas emissions and to making Wales more resilient to the effects of climate change.

1.2.2 The scheme aims to help to achieve or facilitate these aims as part of a wider transport strategy for South East Wales, as outlined within the Prioritised National Transport Plan.

1.2.3 The Transport Planning Objectives (TPOs), or goals, are:

TPO 1: Safer, easier and more reliable travel east-west in South Wales.

TPO 2: Improved transport connections within Wales and to England, the Republic of Ireland and the rest of Europe on all modes on the international transport network.

TPO 3: More effective and integrated use of alternatives to the M4, including other parts of the transport network and other modes of transport for local and strategic journeys around Newport.

TPO 4: Best possible use of the existing M4, local road network and other transport networks.

TPO 5: More reliable journey times along the M4 Corridor.

TPO 6: Increased level of choice for all people making journeys within the transport Corridor by all modes between Magor and Castleton, commensurate with demand for alternatives.

TPO 7: Improved safety on the M4 Corridor between Magor and Castleton.

TPO 8: Improved air quality in areas next to the M4 around Newport.

TPO 9: Reduced disturbance to people from high noise levels, from all transport modes and traffic within the M4 Corridor.

TPO 10: Reduced greenhouse gas emissions per vehicle and/or person kilometre.

TPO 11: Improved travel experience into South Wales along the M4 Corridor.

TPO 12: An M4 attractive for strategic journeys that discourages local traffic use.

TPO 13: Improved traffic management in and around Newport on the M4 Corridor.

TPO 14: Easier access to local key services and residential and commercial centres.

TPO 15: A cultural shift in travel behaviour towards more sustainable choices.

1.2.4 The scheme-specific environmental objectives (EO), as set out in the Strategic Environmental Assessment of the Plan, are as follows:

EO1 - Improved air quality in areas next to the existing M4 around Newport;

EO2a - Reduce greenhouse gas emissions per vehicle and/or person kilometre;

EO2b - Ensure that effective adaptation measures to climate change are in place;

EO3 - Reduce disturbance to people from high noise levels, from all transport modes and traffic within the existing M4 Corridor;

EO4 - Ensure that biodiversity is protected, valued and enhanced;

EO5 - Improved access to all services and facilities and reduce severance;

EO6 - Protect and promote everyone's physical and mental wellbeing and safety;

EO7 - Reduce transport related contamination and safeguard soil function, quality and quantity;

EO8 - Minimise transport related effects on surface and groundwater quality, flood plains and areas of flood risk;

EO9 - Ensure the prudent and sustainable use of natural resources and energy;

EO10 - Ensure that diversity, local distinctiveness and cultural heritage are valued, protected, celebrated and enhanced;

EO11 - Ensure that landscape and townscape is properly valued, conserved and enhanced;

1.2.5 In addition, the Wales Transport Strategy includes the following environmental outcomes (WTSEO):

Outcome 11: The sustainability of the transport infrastructure - Increase the use of more sustainable materials in our country's transport assets and infrastructure;

Outcome 12: Greenhouse gas emissions - Reduce the impact of transport on greenhouse gas emissions;

Outcome 13: Adapting to climate change - Adapt to the impacts of climate change;

Outcome 14: Air pollution and other harmful emissions - Reduce the contribution of transport to air pollution and other harmful emissions;

Outcome 15: The local environment - Improve the positive impact of transport on the local environment;

Outcome 16: Our heritage - Improve the effect of transport on our heritage;

Outcome 17: Biodiversity - Improve the impact of transport on biodiversity.

2 Scope of this Report

Chapter Summary

- The Wider Economic Assessment is concerned with impacts on the *real* economy at a local and regional level;
- The aims of the M4 CaN reflect the strategic importance of the M4 to the economy of South Wales.

2.1 Purpose

2.1.1 The purpose of the Wider Economic Impact report is to consider the impact of the M4 CaN proposals on the local and regional economy.

2.1.2 Undertaking an assessment of economic impacts recognises the strategic importance of the M4 to the economy of South Wales as well as the Welsh Government's objectives for the scheme. The Welsh Government's Plan for the M4 CaN¹⁰ identifies a total of 17 problems on the M4 corridor. One of the problems identified is as follows:

'The existing transport network acts as a constraint to economic growth and adversely impacts the current economy'.

2.1.3 In light of this problem, one of the aims for the M4 CaN is to:

'Deliver a more efficient and sustainable transport network supporting and encouraging long-term prosperity in the region, across Wales, and enabling access to international markets.'

2.1.4 Given this aim, it is appropriate to consider the ways in which M4 CaN could impact on the local and regional economy.

2.2 Wider Economic Impacts and the Economic Appraisal Report

2.2.1 It is important to distinguish between the Economic Appraisal Report (EAR) and the Wider Economic Impact Assessment.

2.2.2 The primary output of the EAR is a Cost-Benefit Analysis (CBA) of the scheme. The CBA is concerned with the effects of the scheme on social welfare relative to a 'do minimum' scenario. As far as is practical, the CBA seeks to provide a monetary valuation of the costs and benefits of the scheme in order to demonstrate whether the scheme is likely to provide value for money. The CBA includes monetary values for a range of impacts for which the market does not provide a measure of value or for which no financial transaction is involved. For example, the CBA measures the benefit (or the change in social welfare) of lower journey times for non-work trips (such as a

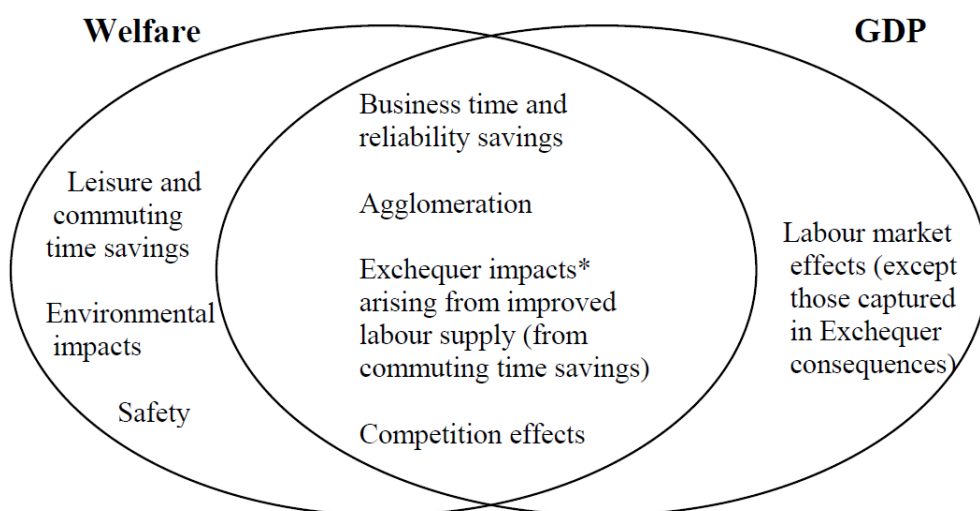
¹⁰ M4 Corridor Around Newport: The Plan. Welsh Government, July 2014

commuter trip) based on estimates of user's 'willingness to pay'¹¹ for journey time savings.

2.2.3 Conversely, the Wider Economic Impact Assessment considers impacts on the *real* economy. The purpose of the Wider Economic Impact Assessment is to understanding how transport conditions will influence the decisions of economic actors (namely firms and individuals) and how this will ultimately affect the location and scale of economic activity. Therefore, whereas the EAR measures welfare, wider economic impacts are typically expressed in units of Gross Domestic Product (GDP)¹² or numbers of jobs created.

2.2.4 In this respect there are some overlaps between the two assessments. This is illustrated in the venn diagram below¹³:

Figure 1: Transport Investments, Welfare and GDP



Source: Department for Transport (2005), *Transport, Wider Economic Benefits, and Impacts on GDP*

2.2.5 The overlapping area in the diagram represents impacts that are both welfare effects and GDP impacts. Benefits (or cost savings) experienced by business users are a prime example of an impact on both welfare the GDP. The CBA also assesses a range of welfare impacts that do not directly represent a GDP impact, such as journey time savings for leisure and commuter users. Finally, there are also be effects of transport investments that increase GDP but do not necessarily result in an equivalent increase in welfare (and are therefore not captured in the CBA). An example of this is where an

¹¹ Willingness to pay is a theoretical measure of the value that users ascribe to the time spend travelling, given that they could put that time to more productive use (either as leisure time or working longer hours).

¹² Gross Domestic Product is a monetary measure of the value of all goods and services produced by an economy. GDP is widely used as a measure of economic performance. For regional economies and individual industry sectors, Gross Value Added (GVA) is often used as a measure of economic performance. GVA is closely related to GDP. GVA is the value the output of an industry or region, less the value of intermediate inputs.

¹³ Recreated from Transport, Wider Economic Benefits, and Impacts on GDP. Department for Transport Discussion Paper (July 2005)

individual takes the decision to enter the labour market job as a result of an improvement in transport and accessibility. This may contribute to an increase in the GDP of an economy, but the welfare gain may be lower than the GDP impact if he or she has to spend more time travelling as a result.

2.2.6 A further distinction between the two assessments is that, whereas the CBA measures the *direct* effects of the scheme on transport conditions for users, the Wider Economic Impact Assessment is concerned with both direct and indirect effects of the transport investment on the economy. In the example above, whereas the CBA seeks to measure the change in welfare experienced by commuters, the Wider Economic Impact assessment is concerned with how lower journey times could affect commuting patterns or levels of productivity.

2.2.7 The final difference between the CBA and economic impact assessment is the geographic scope of the analysis. The CBA is focussed only on net economic benefits at a Great Britain (GB) level. How such costs and benefits are distributed spatially is not considered. In practice, the economic benefits of a transport scheme will be concentrated in particular areas – typically areas in closer proximity to the scheme – whilst the impacts across a wider area will be more diffuse. It is also the case that a transport improvement may lead to an increase in economic activity in one area at the cost of a reduction in economic activity in another areas. The Wider Economic Impact is concerned with the effects on the economy of a defined geographical area and considers where there may be positive or negative effects. A study area for the assessment of the impacts of M4 CaN is defined in Chapter 4 of this report.

2.3 Scope

2.3.1 The objective of the Wider Economic Impact assessment is to identify the ways in which M4 CaN is expected to impact on the economy. These are termed ‘transmission mechanisms’. The mechanisms represent the causal link between the effect of the scheme on transport conditions and impacts on the economy. Once these mechanisms have been identified, the purpose of the assessment is to consider the likely significance of these impacts.

2.3.2 The relationship between transport and the economy is highly complex. The economic impacts considered in this report are the product of an array of decisions made by individuals and individual businesses about where to work, where to shop, and where to invest. Because of this complexity, it is difficult to be precise about the magnitude of wider economic effects that result from changes in transport conditions.

2.3.3 Partly as a result of this complexity, when measuring the effect of past infrastructure improvements, it is difficult to isolate the effects of transport from wider economic and social trends. As would be expected, it is also the case that the impact of transport

improvements is context specific. As a result, the analysis of economic impacts cannot be based wholly on empirical relationships between changes in transport and effects on the economy. To reflect this, the Wider Impact Assessment is based on a combination of qualitative judgement (drawing on the transport economic literature) and quantitative evidence.

- 2.3.4** The primary focus of the assessment is on the long term impact of M4 CaN once the scheme is in operation, although an assessment has been undertaken of the impacts of the scheme on the economy during the construction phase.

2.4 Approach

- 2.4.1** The Wider Economic Impact assessment has been undertaken based on the following research:

- a) A review of the literature on the economic impacts of highway improvements including evidence from studies undertaken in Wales (Chapter 3);
- b) A baseline assessment of the economy of the study area (comprising South East Wales and part of the South West of England) with particular focus on Newport (Chapter 4);
- c) An assessment of current traffic problems on the M4 around Newport (Chapter 5)
- d) An assessment of the direct effects of the M4 on transport conditions (Chapter 6);
- e) An assessment of the effects of M4 CaN during the construction phase of the project (Chapter 7);
- f) An assessment of the effects of M4 CaN during the operational phase of the project (Chapter 8).

3 Transport and Economic Performance

Chapter Summary

- **Transport infrastructure, whether for the movement of people or goods is essential to the functioning of any economy.**
- **Traffic congestion imposes costs on the economy through longer journey times and poor journey time reliability.**
- **Businesses identify the quality of transport as a determinant of investment decisions. Transport improvements have been shown to affect land use and business location.**
- **Transport and accessibility affect productivity and economic performance. Spatial factors – including travel times to London – account, in part, for Wales' lower than average GDP.**

3.1 Introduction

3.1.1 This chapter considers the evidence on the impacts of transport on economic performance. Section 3.3 provides an overview of the general relationship between transport and the economy, identifying the key mechanisms through which transport improvements affect economic performance. Section 3.4 explores in greater detail the literature on the impact of investment in highways improvements in particular. Section 3.5 considers the evidence of the impact of past transport investments in Wales as well as research on the importance of transport to the economy more generally.

3.2 Transport and the Economy

3.2.1 Transport infrastructure, whether for the movement of people or goods – is clearly essential to the functioning of any economy. The key issue considered here is whether, and in what circumstances, improving transport infrastructure leads to an improvement in economic performance.

3.2.2 A wide ranging review of the relationship between transport and the economy – The Eddington Transport Study (produced for HM Treasury and the Department for Transport) concluded that by imposing costs on business interactions, transport can reduce productivity and limit the potential for innovation.¹⁴ Investment in improving transport infrastructure can alleviate these pressures and support increased productivity and sustainable economic growth, particularly at the local level (Eddington, 2006).

3.2.3 The Eddington Study identified the following drivers of economic performance:

¹⁴ Eddington, R. (2006) The Eddington transport study. The case for action: Sir Rod Eddington's advice to Government, HM Treasury. Available online at: http://www.fcrn.org.uk/sites/default/files/Eddington_Transport_Study.pdf [accessed November 2015]

- a) increasing business efficiency
- b) increasing business investment and innovation
- c) supporting clusters and agglomerations
- d) improving efficiency functioning of labour markets
- e) increasing competition
- f) increasing domestic and international trade
- g) attracting globally mobile activity.

3.2.4 The Eddington Review concluded that targeted, well thought out transport infrastructure investment can significantly aid these drivers and thus improve economic performance. It suggested that a 5% reduction in travel time for business and freight travel on UK roads could generate around £2.5 billion of cost savings – approximately 0.2 per cent of GDP (Eddington, 2006).

3.2.5 A report of the Department for Transport's (DfT) Standing Advisory Committee on Trunk Road Appraisal (SACTRA) on 'Transport and the Economy'¹⁵ identified the following mechanisms through which transport improvements could, in principle, improve economic performance:

- a) reorganisation or rationalisation of production, distribution and land use;
- b) effects on labour market catchment areas and hence on labour costs;
- c) increases in output resulting from lower costs of production;
- d) stimulation of inward investment;
- e) unlocking inaccessible sites for development; and
- f) triggering growth which in turn stimulates further growth.

3.2.6 The SACTRA report concludes that, when assessing any of the above effects, it is important, therefore, to consider the economic context of particular transport improvements, and to distinguish their impacts at different spatial levels.

3.2.7 Whilst the relationship between transport and the economy is complex, both SACTRA and Eddington support the conclusion that transport can be viewed as a necessary but not sufficient condition for economic development¹⁶. The Eddington Review concludes that, where the transport network is established, transport improvements are most likely to deliver economic benefit where the investment is a response to signals of transport demand exceeding capacity.

¹⁵ Standing Advisory Committee on Trunk Road Appraisal (SACTRA) (1996) Final report. Department for Transport. Available online at: http://webarchive.nationalarchives.gov.uk/20050301192906/http://dft.gov.uk/stellent/groups/dft_econappr/documents/pdf/dft_econappr_pdf_022512.pdf [accessed November 2015]

¹⁶ The Economics of Transport: A theoretical and applied perspective (Cowie, 2010)

- 3.2.8** As noted in Chapter 2, improvements to transport infrastructure not only result in direct cost savings for users – or ‘user benefits’ – but also deliver wider economic benefits. In a recent review commissioned by the DfT on Transport Investment and Economic Performance (TIEP), Venables et al group the potential impacts of infrastructure investment into three categories: **user benefits**; **productivity effects**; and **investment and employment** (Venables et al, 2014).
- 3.2.9** User benefits include direct savings in terms of time, vehicle operating costs, and other elements of the ‘generalised transportation cost’ (Venables et al, 2014). Reducing direct transport costs can in turn reduce transaction costs for a variety of economic interactions; for example, between firms, between firms and consumers, and between firms and labour.
- 3.2.10** Productivity effects arise primarily from increased economic scale and density, and can benefit firms and workers including those that are not necessarily users of a particular transport improvement (Venables et al, 2014). Venables et al identify three mechanisms through which transport systems help to secure these agglomeration economies: firstly, by improving interactions between firms and allowing them to expand, gain scale economies and develop specialist skills; secondly, by enabling cities to specialise in particular industrial sectors, supporting ‘clustering’ of activity, and developing sector-specific advantages; and thirdly, by expanding labour market catchments and improving commuter links to enable workers to access jobs in centres of activity (Venables et al, 2014; Eddington, 2006).
- 3.2.11** The third category of potential effects of transport improvements identified by Venables et al – investment and employment – refers to the ways in which transport influences patterns of investment and economic activity, by increasing the attractiveness of particular areas and thereby shaping the location decisions of firms (Venables et al, 2014). For example, lower transport costs may stimulate inward investment by increasing potential private sector returns on investment.¹⁷ However, it is recognised in the literature that transport is one of a range of factors that influence firms’ investment decisions, along with, for example, the availability of sites and of suitably skilled labour.
- 3.2.12** Agglomeration economies can also influence a firm’s location decisions and encourage investment in areas where firms in a particular sector are densely concentrated and therefore able to benefit from economies of scale and other productivity effects.
- 3.2.13** At a macro-economic level, the TIEP report states that, *‘estimates suggest that if all other drivers of growth were to increase by 10% and transport infrastructure were to stay constant, then realised growth in income would be just 9%, i.e. 1% point less than it otherwise would have been’*.

¹⁷ What Works Centre for Economic Growth (2015) Evidence review 7: transport. Available online at: <http://www.whatworksgrowth.org/policies/transport/> [accessed October 2015]

- 3.2.14** The following section looks at the evidence relating to highways investment specifically, and discusses the mechanisms through which improvements to road infrastructure can influence economic performance at various spatial scales.

3.3 The economic impact of highways investment

- 3.3.1** Across the UK, road transport accounts for 90% of all passenger kilometres travelled, and 68% of all freight kilometres travelled. Given the relative importance of the highway network to the UK economy, it seems logical to conclude that the functioning of the network – particularly the strategic road network – must have a determining role in economic performance.
- 3.3.2** There is international evidence to support this view. For example, Na et al studied the network effects of motorways on economic growth across 19 OECD countries – including the UK – over the period 1990–2006, and found that motorway construction has an increasingly positive effect on both growth and productivity as the network expands.¹⁸ In this study, areas with the largest stock of roads were found to experience the greatest productivity effects as a result of motorway construction.
- 3.3.3** The following sections consider the evidence on the specific mechanisms through which improved highways infrastructure can deliver positive economic effects.

3.4 Transport Costs and Firm Efficiency

- 3.4.1** Improvements in highways infrastructure can lead to a reduction in direct transport costs for businesses, including both lower fuel and vehicle operating costs, and reduced travel times. Research by the Centre for Economics and Business Research (CEBR) found that, on average, road users in metropolitan areas across the UK, US, France and Germany spend 36 hours in gridlock traffic each year.¹⁹ This represents ‘lost productive time’ for firms. The concept of lost productive time is relevant both to those travelling on work time, and to commuters who balance time spent working and time spent travelling against their personal leisure time. For example, a commuter who experiences a reduction in their commuting time may choose to spend a proportion of the time gained at work or at leisure.
- 3.4.2** The CEBR estimated that the annual direct costs of congestion to the UK economy were \$12.7 billion in 2013, and could rise by 66% to \$20.9 billion by 2030 (CEBR, 2014). Direct costs are defined as the value of time and fuel wasted while sitting in congested traffic during peak periods, and the social cost of the negative impact of congestion

¹⁸ Na, K.-Y., Han, C. and Yoon, C.-H. (2011) Network effect of transportation infrastructure: a dynamic panel evidence. *Annals of Regional Science* (50) 265-274.

¹⁹ Centre for Economics and Business Research (CEBR) (2014) The future economic and environmental costs of gridlock in 2030. Available online at: <http://www.cebr.com/reports/the-future-economic-and-environmental-costs-of-gridlock/> [accessed November 2015]

on the environment. The CEBR calculations also take into account 'planning time' – the additional time that people allow to reach their destination – as an indicator of unreliability due to congestion (CEBR, 2014).

- 3.4.3** The cost savings delivered by highway improvements do not relate only to the direct travel time saving. Evidence suggests that journey time reliability is also important. Reliable transport links are valued by businesses and commuters alike, and can be an important consideration affecting where firms choose to locate. For example, 88% of businesses that responded to the Confederation of British Industry (CBI) Infrastructure Survey for 2014 described the quality and reliability of transport infrastructure as a significant consideration in their investment decisions.²⁰
- 3.4.4** Firstly, users dislike unexpected delays such that they may place a greater weight on time spent in congested conditions or slow moving traffic, than time spent in normal or 'free flow' conditions. Secondly, users need to factor this poor reliability into their scheduling time for journeys, and include extra 'planning time' where they know they are likely to be affected by congestion (CEBR, 2014). This additional time, which may be wasted in congested traffic, imposes a cost or disutility on firms and other users which can be passed on to households through higher prices for goods and services as a result of the increased costs of doing business in congested cities.
- 3.4.5** The CEBR estimated the total *indirect* costs of congestion to the UK economy at \$7.9 billion in 2013, and forecast that this could increase by 58% to \$12.5 billion by 2030²¹. Indirect costs are defined as 'the increased cost of doing business'. Such costs are associated with transporting freight and travelling to business meetings in congested conditions, and are passed on to consumers through higher prices for goods and services (CEBR, 2014). In total, combining direct and indirect costs, the research estimated a potential increase in the costs of congestion of 63% by 2030 (CEBR, 2014).
- 3.4.6** For some firms and sectors, the reliability of the transport of goods can have a fundamental impact on their process of production. For example, 'just in time' or 'lean' manufacturing is a production methodology which aims to reduce costs and waste in the manufacturing process. Firms employing this approach will attempt to increase efficiency by receiving goods only as they are needed, thereby reducing inventory costs and the potential for waste. This approach relies on and places greater emphasis on the speed and reliability with which firms can transport goods (SACTRA, 1997). The SACTRA report cites evidence from a study of the effects of improvements to the A55 North Wales Expressway, which found that more than half of businesses in Gwynedd reported that improvements

²⁰ Confederation of British Industry (CBI) (2014) Taking the long view: a new approach to infrastructure. CBI-URS infrastructure survey 2014. Available online at: http://www.cbi.org.uk/media/3590298/cbi_urs_infrastructure_survey.pdf [accessed November 2015]

²¹ At current (January 2016) exchange rates, this is equivalent to £5.4 billion in 2013, rising to £8.5 billion by 2030.

to the road had reduced their input costs, and improved both their ordering times and delivery management.

3.4.7 The time sensitivity of freight movements is also apparent in the wholesale and retail sector, where goods are transported to retail outlets via a network of regional distribution centres. Suppliers and logistics operators are required to respond quickly to customer demand and stock levels, often transporting goods frequently and at short notice to achieve efficiencies and reduced waste. Logistics firms will be subject to particular time windows within which they must pick up or deliver goods, and may face penalties for late arrival. In effect, such penalties reflect the importance of timing to producers and retailers. For this reason, Venables et al report estimates that suggest that journey time reliability can be considered more important by businesses than pure journey time savings, allowing businesses to increase efficiency and reduce the amount of contingency time that they need to build into freight movements (Venables et al, 2014).

3.5 Transport and Firm Location

3.5.1 The literature supports the view that transport can be an important consideration determining the location of business investment. The CBI recently reported that 99% of firms that responded to its annual Infrastructure Survey said that the quality or cost of infrastructure has a significant impact on their investment decisions (CBI, 2014). As noted above, this included 88% of firms that described the quality and reliability of transport infrastructure specifically as significant, as well as 77% that described the cost of transport infrastructure as significant. Research by the Welsh Assembly Government similarly found that road transport investment – or, conversely, a lack of investment – can have a clear impact on the location of economic activity (Welsh Assembly Government, 2004). In particular, large transport projects such as the construction of a new motorway can ‘profoundly affect’ the location choices made by businesses. Smaller schemes typically have a more limited effect (Welsh Assembly Government, 2004).

3.5.2 Research by Gibbons et al, published in 2012, estimated the impact of new road infrastructure on firm employment and productivity across Britain, and found further strong evidence that road improvements can have a positive effect on both employment and plant numbers. Specifically, a 10% improvement in employment accessibility (measured as the amount of employment reachable per unit of travel time over the major road networks) was found to lead to a 3% increase in the number of businesses and employment up to 30km from the site of a road improvement.²² Most of the employment effects were found to come from the producer services, land transport, and ‘other’ sectors, further supporting the evidence reported above that improved road infrastructure can lower the costs

²² Gibbons, S., Lyytikäinen, T., Overman, H., Sanchis-Garner, R. (2012) New road infrastructure: the effect on firms. Spatial Economics Research Centre discussion paper (117). Available online at: http://eprints.lse.ac.uk/58527/1/lse.ac.uk_storage_LIBRARY_Secondary_libfile_shared_repository_Content_SERC%20discussion%20papers_2012_sercdp0117.pdf [accessed October 2015]

of transport and business travel, and stimulate employment in the logistics sector particularly (Gibbons et al, 2012; Percoco, 2015; van den Heuvel, 2014).

3.5.3

The key finding of this research was that the positive effect for employment was driven by an increase in the number of plants in wards which experienced road improvements, and appeared to be a result of induced firm entry rather than an increase in the size of existing firms (Gibbons, 2012). This is supported by evidence from Pugh and Fairburn's study of the wider economic effects of the M6 Toll road in the English Midlands. Their evaluation found evidence of a positive effect for development on industrial land with easy access to the new motorway. In total, the M6 Toll was found to be associated with an increase in industrial land development – including both the direct effect for land along the toll road corridor and the indirect effect, noted above, on the existing M6 corridor – of 5.69 hectares between 1 April 2002 and 31 March 2004. There was strong evidence to suggest that this was a result largely of new firm entry: most investment in development land had been from sources outside of the Midlands region (Pugh and Fairburn, 2008).

3.5.4

The Welsh Economy Research Unit at Cardiff Business School undertook a study of road improvements and economic development in Merthyr (1996) as part of the British Road Federation submission to the Standing Advisory Committee on Trunk Road Assessment (SACTRA).²³ Key trunk road improvements considered in the study were the completion of the dual carriageway A470 to bypass a number of small villages and improve the connection between Merthyr and M4 Junction 32 (Cardiff); the dualling of the Aberdulais/Glyn-Neath section of the A465 Heads of the Valley Road to reduce journey times to M4 Junction 43 (Neath); and the dualling of the A40 northbound to improve links to the M5 at Ross on Wye. The study also included local road improvements, such as the construction of the Western Relief Road to serve traffic to the town centre.

3.5.5

Through interviews with local businesses and development organisations, the research found that improvements to the road infrastructure in and around Merthyr Tydfil have complemented wider infrastructure improvements to improve perceptions of the area, support economic development, and attract inward investment. Manufacturing investment in the area included R-Tek, a Franco-Japanese supplier of car interiors to manufacturers including Honda at Swindon, and St Merryn Meats, a Cornwall-based supplier of packaged meat to retailers including Tesco. For R-Tek, comparatively low set-up and labour costs and the quality of the road network – particularly the A470 – offset any concerns about the distance to its customers. Access to retail outlets via the A470 and the Heads of the Valleys road was a key consideration for St Merryn.

²³ Welsh Economy Research Unit, Cardiff Business School (1996) Turning the corner? Road improvements and economic development in Merthyr

- 3.5.6** With respect to business location, it needs to be considered that improved transport infrastructure can lead to a ‘two way road’ effect, whereby improved links and reduced transport costs can have disbenefits for peripheral economies that may previously have been ‘protected’ by their relative inaccessibility. For example, improved road links may increase the capacity of external firms to serve local markets, exposing suppliers to competition from more productive firms (Eddington, 2006). Improved transport can also result in outward investment, with firms choosing to relocate from the periphery to the centre; i.e. to a larger, more competitive economy where they may be more able to benefit from agglomeration economies (Venables et al, 2014).
- 3.5.7** However, as Venables et al point out, the two way road effect can also support positive outcomes in peripheral areas. For example, lower costs for labour or land may outweigh the potential benefits of agglomeration, and encourage firms to locate in less competitive areas (Venables et al, 2014). Research by Meijers et al (2012) into the effects of new infrastructure in the Netherlands found positive effects for growth in the periphery, as firms – particularly in the non-commercial services sector – were able to service both the centre and periphery from one location. Furthermore, improved transport can have benefits for firms in peripheral areas who may gain access to new markets, enabling them to trade over a wider area and thereby reduce their input costs (Eddington, 2006; Bryan et al, 1996).²⁴
- 3.5.8** The SACTRA report concludes that the effect of an improvement in accessibility will depend on the specific characteristics of the firms and industries affected. For some firms and industries, where there are efficiency advantages in large scale production, there will be a tendency for economic activity to concentrate in a ‘core’ economic region, up until a point where these regions become too crowded. Equally, for other firms and industries, improved accessibility will lead to a decentralisation of economic activity.
- 3.5.9** There is evidence to suggest that the effects of transport costs savings can vary across sectors, with implications for the location and concentration of employment in particular industries. Research by Holl on the effects of transport infrastructure in Portugal found that motorway corridors were particularly attractive to firms in industrial sectors characterised by medium or high transportation costs, such as minerals, and the manufacture of food and drink, electrical equipment, textiles, and chemicals.²⁵ In these sectors, road improvements had contributed to a process of concentration in areas with good access to the motorway network. The effect was found to be strongest within 10km of the new roads, and to attenuate after 50km (Holl, 2004).

²⁴ Meijers, E., Hoekstra, J., Leijten, M., Louw, E. and Spaans, M. (2012) Connecting the periphery: distributive effects of new infrastructure. *Journal of Transport Geography* (22) 187-198.

²⁵ Holl, A (2004) Transport infrastructure, agglomeration economies, and firm birth: empirical evidence from Portugal. *Journal of Regional science* (44:4) 693-712.

3.6 Transport, agglomeration effects and productivity

- 3.6.1** Agglomeration economies arise through the concentration of economic activity.²⁶ It is recognised in the literature that the scale and density of economic activity are factors which support higher levels of productivity. Industrial concentrations are positively associated with the economic performance of firms (Graham et al, 2009), and increases in city size have been shown to have significant positive effects on productivity (Venables et al, 2014). The potential of a particular location to achieve these benefits can be measured in terms of its access to economic mass; that is, the ease with which firms and workers can communicate, compete and trade with a large mass of other firms, workers and consumers (Venables et al, 2014).
- 3.6.2** Graham writes that there is ‘an inherent relationship’ between transport and agglomeration economies (Graham, 2006). Venables et al identify that transport is a necessary ingredient to securing these benefits through three mechanisms; by increasing economic interactions between firms and by enabling firms to reach wider markets, by enabling cities to specialise and develop sector specific advantages, and by enabling firms to draw upon a wider catchment area of potential employees.
- 3.6.3** Venables et al describe this relationship in terms of a ‘proximity effect’, and a ‘clustering effect’. The proximity effect describes how transport can reduce effective distances and enable communications, trade and business links between firms. The clustering effect refers to the role of transport in allowing employment and other economic activity to locate in more densely concentrated areas; in other words, to create an economic mass (Venables et al, 2014). By encouraging cities to specialise, transport links can allow firms in particular sectors or industries to cluster in locations where they are able to access benefits including, for example, knowledge flows and external economies of scale. These effects can vary by sector: Graham et al found that the impact of agglomeration on productivity is greater in services than manufacturing (Graham et al, 2009).
- 3.6.4** As well as supporting increased productivity, concentration of economic activity can also encourage firms and workers to be more innovative (Venables et al, 2014). For example, agglomeration effects can arise from knowledge spillovers and idea flows, particularly where there is an in-flow of new workers (Redding and Turner, 2014). Agrawal et al have shown that highways can support knowledge spillovers and agglomeration effects, even where there is no change in the local labour market.²⁷ Their research shows that, in regions with a large stock of transportation infrastructure, this infrastructure

²⁶ Graham, D. (2006) Investigating the link between productivity and agglomeration for UK industries. Imperial College. Available online at: http://www.transportworks.org/sites/default/files/assets/evidence_base_documents/Investigating%20the%20link%20between%20productivity%20and%20agglomeration.pdf [accessed November 2015]

²⁷ Agrawal, A., Oettel, A. and Galasso, A. (2014) Roads and innovation. Rotman School of Management working paper (2478752).

supports an increase in innovation by allowing innovative firms to build on knowledge that is geographically more distant (Agrawal et al, 2014). This can be particularly beneficial for smaller firms, which may be less well equipped to generate innovations and knowledge internally. Importantly, the evidence suggests that roads have a greater impact in 'high velocity' fields where technology develops most quickly and access to new knowledge is therefore most valuable (Agrawal et al, 2014).

- 3.6.5** There is some uncertainty about the significance of agglomeration economies and the spatial scale over which they are effective. The Eddington study, for example, found that the productivity benefits of agglomeration begin to drop off after 40 minutes of travel time. Graham et al found that agglomeration effects diminish more rapidly with distance in the service sector than in manufacturing (Graham et al, 2009).
- 3.6.6** A survey of the literature on the agglomeration effects (cited in Venables et al, 2014) suggests that a doubling in city size is associated with an increase in productivity in the range 3% to 8%. This equates to an elasticity of productivity with respect to city size in the range 0.05 to 0.11. A methodology for the quantification of agglomeration effects is provided in the Department for Transport's (DfT) WebTAG²⁸ guidance (Unit A2.1 Wider Impacts). The guidance incorporates elasticities for productivity with respect to 'effective density' (derived by Graham et al. 2009) which gives an economy wide average elasticity of 0.043.

3.7 Transport and labour markets

- 3.7.1** Gibbons and Machin describe the three-way role that transport plays in the labour market: in linking workers to their place of employment; in influencing firms' decisions about location, employment and wages; and in reducing friction and improving flexibility in the labour market by increasing the size of the labour pool and enabling firms to recruit suitable workers more quickly.²⁹ The research suggests that transport tends to have a greater influence on the behaviour of workers than firms, affecting decision-making about where to work and live, as well as around the allocation of time spent working, commuting and on other activities, against time constraints such as childcare and family responsibilities (Gibbons and Machin, 2006).
- 3.7.2** Therefore, transport improvements can effectively act to bring firms and workers closer together, providing workers with a greater volume of employment opportunities and more choice about where to work,

²⁸ Web-based Transport Analysis Guidance (<https://www.gov.uk/guidance/transport-analysis-guidance-webtag>)

²⁹ Gibbons, S. and Machin, S. (2006) Transport and labour market linkages: empirical evidence, implications for policy and scope for further research. Background paper for the Eddington report to the Department for Transport. Available online at: http://webarchive.nationalarchives.gov.uk/20130129110402/http://www.hm-treasury.gov.uk/media/38C/A0/eddington_researchannex1.2_011206.pdf [accessed November 2015]

and increasing the labour catchment area available to firms, enabling them to recruit staff with specific knowledge and skills.

- 3.7.3** Improving labour market functioning and allowing firms to draw on a wide pool of labour is one of the mechanisms through which transport improvements deliver agglomeration effects and productivity benefits (Venables et al, 2014). Given the importance of access to a skilled workforce, it is also reasonable to conclude that improved labour market functioning is one aspect of transport's influence on the attractiveness of regional economies for new business investment.

3.8 Transport and economic performance in Wales

- 3.8.1** Chapter 4 presents evidence on the economic performance of the study area and draws comparisons of economic performance (as measured by GDP) and productivity (GDP per worker) between South Wales and the South West of England. As this data shows, there is a long standing gap between levels of productivity in Wales and the UK average. In light of this, several pieces of research have been commissioned by the Welsh government to explore the factors influencing lower productivity levels in Wales.

- 3.8.2** Importantly, this research suggests that spatial factors (including peripherality and economic density) are significant influencing factors in determining economic performance once factors such as capital stock, industrial structure, skills and other factors had been taken into account. This suggests that transport has a role to play in narrowing the productivity gap between Wales and the UK.

- 3.8.3** An empirical study undertaken for the Welsh Government attempted to understand the relative importance of different factors in explaining the productivity gap between Wales and rest of the UK. This study, undertaken in 2009³⁰ concluded that, at a firm level:

'...productivity is partially determined by geographical features such as population density and distance. The key distance variable is distance from London.'

- 3.8.4** At an industry level, distance from London (as measured by travel time) was a significant factor in explaining productivity differentials across all sectors other than catering and transport. Furthermore the research also finds that 'cluster effects' – the concentration of firms in particular sectors – are a significant explanatory variable.

- 3.8.5** The findings of the 2009 study reinforced the findings of earlier research undertaken in 2006 into the determinants of Wales' productivity³¹. The 2006 study found a relationship between levels of firm productivity and peripherality as measured by the travel time from

³⁰ Extending the research on understanding the productivity variations between Wales and the UK (2009). Professor John Hudson, Department of Economics & International Development, University of Bath

³¹ Understanding the productivity variations between Wales and the UK (2006). University of the West of England and the University of Bath

London. The research estimated that the productivity of the average firm fell by 0.7% for every 10% increase in travel time.

3.8.6 A further study on productivity in Wales specifically considered the role of accessibility and peripherality in determining levels of productivity³². The study constructed indices of accessibility based on travel time by road to local towns and cities, and of peripherality based on distance, via the road network from any one local authority area to all others in England and Wales, weighted by the mass or size of each place measured in terms of population.

3.8.7 In considering the policy implications of the research this study concludes that:

‘The benefit to more peripheral regions of physical transport infrastructure investment, such as improved rail or road links is at one level an obvious response to issues of accessibility and peripherality.’

‘By UK standards, however, (Cardiff) is nevertheless relatively limited in terms of economic mass certainly compared with London and the SE but also Birmingham and the midlands, or Manchester/Liverpool. This suggests that there are still benefits to be secured by addressing the barriers presented by the Severn Crossings and in particular the real and perceived effects of congestion and disruption on the M4 and M5.’

3.8.8 A further study is currently being undertaken by UWE for the Welsh Government to update the research on the determinants of productivity in Wales. The early findings from this research reinforce the finding that spatial factors contribute to the productivity gap between Wales and other parts of the UK.

3.9 Conclusions

3.9.1 The evidence presented here supports the view that investment in roads and highway infrastructure has positive effects on economic performance. Where demand for transport exceeds capacity this suggests that inadequate transport infrastructure is acting as a constraint on economic growth.

3.9.2 Investment in roads that reduces congestion and delay will reduce direct transport costs for businesses. Further indirect cost savings can arise from faster business trips, easier movement of goods, and better access to customers and suppliers. Benefits can also result from improvements in reliability; for example by reducing uncertainty and improving stock management, particularly in the retail and logistics sectors and where firms employ ‘just in time’ delivery.

3.9.3 Accessibility, including proximity to motorways and motorway junctions, can be an important determinant of firm location, particularly for activities characterised by high transport costs

³² Productivity in Wales: the impacts of peripherality on spatial patterns of productivity (2010). University of the West of England.

including logistics and manufacturing. The evidence suggests that road improvements can have a significant effect on firm location and firm entry at the local or regional scale.

3.9.4 Transport is closely linked to productivity through the generation of agglomeration economies. By supporting the concentration of economic activity and the clustering of firms in particular sectors and industries, improved road links can enable quicker and easier communication between firms and give access to benefits such as knowledge flows and economies of scale.

3.9.5 The Welsh economy experiences lower levels of productivity than the rest of the UK due, in part, to spatial factors such as peripherality and a lack of a major conurbation. This research suggests there may be a role for transport in determining Wales' future economic performance by increasing the effective concentration of economic activity which, through agglomeration effects, could lead to higher productivity and improved economic performance.

4 Economic Context

Chapter Summary

- A study area has been defined for the Wider Economic Impact assessment comprising South Wales and parts of the South West of England.
- Nearly 3 million people live in the study area and population is expected to increase.
- Patterns of employment in the study area illustrate the importance of the M4 corridor.
- Car travel is the dominant mode of transport for commuters and the car mode share has been increasing in recent decades.

4.1 Study Area

- 4.1.1** The M4 in South Wales is one of the most heavily used roads in Wales. It forms part of the Trans-European Transport Network (TENT) and plays a key strategic role in connecting South Wales with the rest of Europe, providing links to Ireland via the ports of South West Wales, as well as the gateway link between South Wales, England and mainland Europe.
- 4.1.2** The objectives of M4 CaN reflect the strategic importance of the M4. The scheme aims to improved transport connections within Wales and to England, the Republic of Ireland and the rest of Europe (TPO 1). The scheme is also intended to improve traffic management in and around Newport (TPO 13). For the purposes of the Wider Economic Impact Assessment, it is necessary to define a study area where the economic effects of the M4 CaN are expected to be most significant.
- 4.1.3** Given the strategic importance of the M4, the area of influence of the scheme is considered to extend beyond the immediate surrounding area of Monmouthshire, Newport and Cardiff. The study area for the assessment therefore covers the collection of local authorities either side of the River Severn in Wales and England, extending from Swansea in the West to Bristol and parts of Gloucestershire and Somerset in the East.³³ This area incorporates the major urban centres of Swansea, Cardiff, Newport and Bristol on the M4 corridor.
- 4.1.4** There would be further economic benefits of the scheme beyond this boundary. However, economic effects are expected to be most significant within the study area given its proximity to the scheme.
- 4.1.5** The scheme itself runs from the southern part of Monmouthshire, through Newport to the border of Newport and Cardiff. Two new junctions would be created on the new route: Docks Way Junction

³³ Where relevant, 'the Welsh study area' is used to refer to the 12 local authorities that make up the study area in South Wales, and 'the English study area' to the four local authorities that make up the study area in South West England.

and Glan Llyn Junction. Given the potential impact of the scheme on land use, particular attention is given to the local planning context.

4.1.6 The study area includes key areas of economic priority as identified in strategic economic development policies, including the Cardiff Capital Region³⁴ in South East Wales and Severnside Enterprise Area³⁵, connecting the economies of South East Wales and the West of England.

4.1.7 There are three Enterprise Zones within the Cardiff Capital Region. These are zones where the Welsh Government is prioritising investment in business infrastructure. Central Cardiff Enterprise Zone is supporting Financial and Professional Services companies and is located in the heart of the city centre, incorporating Cardiff's main rail station. There are also zones at St Athan - Cardiff Airport supporting aerospace and defence and Ebbw Vale, supporting manufacturing.

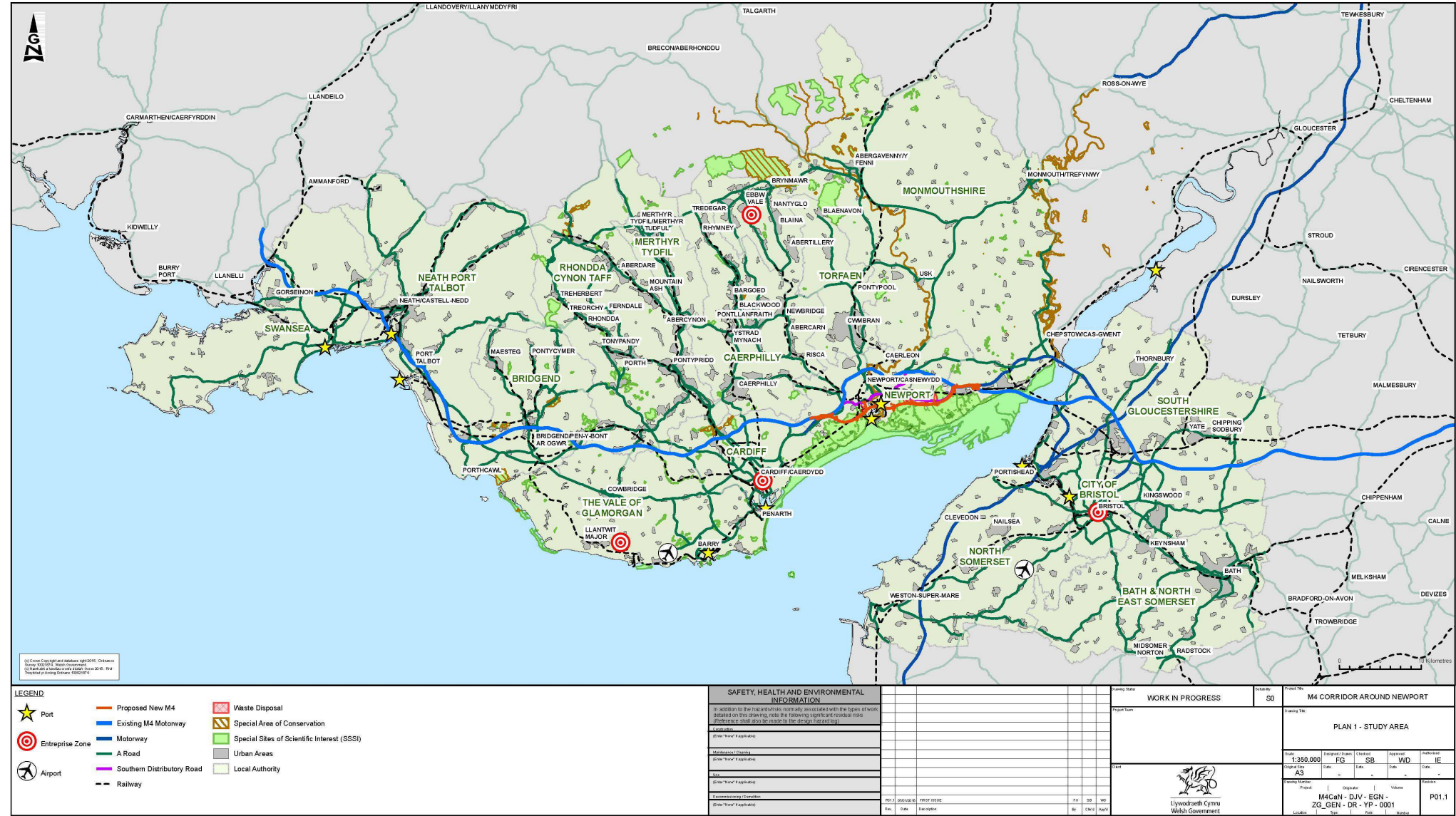
4.1.8 The Severnside Enterprise Area is an industrial area, extending for five miles along the Severn Estuary, Avonmouth and covering some 1,800 hectares. The area is located between Bristol and the River Severn, immediately adjacent to the M5 and M49 motorways. It consists of two main areas of economic activity – Avonmouth in the south and Severnside in the north.

4.1.9 Figure 2 shows the boundary of the study area.

³⁴ <http://cardiffcapitalregion.com>

³⁵ <http://www.westofenglandlep.co.uk/place/enterprise-zone-and-areas/ea-avonmouth-severnside>

Figure 2: Map of Study Area



4.2 Population and Population Growth

4.2.1 The 2011 Census provides a recent measure of the total resident population and population density across the study area. The total population of each local authority is included in Table 1 below. The study area as a whole has a population of approximately 2.9 million. The Welsh study area has a population of approximately 1.9 million, and accounts for over 60% of the total resident population of Wales.

4.2.2 Comparison of data from the 2001 Census and 2011 Census provides a measure of historic change in the resident population. Across the study area, the population increased by 7.1% over this period, and, with the exception of Blaenau Gwent, every local authority experienced an increase in its resident population. Cardiff (+13.3%) and Bristol (+12.5%) exhibited the greatest percentage growth rates. The population in Newport grew by +6.4%, in excess of the growth rate seen in the Welsh study area and across Wales as a whole.

Table 1: Historic trends in total resident population, 2001-2011. Source: 2001 and 2011 Census

Area	2001	2011	% change 2001-2011	Compound Annual Growth Rate (CAGR)
Blaenau Gwent	70,064	69,814	-0.4%	0.0%
Bridgend	128,645	139,178	8.2%	0.8%
Caerphilly	169,519	178,806	5.5%	0.5%
Cardiff	305,353	346,090	13.3%	1.3%
Merthyr Tydfil	55,981	58,802	5.0%	0.5%
Monmouthshire	84,885	91,323	7.6%	0.7%
Neath Port Talbot	134,468	139,812	4.0%	0.4%
Newport	137,011	145,736	6.4%	0.6%
Rhondda Cynon Taf	231,946	234,410	1.1%	0.1%
Swansea	223,301	239,023	7.0%	0.7%
The Vale of Glamorgan	119,292	126,336	5.9%	0.6%
Torfaen	90,949	91,075	0.1%	0.0%
Welsh study area (a)	1,751,414	1,860,405	6.2%	0.6%
BaNES ³⁶	169,040	176,016	4.1%	0.4%
Bristol, City of	380,615	428,234	12.5%	1.2%
North Somerset	188,564	202,566	7.4%	0.7%
South Gloucestershire	245,641	262,767	7.0%	0.7%

³⁶ Bath and North East Somerset

Area	2001	2011	% change 2001- 2011	Compound Annual Growth Rate (CAGR)
English study area (b)	983,860	1,069,583	8.7%	0.8%
Total study area (a+b)	2,735,274	2,929,988	7.1%	0.7%
England	49,138,831	53,012,456	7.9%	0.8%
Wales	2,903,085	3,063,456	5.5%	0.5%

4.3 Future population projections

4.3.1 Population projections are published for both England and Wales. The latest available projections at a local authority level for Wales are 2011-based³⁷ while those for England start in 2012³⁸. Accordingly, each area is considered in turn. The data in Table 2 shows that the population of the Welsh study area is projected to grow by around 10.4% (0.4% per annum) over the period 2011-2036. Growth is expected to be highest in Cardiff (1.14% per annum) and Newport (0.64%). Of the local authorities in the Welsh study area, only Blaenau Gwent and Monmouthshire are projected to experience a decrease in population.

Table 2: 'Principal' population projections for local authorities in Wales, 2011-2036. Source: Welsh Government 2011 Local Authority Population Projections

Local authority area	2011	2036	% change, 2011-2036	CAGR
Blaenau Gwent	69,812	65,209	-6.6%	-0.27%
Bridgend	139,410	151,023	8.3%	0.32%
Caerphilly	178,782	182,334	2.0%	0.08%
Cardiff	345,442	458,544	32.7%	1.14%
Merthyr Tydfil	58,851	62,434	6.1%	0.24%
Monmouthshire	91,508	90,334	-1.3%	-0.05%
Neath Port Talbot	139,880	142,108	1.6%	0.06%
Newport	145,785	170,941	17.3%	0.64%
Rhondda Cynon Taf	234,373	235,439	0.5%	0.02%

³⁷ For Wales, 2011-based local authority population projections for Wales (Variant projections Revised) have been examined. These 2011-based projections are trend-based projections for the 25-year period from 2011 to 2036. They are based on mid-year population estimates for 2011 that are the first population estimates to be based on the 2011 Census.

³⁸ For England, the 2012-based Subnational Population Projections for England have been analysed. These are based on the 2012 mid-year population estimates published on in June 2013 and a set of underlying demographic assumptions regarding fertility, mortality and migration based on local trends. They are consistent with the 2012-based national population projections for England and take into account information from the 2011 Census.

Local authority area	2011	2036	% change, 2011-2036	CAGR
Swansea	238,691	269,929	13.1%	0.49%
The Vale of Glamorgan	126,679	133,727	5.6%	0.22%
Torfaen	91,190	92,204	1.1%	0.04%
Welsh study area	1,860,403	2,054,227	10.4%	0.40%
Wales	3,063,758	3,333,536	8.8%	0.34%

4.3.2 The equivalent population projections for England – set out in Table 3 – suggest that all of the local authorities in the English study area will experience an increase in population. The highest growth rates (2012-2037) are expected in North Somerset (0.86%) and Bristol (0.80%) with growth across the English study area of 0.74% per annum.

Table 3: Sub-national Population Projections (SNPP) for England, 2012-2037. Source: ONS SNPP for England (Thousands)

Local authority area	2012	2037	% change, 2011-2036	CAGR
South Gloucestershire	266	318	19.7%	0.72%
Bristol, City of	433	528	22.1%	0.80%
BaNES	178	199	12.1%	0.46%
North Somerset	204	253	23.8%	0.86%
English study area	1,081	1,299	20.2%	0.74%
England	53,494	62,166	16.2%	0.60%

4.4 Employment

4.4.1 The Business Register and Employment Survey (BRES) publishes employee and employment estimates at detailed geographical and industrial levels, based on data gathered from businesses across England, Scotland and Wales. The BRES definition of an employee is anyone working on the BRES reference date who is aged 16 years or over that the contributor directly pays from its payroll(s), in return for carrying out a full-time or part-time job or being on a training scheme.

4.4.2 In 2014, the study area as a whole had approximately 1.3 million employees, with the largest concentrations of jobs in Bristol (249,654), Cardiff (196,348), South Gloucestershire (146,892), and Swansea (105,191). There were approximately 68,795 employees in Newport and a further 33,167 jobs in Monmouthshire.

4.4.3 Table 4 shows historic trend BRES data for the period 2009 to 2014. In absolute terms, Bristol (12,161), Cardiff (6,660) and Swansea (3,471) experienced the largest growth in employees over this period, while, in percentage terms, Torfaen (9.9%), Neath Port Talbot (5.7%) and Bristol (5.1%) had the largest growth. Overall, the Welsh study area (2.3%) experienced slightly slower growth in employment than the English study area (3.2%).

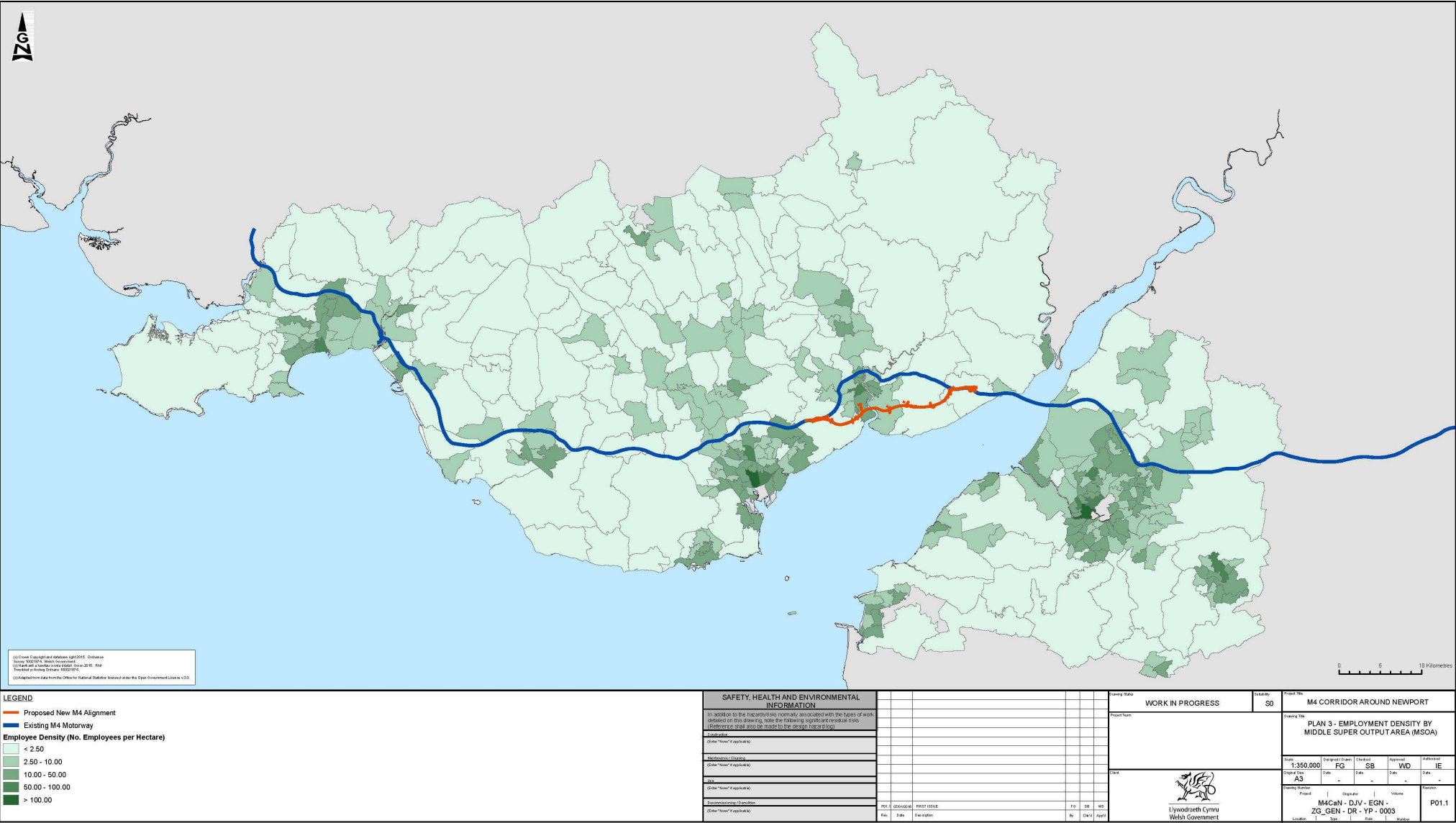
Table 4: Total employees by local authority area, 2009-2014. Source: 2014 BRES

Local authority	2009	2014	Change 2009-2014	
			No.	%
Blaenau Gwent	18,235	18,206	-29	-0.2%
Bridgend	55,993	56,667	674	1.2%
Caerphilly	52,116	52,632	516	1.0%
Cardiff	189,688	196,348	6,660	3.5%
Merthyr Tydfil	22,021	21,093	-928	-4.2%
Monmouthshire	33,850	33,167	-683	-2.0%
Neath Port Talbot	43,258	45,720	2,462	5.7%
Newport	70,540	68,795	-1,745	-2.5%
Rhondda Cynon Taf	71,212	72,444	1,232	1.7%
Swansea	101,720	105,191	3,471	3.4%
The Vale of Glamorgan	36,539	38,203	1,664	4.6%
Torfaen	33,765	37,102	3,337	9.9%
Welsh study area	728,937	745,568	16,631	2.3%
BaNES	83,167	82,703	-464	-0.6%
Bristol, City of	237,493	249,654	12,161	5.1%
North Somerset	77,689	80,013	2,324	3.0%
South Gloucestershire	143,615	146,892	3,277	2.3%
English study area	541,964	559,262	17,298	3.2%
Total study area	1,270,902	1,304,830	33,928	2.7%

4.5 Distribution of Employment

4.5.1 The distribution of economic activity (employment) across the study area is shown in Figure 3. It is possible to identify concentrations of employment in the major urban centres of Swansea, Cardiff, Newport and Bristol. The existence of the 'M4 corridor' in economic terms is discernable given that employment is concentrated in the coastal strip of South Wales and in Bristol and South Gloucestershire through which the M4 passes. To an extent this is to be expected given that the motorway network has developed to link the most populous areas, but nevertheless land use patterns are indicative of the importance of the M4 corridor to the wider economy.

Figure 3: Employment Density (employees per hectare) Source: BRES, 2014



4.5.2 The role of the M4 in influencing land use and patterns at a more local level is illustrated in Figure 4, which provides estimates of the number of jobs located adjacent to each junction of the M4 in the area surrounding Newport and Cardiff. The number of jobs has been estimated within a 1km boundary of the approximate centre of each junction in order to capture firms that are located in business parks at motorway junctions, or other locations that are likely to be afforded good access to the M4 via an adjacent route.

4.5.3 The number of jobs at each junction varies from 434 jobs (Junction 33) to 5,956 jobs (Junction 32). Of the 12 junctions considered, 8 have local employment of in excess of 3,000 jobs. There will be a variety of factors that determine the degree of development around a junction. Planning restrictions are likely to play a key role (as is likely to be the case for Junction 33) as will the physical constraints on development imposed by residential areas (Junctions 25 and 26). Furthermore, access to the local road network will be important. For example, junction 29 is the confluence of the M4 and A48 but provides no access to the immediate surrounding area. Another influence is likely to be proximity to Cardiff or Newport and it is notable that the junctions with the highest levels of employment (Junction 23, 24, 27, 30 and 32) are situated on the outskirts of an urban area.

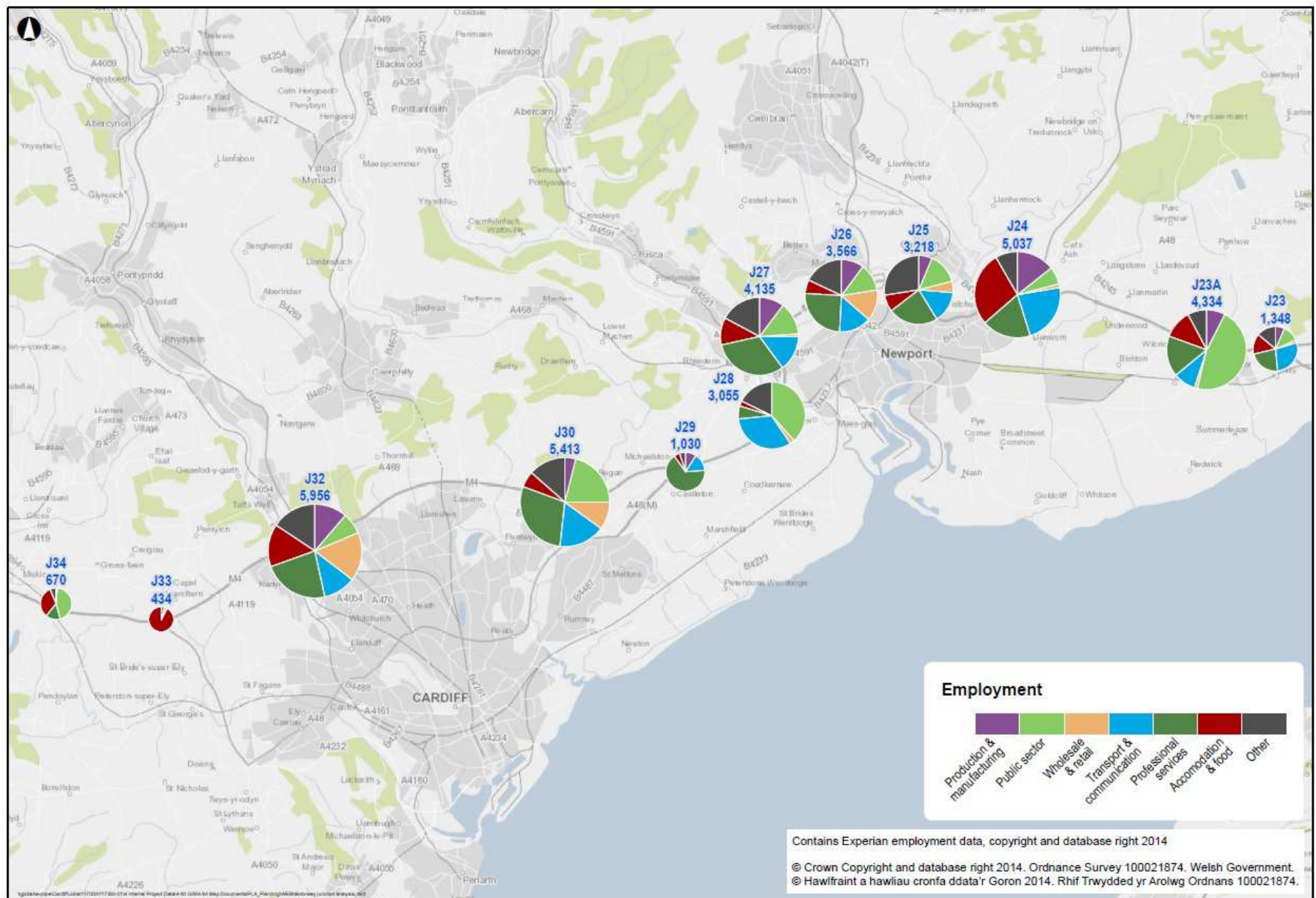


Figure 4: Employment at M4 Junctions. Source: Experian, 2014

4.6 Industrial Structure

- 4.6.1** BRES provides data on employment by industrial sector. Figure 5 shows the percentage of total employees employed in broad industrial sectors across the study area in 2014, compared with England and Wales as a whole.
- 4.6.2** In particular, this indicates that the study area has a greater proportion of employees in the manufacturing and health sectors than England and Wales. It also has a smaller proportion of employees in service sectors such as the professional, scientific and technical sector and business administration and support services. Overall, the data indicates that the industrial base in the study area has a greater proportion of employees accounted for by production activities such as manufacturing and a smaller proportion in service based sectors.

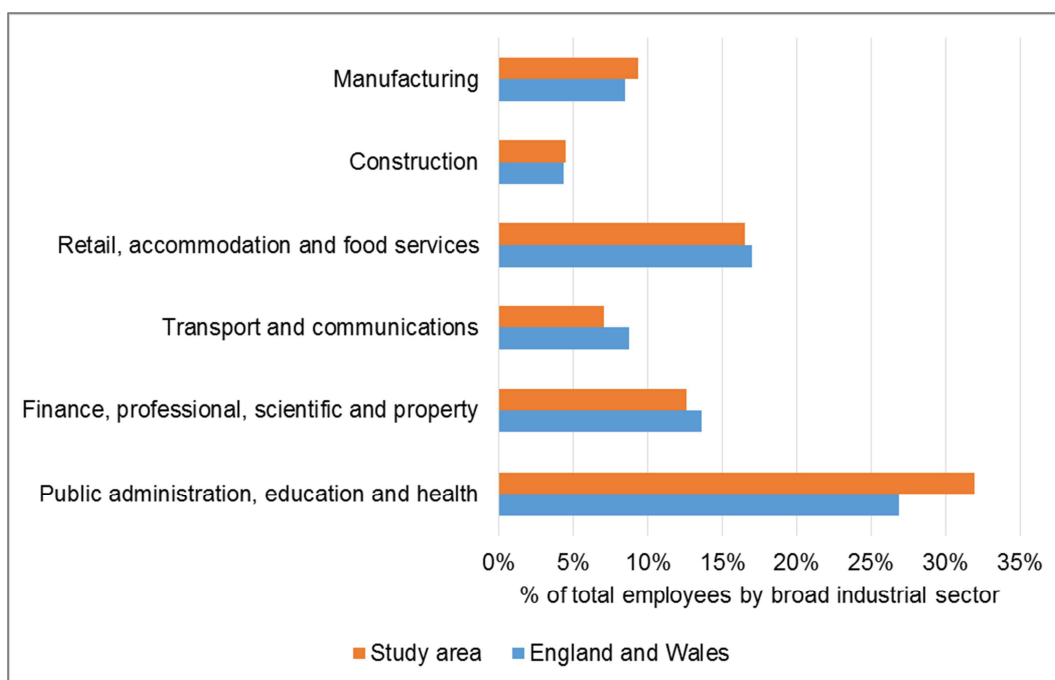
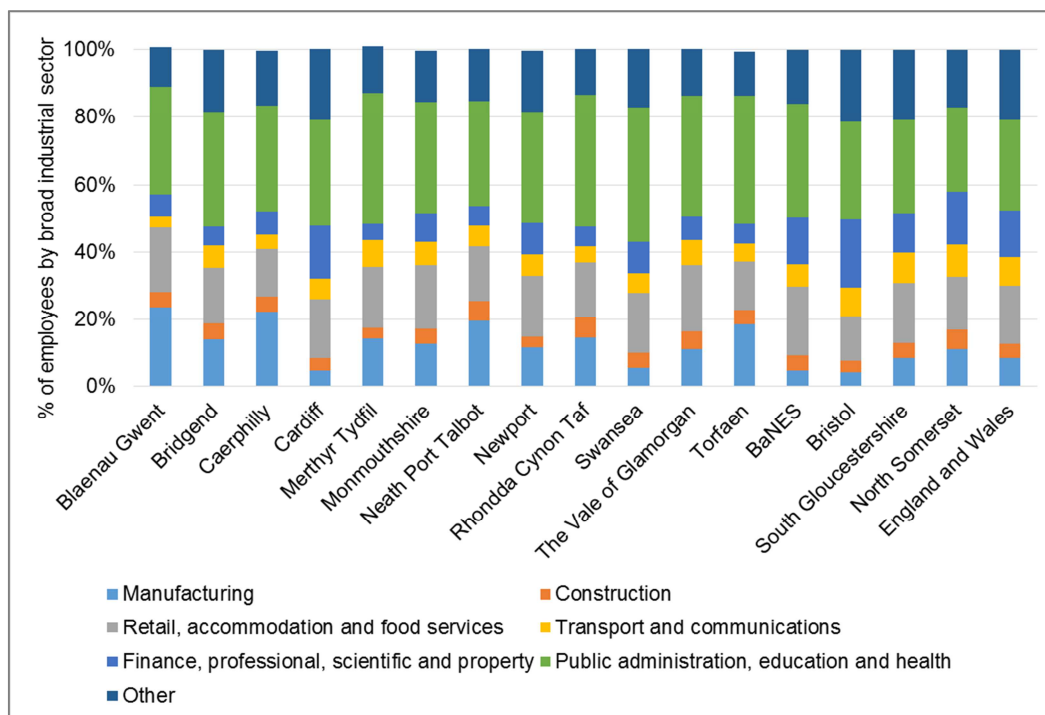


Figure 5: Employees by broad industrial sector, 2014. Source: 2014 BRES

- 4.6.3** Figure 6 shows the breakdown of employment by broad sector for each local authority. Within the study area, differences in economic structure can be explained to a large extent by the degree of urbanisation. Notwithstanding this, the authorities in the Welsh study area generally have a higher proportion of the workforce employed in manufacturing as well as in public sector functions such as health and education. Cardiff, along with Bristol, BaNES and North Somerset, shows a higher than average level of employment in finance and professional services.

Figure 6: Employment by Sector, 2014. Source: BRES, 2014

4.7 Economic Performance and Productivity

4.7.1 Gross Value Added (GVA) measures the contribution to the economy of each individual producer, industry or sector in the UK. It is used in the estimation of gross domestic product (GDP), a key indicator of the state of the overall economy. Data for GVA per filled job can be used as a measure of productivity.

4.7.2 The UK Regional Accounts measures of regional GVA provides data at three levels of geography, defined according to the European Nomenclature of Territorial Units for Statistics (NUTS) classification: NUTS1, NUTS2 and NUTS3³⁹. This analysis examines NUTS1 and NUTS3 data. NUTS2 does not align with the study area geography.

4.7.3 Table 5 sets out workplace-based GVA per head at NUTS1 and NUTS3 level. In 2014, this was approximately £22,324 in South West England and £17,573 in Wales. At NUTS3 level, the highest levels were recorded in the City of Bristol (£30,007) and BaNES, North Somerset and South Gloucestershire (£26,520) areas. In Wales, GVA per head was £22,107 in Cardiff and the Vale of Glamorgan, £19,798 in the Monmouthshire and Newport area, and in the range of £13,479 to £18,326 in the South Wales Valleys, Bridgend and Neath Port Talbot and Swansea areas.

³⁹ At the NUTS1 level, estimates of regional GVA are presented on two bases: on a workplace basis, where GVA is allocated according to the region where the economic activity takes place; and on a residence basis, where GVA components relating to employment income (Compensation of Employees and Mixed Income) are allocated instead to the region of residence of the employed persons. At the NUTS2 and NUTS3 levels only workplace-based estimates are provided.

Table 5: Workplace-based GVA per head at current basic prices, 2014, NUTS1 and NUTS3. Source: ONS UK Regional Accounts.

	Total GVA, £ per head
NUTS1	
South West England	22,324
Wales	17,573
NUTS3	
Bristol, City of	30,007
BaNES, North Somerset & South Gloucestershire	26,520
Central Valleys	15,449
Gwent Valleys	13,479
Bridgend and Neath Port Talbot	16,256
Swansea	18,326
Monmouthshire and Newport	19,798
Cardiff and Vale of Glamorgan	22,107

4.7.4 Applying an index where UK=100, GVA per head in 2014 was 90.7 in South West England and 71.4 in Wales. Table 6 shows that, over the decade to 2014, the index of GVA per head in Wales fell slightly relative to the UK average, suggesting that Wales has fallen further behind the UK average.

4.7.5 At a more local level (NUTS3) relative economic performance varied significantly across the study area. It is notable, however, that both Cardiff and the Vale of Glamorgan, and Newport and Monmouthshire experienced a relative decline in GVA per capita.

Table 6: Index of workplace-based GVA per head at current basic prices, 2014, NUTS1 and NUTS3. Source: ONS UK Regional Accounts.

	Index of GVA, UK=100	
	2004	2014
NUTS1		
South West England	92.5	90.7
Wales	73.7	71.4
NUTS3		
Bristol, City of	122.1	121.9
BaNES, North Somerset & South Gloucestershire	104.3	107.7
Central Valleys	60.8	62.8
Gwent Valleys	55.2	54.8
Bridgend and Neath Port Talbot	62.3	66.0
Swansea	76.7	74.4
Monmouthshire and Newport	95.5	80.4
Cardiff and Vale of Glamorgan	101.3	89.8

4.7.6 Table 7 sets out data on GVA per filled job, which can be used to compare levels of labour productivity across the study area. The latest available data is for 2013, and shows that GVA per filled job in South West England was £42,713, compared with £39,207 in Wales.

4.7.7 At NUTS3 level, the data indicates that there are large difference in the level of productivity between areas in South West England and those in Wales. The highest levels of GVA per filled job were recorded in the BaNES, North Somerset and South Gloucestershire area (£49,986) and in Bristol (£47,784). The lowest level was in Swansea (£37,874), the only area where GVA per filled job was below the average for Wales.

Table 7: GVA per filled job, 2013, NUTS1 and NUTS3. Source: ONS Subregional Productivity, August 2015 release.

	Total GVA, £ per filled job
NUTS1	
South West England	42,713
Wales	39,207
NUTS3	
Bristol, City of	47,784
BaNES, North Somerset & South Gloucestershire	49,986
Central Valleys	40,428
Gwent Valleys	39,295
Bridgend and Neath Port Talbot	41,128
Swansea	37,874
Monmouthshire and Newport	43,276
Cardiff and Vale of Glamorgan	43,907

4.7.8 As indicated in Table 8, productivity levels in Wales are approximately 82% of productivity levels across the UK. Productivity in the South West lags the UK average by a smaller margin. No areas in Wales, including Cardiff and the Vale of Glamorgan, achieve UK average levels of productivity. Trend data set out in Table 8 shows that levels of productivity in Wales and the South West of England fell slightly, relative to the rest of the UK. At a NUTS3 level, some areas – most notably the Gwent Valleys and Bridgend and Neath Port Talbot – experienced some improvement in relative productivity.

Table 8: Index of GVA per filled job at current basic prices, 2013, NUTS1 and NUTS3. Source: ONS Subregional Productivity, August 2015 release.

	Index of GVA, UK=100	
	2004	2013
NUTS1		
South West England	91.2	88.8
Wales	82.3	81.5
NUTS3		
Bristol, City of	103.3	97.2
BaNES, North Somerset & South Gloucestershire	104.2	105.5
Central Valleys	87.0	85.2
Gwent Valleys	76.3	81.3
Bridgend and Neath Port Talbot	82.8	84.7
Swansea	76.3	78.2
Monmouthshire and Newport	89.6	90.9
Cardiff and Vale of Glamorgan	93.7	91.7

4.8 Employment, Unemployment and Economic Activity

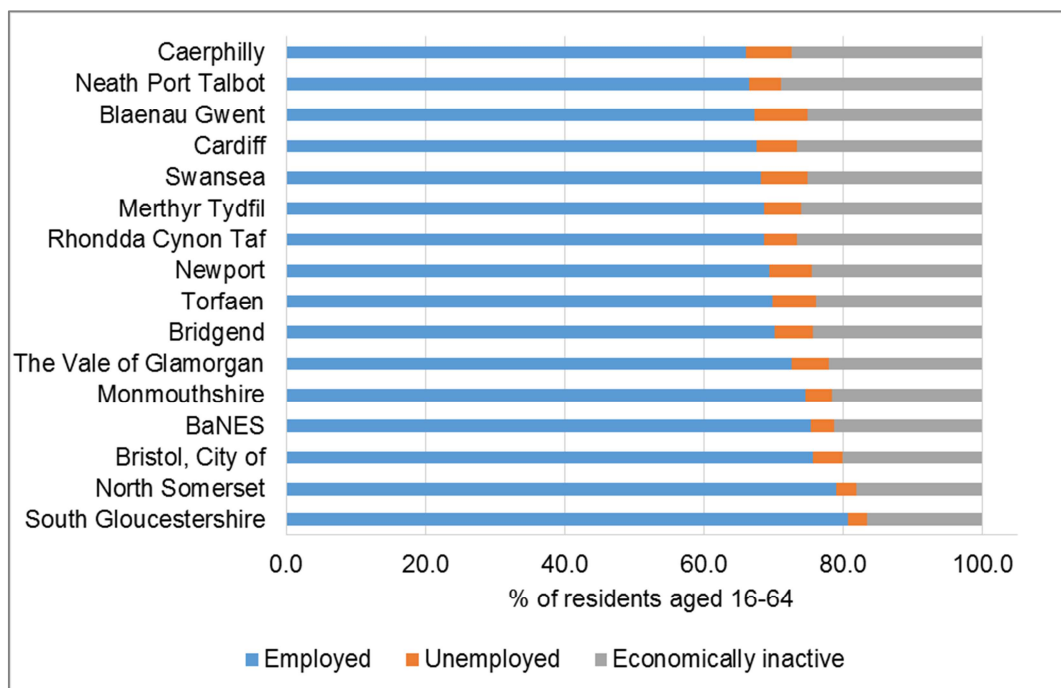
4.8.1 Figure 7 shows the rates of employment, unemployment and economic inactivity for each local authority across the study area. Unemployment is measured using the International Labour Organisation (ILO) measure of unemployment. This is different to the claimant count measure of unemployment based solely on eligibility for benefits (i.e. Jobseekers' Allowance), and is generally accepted to be a more comprehensive measure. The rate of economic inactivity is defined as the proportion of the workforce neither in work, nor unemployed and seeking work.

4.8.2 In the year to June 2015, the rate of economic activity across the study area was 76.4%. The four local authority areas in England had the highest economic activity rates in the study area, ranging from 78.7% in BaNES to 83.5% in South Gloucestershire. In the Welsh study area, all local authorities had rates below the lower bound of the range of values in the English study area, ranging from 71.1% in Neath Port Talbot to 78.3% in Monmouthshire. In Cardiff and Newport, the comparable figures were 73.4% and 75.6% respectively; marginally below the average across the study area.

4.8.3 In line with the economic activity rate, the four local authority areas within the English study area also had the highest employment rates, ranging from 75.3% in BaNES to 80.7% in South Gloucestershire. In the Welsh study area, employment rates ranged from 66% in Caerphilly to 74.5% in Monmouthshire.

4.8.4 The lowest levels of unemployment⁴⁰ were also found in the English study area. The highest rates of unemployment were recorded in Blaenau Gwent (7.5%), Swansea (6.7%) and Caerphilly (6.5%). In Newport, the rate was 6.1%, and in Cardiff 5.8%; above the average for the Welsh study area (5.7%) and notably higher than the average across the wider study area (3.3%).

Figure 7: Employment, unemployment and economic inactivity, 2014/2015.
Source: ONS Annual Population Survey



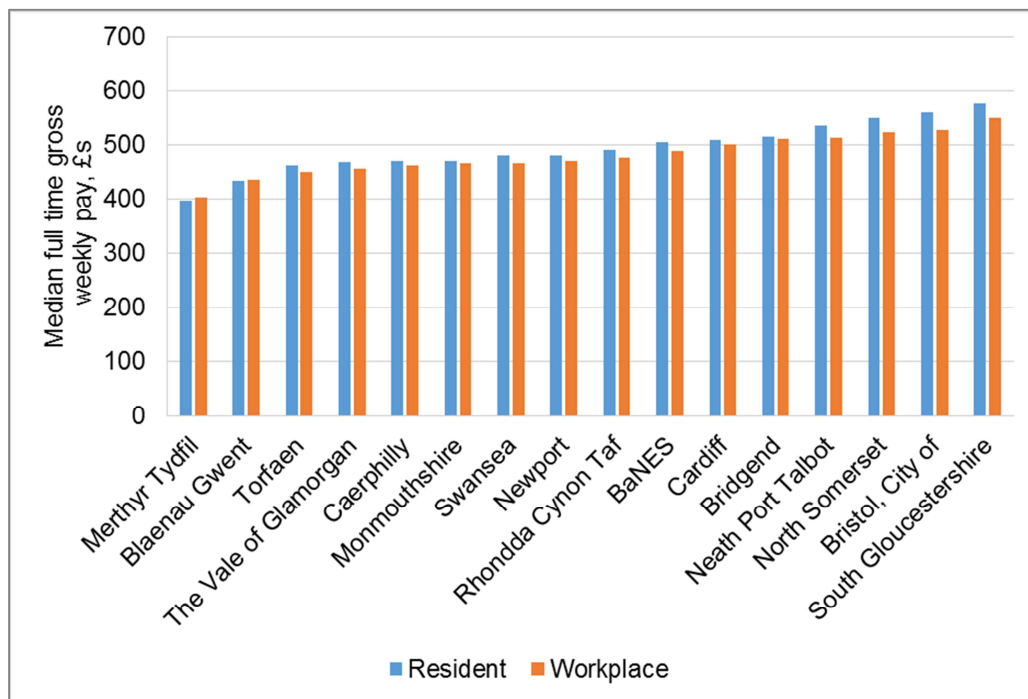
4.9 Wages

4.9.1 Figure 8 uses data from the Annual Survey of Hours and Earnings (ASHE) for 2014. It shows the median gross full-time weekly pay across the study area, on both a residence and workplace basis. On the whole – and with the notable exception of Monmouthshire – both residence-based and workplace-based median wages were typically higher in the English study area than the Welsh study area.

4.9.2 Resident wages are higher than workplace wages in most cases. This reflects the fact that workers who travel further afield for employment tend to be those in higher paid jobs.

⁴⁰ Calculated as the proportion of the total working-age population (16-64).

Figure 8: Median gross full-time weekly pay, 2014. Source: ONS Annual Survey of Hours and Earnings, 2014



4.10 Economic Deprivation

4.10.1 The Wales Index of Multiple Deprivation (IMD) was updated in 2014. Deprivation is measured for every Lower Super Output Area (LSOA)⁴¹ by combining a range of economic and social indicators across eight 'domains' of income, employment, health, education, access to services, community safety, physical environment, and housing.

4.10.2 The data – summarised in Table 9 – shows that Blaenau Gwent has the highest levels of multiple deprivation in the Welsh study area, with 23% of LSOAs within the local authority area falling within the 10% most deprived in Wales. Merthyr Tydfil also has particularly high levels of deprivation, with 22% of LSOAs in the 10% most deprived nationally. The lowest occurrences of deprivation are in Monmouthshire – where no LSOAs are in the 10% most deprived in Wales.

⁴¹ An LSOA is a geographical unit used for statistical purposes by the ONS. Each LSOA has between 1,000 and 3,000 residents, and 400 and 1,200 households.

Table 9: Welsh Index of Multiple Deprivation

	% of LSOAs in 10% most deprived in Wales
Blaenau Gwent	23%
Bridgend	10%
Caerphilly	13%
Cardiff	18%
Merthyr Tydfil	22%
Monmouthshire	0%
Neath Port Talbot	13%
Newport	15%
Rhondda Cynon Taf	17%
Swansea	12%
The Vale of Glamorgan	5%
Torfaen	5%

4.10.3 The underlying data for individual domains shows that Blaenau Gwent and Merthyr Tydfil also have the most concentrations of employment deprivation in the Welsh study area. Newport has a high rate of income deprivation, with 20% of LSOAs in the area falling within the 10% most deprived nationally. Newport also has the highest level of physical environment deprivation⁴² in the Welsh study area – and the second highest across Wales – with 29% of LSOAs within the 10% most deprived for this domain.

4.10.4 The English IMD was updated in 2015, and measures deprivation across seven domains: income; employment; education, skills and training; health and disability; crime; barriers to housing and services; and living environment. Table 10 shows that, across the English study area, Bristol has the highest levels of deprivation, with 16% of LSOAs within the 10% most deprived nationally. BaNES, North Somerset and South Gloucestershire all have low levels of multiple deprivation.

Table 10: English Index of Multiple Deprivation

	% of LSOAs in 10% most deprived in England
BaNES	1%
Bristol	16%
North Somerset	7%
South Gloucestershire	0%

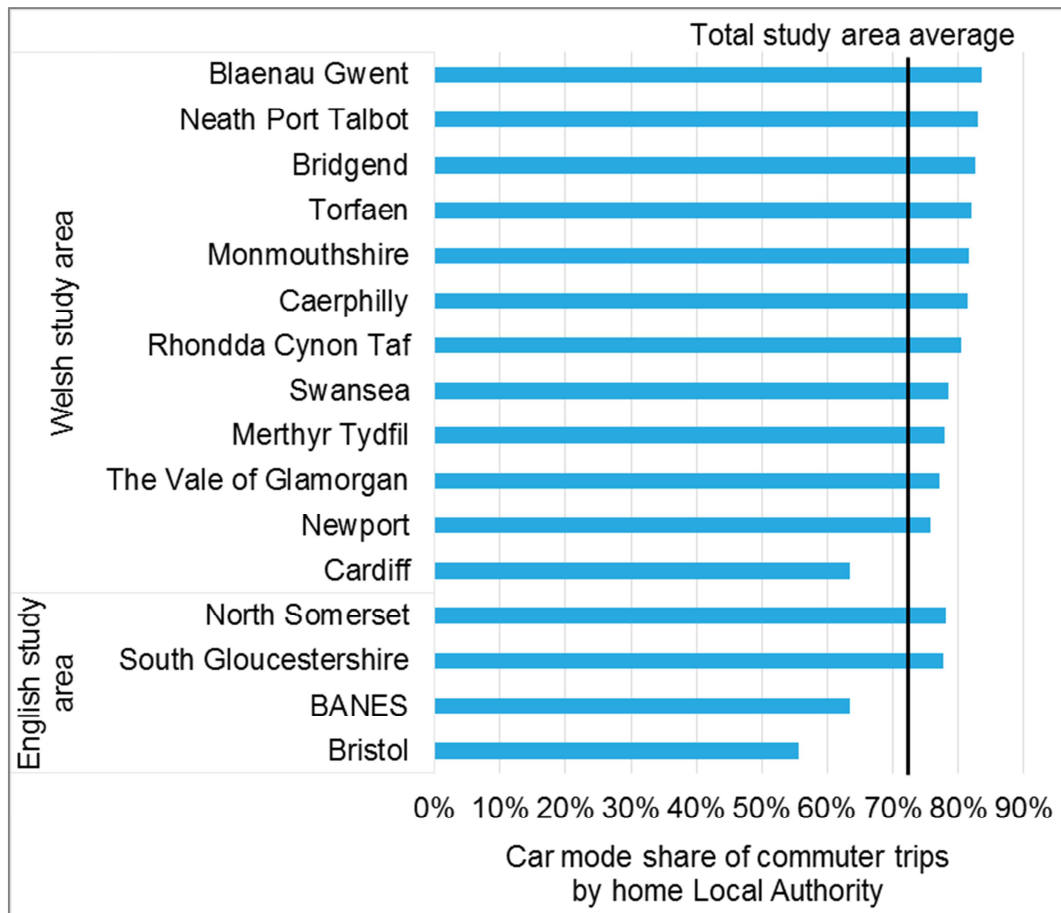
4.10.5 Due to the way in which IMD are calculated, it is not possible to compare deprivation in Welsh local authority areas with English local authority areas.

⁴² This measures factors that may impact on the wellbeing or quality of life of people living in the local area, using the following indicators: air emissions, air concentrations, proximity to waste disposal and industrial sites, and flood risk.

4.11 Commuting – Mode Shares

4.11.1 The Census provides data on mode share of commuting activity. Travel by car is the dominant mode, accounting for 77% of commuting in the Welsh study area. This compares to 66% in England and Wales as a whole. Only Cardiff, Bristol and BaNES have a car mode share that is lower than the national average.

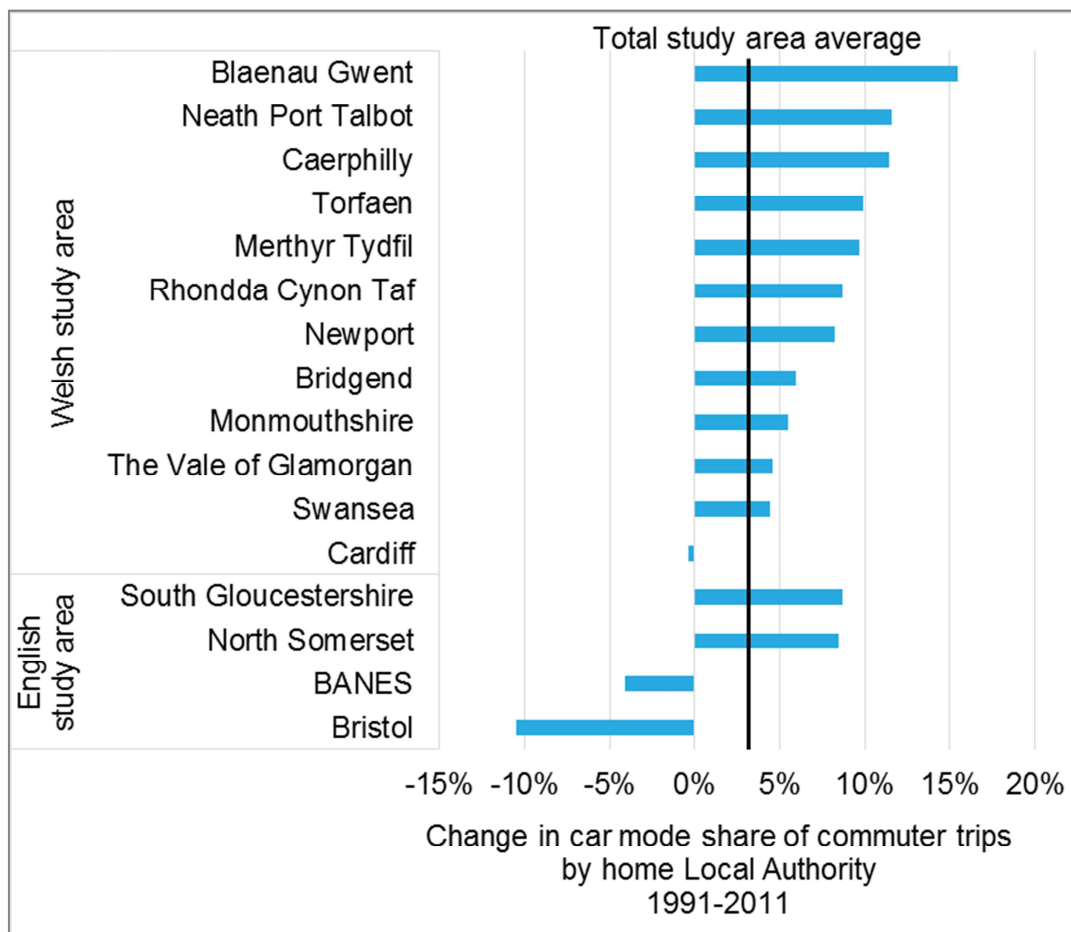
Figure 9: Car mode shares in the study area. Source: 2011 Census



4.11.2 Car mode shares have increased from 71% in 1991 to 77% in 2011 in the study area. This is in contrast to a slight decrease in car mode share experienced since 2001 in England and Wales as a whole.

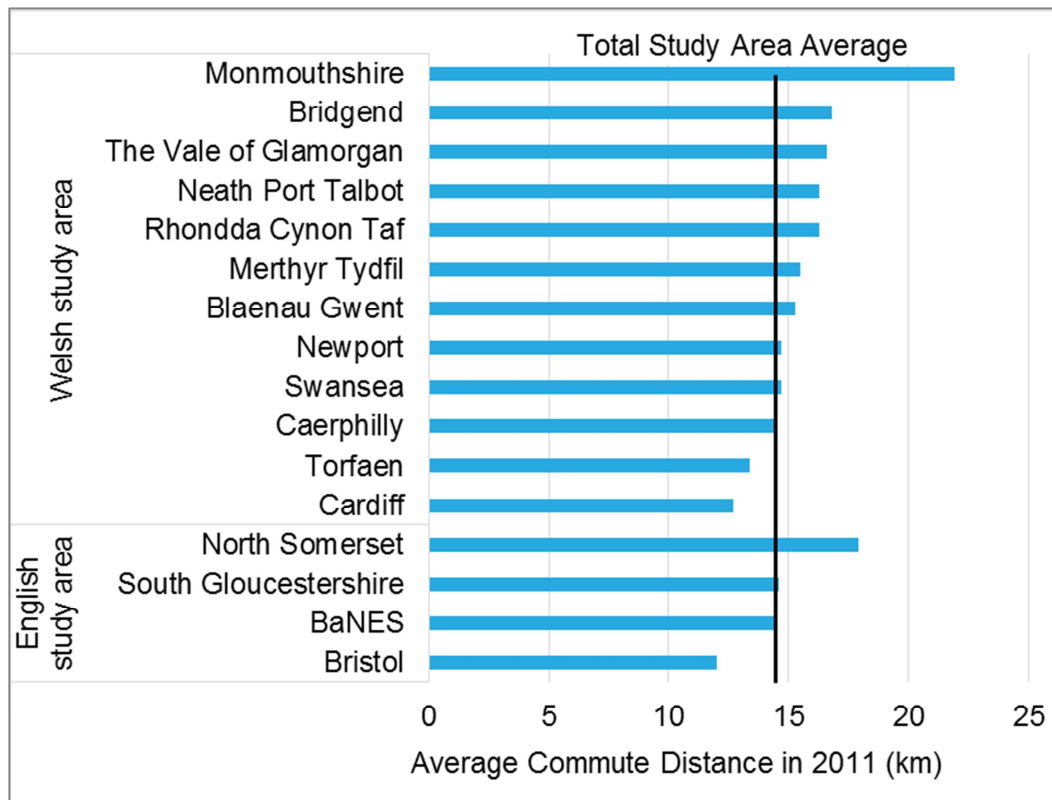
4.11.3 Car mode shares have increased by as much as 15% since 1991 in some parts of the study area (Figure 10). In the Welsh study area, the mode share has increased by 6% overall. Only Cardiff (-0.4%), Bristol (-10.5%) and Bath and North East Somerset (-4.1%) have experienced a reduction in car mode share.

Figure 10: Change in car mode shares, 1991-2011, by local authority area.
Source: Census 2011



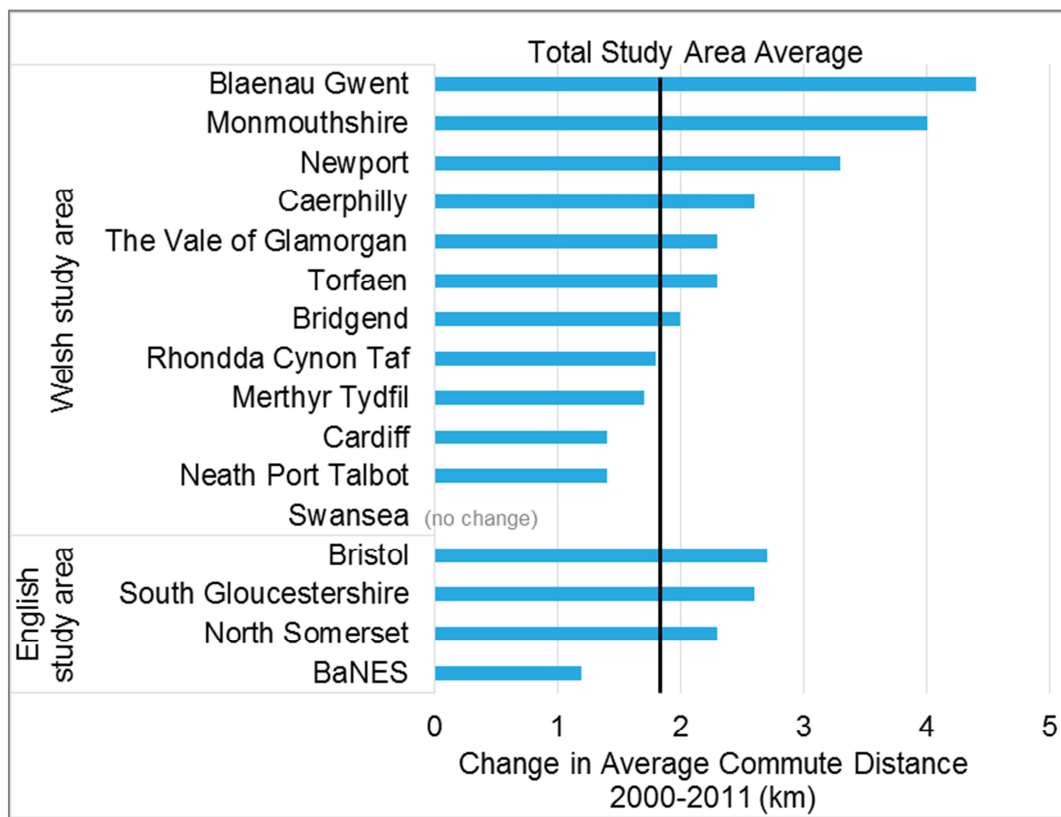
4.12 Commuting – Distance travelled

4.12.1 The average distance travelled to work in the study area was just over 15km. This is similar to the England and Wales average, and approximately equivalent to the driving distance between Newport and Pontypool or between Cardiff and Barry. Variations between local authorities to an extent reflect differences in urbanisation, with more rural locations such as Monmouthshire and North Somerset showing longer commuting distances.

Figure 11: Average distance travelled to work, 2011. Source: 2011 Census

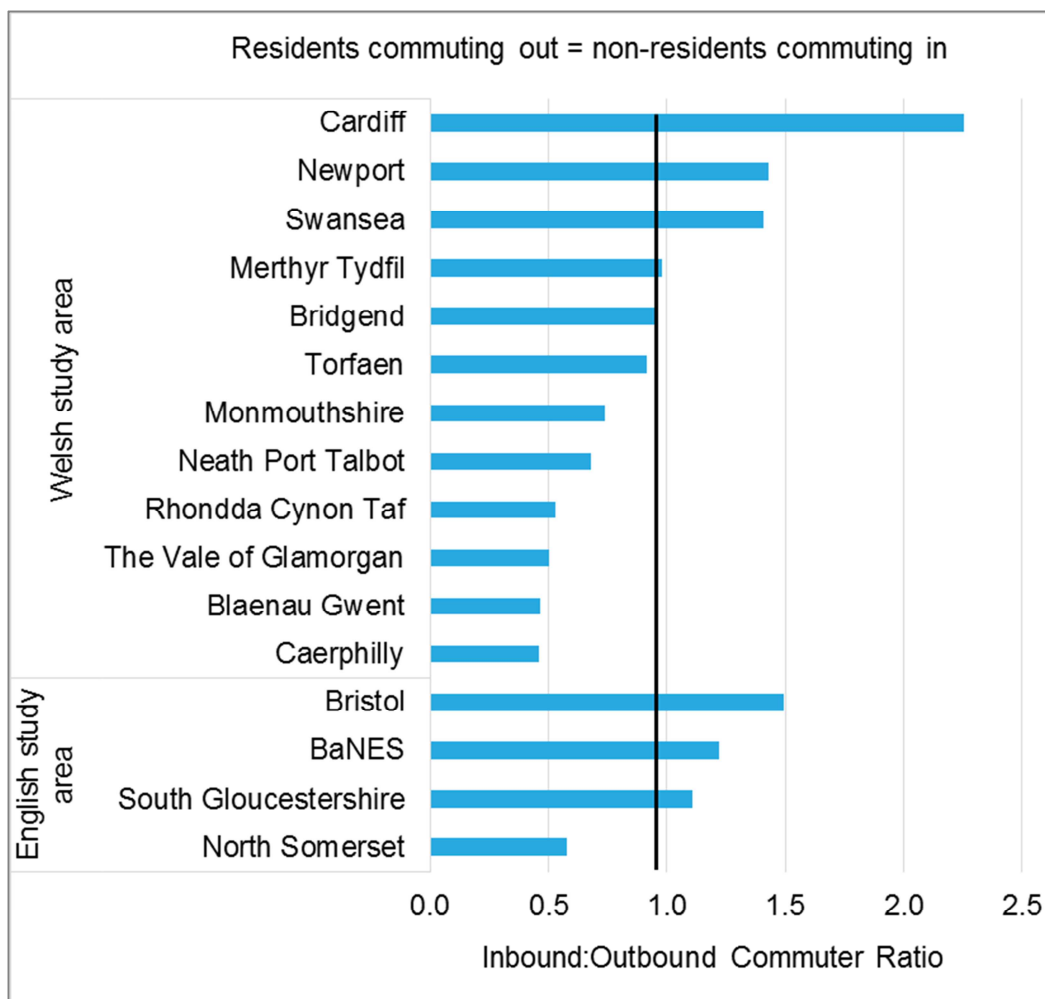
4.12.2 The average distance travelled to work has increased slightly over the 10 years between the 2001 and 2011 Census. This increase has been particularly marked for some of the local authority areas around Newport (Newport, Caerphilly, Monmouthshire and Blaenau Gwent).

Figure 12: Change in average distance travelled to work, 2001-2011.
Source: ONS summary of 2011 Census data



4.13 Commuting Patterns

4.13.1 Figure 13 shows the ratio of inbound commuter trips to outbound commuter trips for each local authority. This shows that six of the 16 local authorities in the study area (Cardiff, Newport and Swansea in Wales and Bristol, BaNES and South Gloucestershire in England) have net inflow of commuters, that is to say, the number of workers travelling into the local authority exceeds the number of residents travelling out of the local authority for work.

Figure 13: Inbound-outbound commuter ratio

4.13.2 Figure 14 shows the main commuting flows within the study area from the 2011 Census. This figure shows flows of 2,000 daily commuters or more between local authorities (disregarding those who travel within a local authority area to work). The figure illustrates the complex nature of commuting patterns in the study area. North-south commuting patterns into Cardiff and Newport are strongly represented but the figure also highlights the importance of commuting flows along the M4 corridor between Cardiff and Newport.

4.13.3 Although not indicated in Figure 14, cross border movements of workers between South Wales and the South West of England are also significant. Based on 2011 Census data, 12,900 people commute from the Welsh study area to their place of work in the English study area and 5,500 commute to South Wales from the English study area. It is notable that a much larger number of Welsh residents travelled to work in Bristol than travel in the reverse direction. This is likely to be a product of the differential in wages between the English and Welsh study areas set out in Section 4.9 above.

Figure 14: Commuting flows across study area



4.14 Local Economic Context – Industrial Structure

4.14.1 This section considers the local economic context in Newport, as well as Cardiff and Monmouthshire, drawing upon the data sets analysed above.

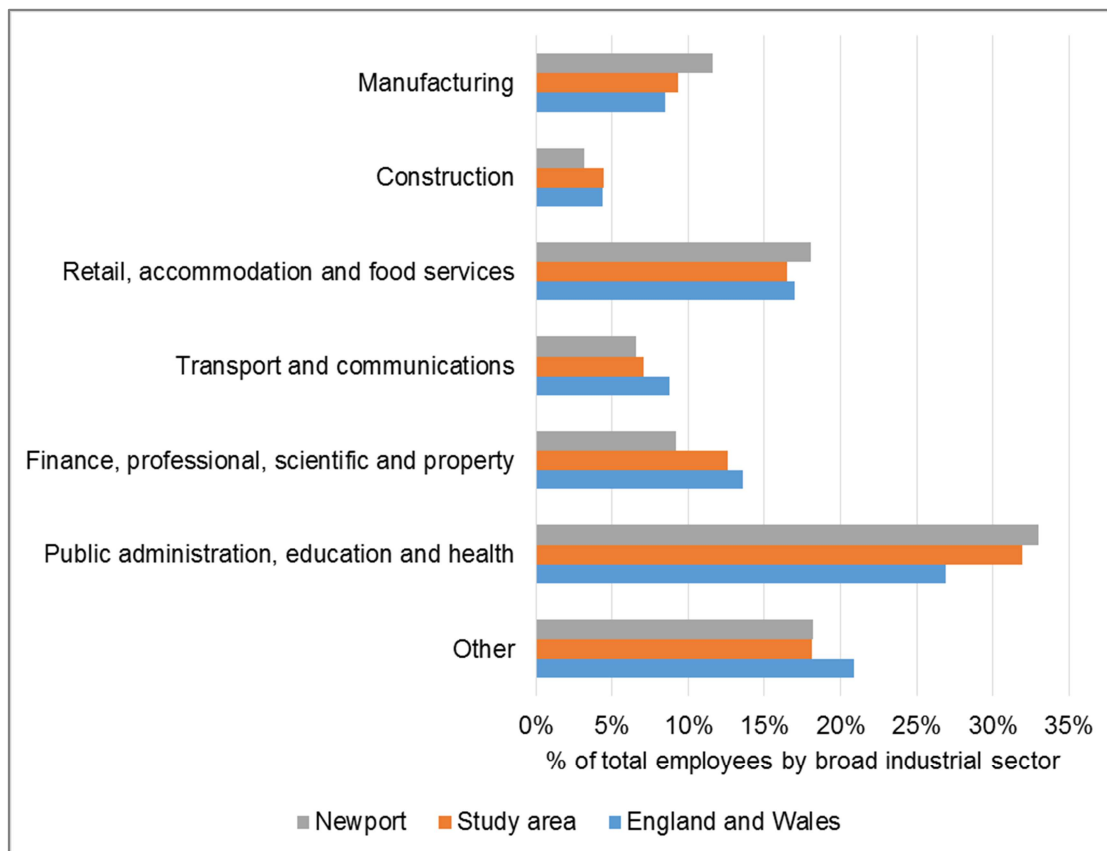
4.14.2 The Business Register and Employment Survey (BRES) publishes employee and employment estimates at detailed geographical and industrial levels.

4.14.3 In 2014, there were 68,800 employee jobs in Newport. The largest three sectors by number of employees were:

- a) Health - 11,400 jobs, accounting for 16.6% of employees;
- b) Retail – 8,100 jobs, accounting for 11.7% of employees; and
- c) Manufacturing – 8,000 jobs, accounting for 11.7% of employees.

4.14.4 Newport, in common with the study area as a whole, has a greater proportion of employees in the manufacturing and public administration, education and health sectors than England and Wales. It also has a smaller proportion of employees in service functions such as the financial, professional, and scientific and property sectors.

4.14.5 In 2014, the public sector accounted for approximately 18,900 employee jobs in Newport, equivalent to 27.5% of total employee jobs. This was higher than in the neighbouring local authorities of Cardiff (22.8%) and Monmouthshire (24.1%).

Figure 15: Employees by broad industrial sector, 2014. Source: BRES, 2014

4.15 Local Economic Context – Labour Market

4.15.1 In Newport, the economic activity rate in 2014/15 was 75.6%. This rate was slightly higher than Cardiff (73.4%) but lower than Monmouthshire (78.3%). Newport's unemployment rate was 8%; placing it 12th of the 16 local authority areas in the study area (going from lowest unemployment to highest). In contrast, Monmouthshire has the lowest level of unemployment amongst the local authorities in South Wales.

4.15.2 The Annual Survey of Hours and Earnings (ASHE) analysed at the study area level in Section 4.6 provides data on average wages on both a residence and workplace basis.

4.15.3 On a residence basis, the median gross weekly wage in Newport was £462.40; placing it 14th out of the 16 local authorities in the study area. Wages levels were higher in both neighbouring to the east and west; Monmouthshire (£577.60) had the highest median wage and in Cardiff it was £490.90.

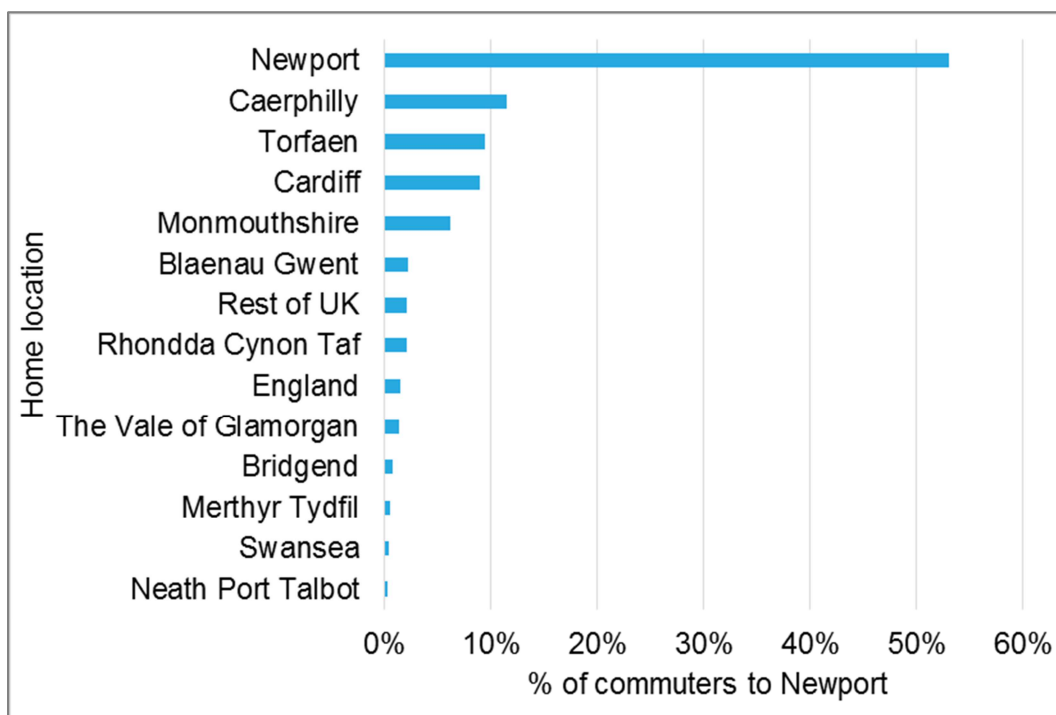
4.15.4 On a workplace basis, the median gross weekly wage in Newport was £470; placing it 9th out of the 16 local authorities in the study area. This was above that in neighbouring Monmouthshire (£466) but less than in Cardiff (£499.70).

4.15.5 In Newport, the proportion of individuals with higher-level skills of NVQ4 was 35.4%; placing it 7th of the 16 local authorities in the study area. This was lower than the comparable figure in both neighbouring Cardiff (46%) and Monmouthshire (40.9%).

4.16 Local Economic Context – Commuting patterns

4.16.1 The 2011 Census commuter data indicates that Newport has net inward commuting with an inbound-outbound commuting ratio of 1.4. More than 40% of those working in the city travel in from outside. Figure 16 shows the home location of commuters to Newport. The largest inflows into Newport come from Caerphilly, Cardiff, Torfaen and Monmouthshire.

Figure 16: Home location of commuters to Newport. Source: 2011 Census



4.17 Local Economic Context – Newport Docks

4.17.1 The M4 proposals include a new bridge crossing of the River Usk, which has several commercially operated wharves. The bridge and approach viaducts also cross the Newport Docks, owned and operated by Associated British Ports (ABP), between North and South Dock.

4.17.2 The North Dock includes facilities catering for the movement of steel, timber and bulks. It provides a dry docking facility capable of handling vessels up to 8,000 tonnes. The North Dock area also includes a rail

terminal and Network Rail holds an option to develop 29 acres of land⁴³.

4.17.3 The South Dock includes facilities catering for the movement of steel, coal, minerals, sand, fertilisers, metals recycling, cement and other bulk cargoes. Sims Metals Management operates a scrap metal terminal on the North Quay. The southern section of Western quays is used by Severn Sands for the import of dredged aggregates from the Bristol Channel while the area directly next to Severn Sands has been designated an energy development site. Part of the northwest corner of the energy development site has been developed and a new facility, Sims Metals Waste Electronics and Electrical Equipment (WEEE) recycling plant has been constructed.

4.17.4 Port freight statistics published by DfT provide data on the quantities of cargoes moving through Newport Docks. The latest annual data available is for 2014 and was published in August 2015. Table 11 shows tonnage by traffic type in 2014.

4.17.5 Iron and Steel products accounted for the largest movements by tonnage, followed by products in the 'Other bulks' category.

Table 11: Traffic at Newport Docks, 2014. Source: DfT Port Freight Statistics, Final Annual, 2014

	Tonnage (thousand tonnes)						
	Foreign traffic			Domestic traffic			All traffic
	Imports	Exports	All	In-wards	Out-wards	All	
Dry bulk							
Ores	0	234	234	26	0	26	260
Coal	152	0	152	3	0	3	155
Agricultural products	218	44	262	14	0	14	276
Other dry bulk	123	32	155	149	0	149	304
All dry bulk traffic	492	311	803	192	0	192	995
All bulks							
Bulk fuels	152	0	152	3	0	3	155
Other bulks	341	311	652	189	0	189	840
All bulk traffic	492	311	803	192	0	192	995
Other general cargo							
Forestry products	68	0	68	0	0	0	68
Iron and steel	674	856	1,530	0	13	13	1,543

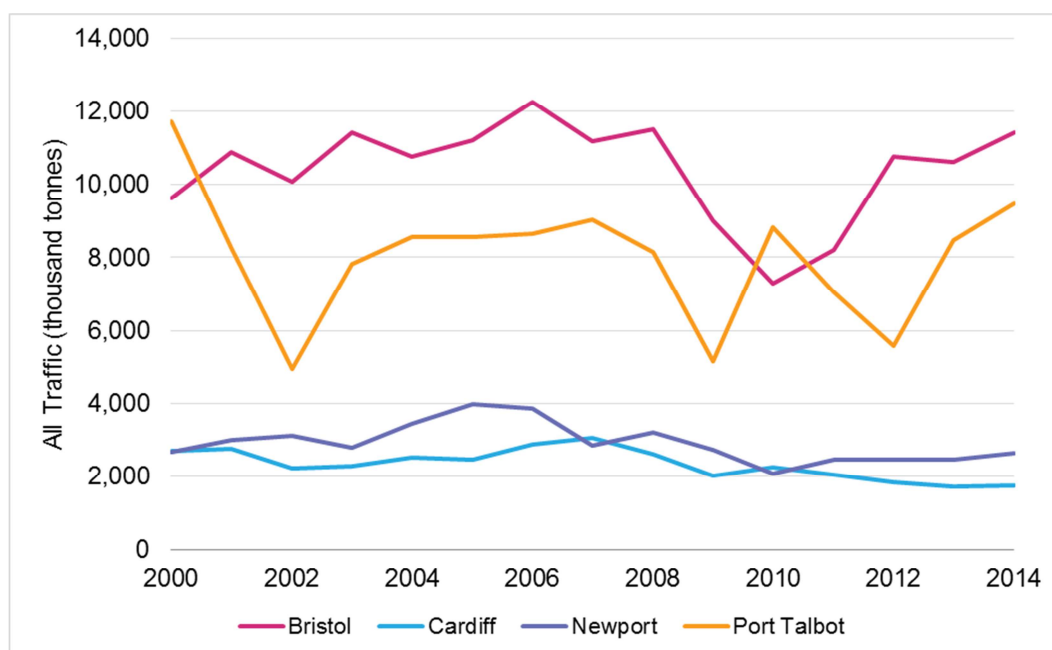
⁴³ Newport Docks Masterplan, 'Draft for discussion', ABP (2010).

	Tonnage (thousand tonnes)						
	Foreign traffic			Domestic traffic			All traffic
	Imports	Exports	All	In-wards	Out-wards	All	
products							
General cargo & containers <20'	11	0	11	-	0	-	11
All other general cargo traffic	753	856	1,609	-	13	13	1,622

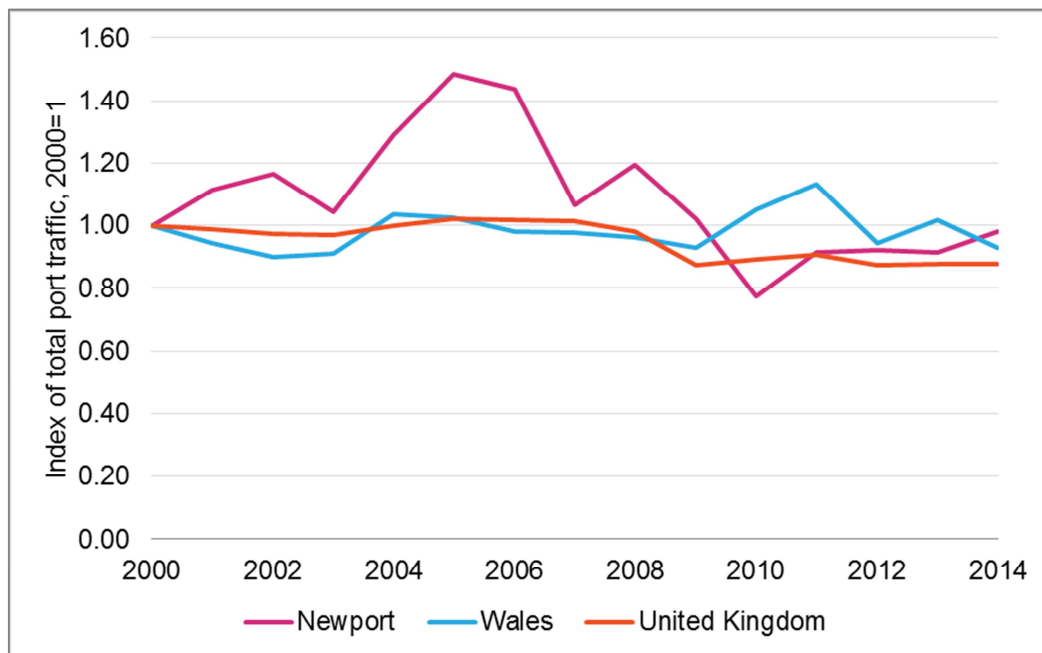
4.17.6 Figure 17 compares trends in port volumes at Newport and other ports in the Severn Estuary. Traffic volumes at Newport have fluctuated over recent years although Newport accounted for a similar volume of traffic in 2014 (2.7m tonnes) as in 2000 (2.6m tonnes).

4.17.7 Newport handles a lower overall volume of goods, by weight, than the ports at Port Talbot and Bristol. It is notable, however, that Newport Docks was the second largest port in the UK by tonnage with respect to iron and steel products, accounting for 15.5% of the total iron and steel tonnage moving through UK ports.

Figure 17: Port traffic comparison, 2000-2014



4.17.8 Tonnes moved through UK ports have declined slightly since 2008. At Newport Docks volumes peaked in 2005 but have fallen in recent years.

Figure 18 Port traffic comparison, indexed with 2000=1

4.17.9 The Docks estate covers around 685 acres with key firms operating on the estate including Origin Fertilisers, Severn Sands, Jewson and WE Dowds. Newport City Council's Revised Deposit Local Development Plan (LDP) identifies 204 hectares of land at Newport Docks as an employment land allocation. The LDP states:

"There is a surplus of land within Newport Docks which could better meet Newport's economic development objectives if brought into alternative, productive, employment generating uses within Use Classes B1, B2 or B8."

4.17.10 An economic impact study of the economic value of ABP's activities to the UK economy was published in January 2014⁴⁴. The study was undertaken at the UK level, encompassing ABP's operations across 21 ports across the UK in 2012. Estimates by regional groups and ports were also part of the work. Newport Docks was estimated to support approximately 3,000 local jobs and £186 million in GVA annually in 2012.

4.17.11 Analysis of the impact of M4 CaN on Newport Docks is included in Chapter 8 of this report.

4.18 Land Use and Planning Context

4.18.1 As noted, in Section 3, transport is an important determinant of transport investment decisions and new transport infrastructure can influence future land use patterns. This section describes the land use and planning context for the M4 proposals, drawing on the Local Development Plans and supporting documents for Newport, Monmouthshire and Cardiff.

⁴⁴ Economic Value of ABP to UK plc, Arup (January 2014).

- 4.18.2** It should be noted that the planning policies currently in place, and the allocations set out within them, do not take into account the potential impact of M4 CaN on the demand or supply of employment land in the area.

4.19 Employment Land in Newport

- 4.19.1** The 2013 Newport Employment Land Review (ELR) forecasts that, between 2011 and 2026, the number of jobs in Newport will grow by some 7,400, an increase of 9% on 2011 levels.
- 4.19.2** The employment forecasts imply that there will be an overall net requirement for an additional 21.5 ha of Class B (business and industrial) land between 2011 and 2026. The ELR concludes that the primary driver of the increase in demand for floorspace will be the service sector. The total net requirement includes net additional provision of B1 (office) floorspace equal to 19 ha over the plan period.
- 4.19.3** Employment in manufacturing is expected to fall such that the requirement for Class B1 (industrial) requirement is expected to fall by around 8 ha. In contrast, warehousing requirements are expected to grow by an additional 16 ha (63,000 sqm). The ELR suggests merging the two requirements, and calculates that there is an overall need to plan for a net additional 2 ha (8,500 sqm) of industrial/warehousing land.
- 4.19.4** Importantly the ELR states that '*A key caveat to all our recommendations is that if the new M4 [i.e. M4 CaN] is confirmed the Council will need to re-appraise its whole employment land strategy*'.
- 4.19.5** The adopted Newport Local Development Plan (January 2015) outlines the land use framework for Newport up to 2026.
- 4.19.6** LDP Policy EM1 '*Employment Land Allocations*' outlines how provision will be made for approximately 172 ha of employment land for the period up to 2026. The following sites are allocated as employment land in the Newport area:
- a) Duffryn – 38.5 hectares for B1, B2, and B8 uses;
 - b) East of Queensway Meadows, south of Glan Llyn – 27 hectares for B1, B2 and B8 uses;
 - c) Celtic Springs – 6 hectares primarily for B1 use; and
 - d) Solutia – 43 hectares for B1, B2, B8 and leisure use.
 - e) Gwent Europark – 16 hectares for b8 distribution uses;
 - f) Land off Chartist Drive, Rogerstone – 2 hectares for b1, b2 and b8 uses;
 - g) Celtic Business Park (Llanwern former steelworks eastern end) – 35.5 hectares for b1, b2 and b8 uses;
 - h) Phoenix Park (former Pirelli works), corporation road – 2 hectares for b1, b2 and ancillary uses;

- i) Godfrey Road (rear of station) – 2 hectares for business and commercial uses.

- 4.19.7** The LDP states that the allocations will be protected for employment uses, and alternative uses for the sites will be resisted.
- 4.19.8** With respect to Dyffryn, the LDP confirms that this is a large scale strategic development area well connected to the M4, containing some of the most prestigious employment developments within Newport.
- 4.19.9** With respect to the sites at Glan Llyn and Solutia, the LDP confirms that the sites are well connected to the Southern Distributor Road and provide excellent strategic locations for B1, B2 and B8 uses. The LDP states that a new junction off the proposed new section of motorway to the south of Newport would provide increased motorway accessibility to this strategic regeneration area.
- 4.19.10** LDP Policy EM2 '*Newport Docks*' outlines that the existing employment site at Newport Docks is protected for B1, B2 and B8 uses and the Council are supportive of complementary development that will not hinder the operational use of the Docks. As reference elsewhere in this report, the LDP notes that there is a surplus of land within Newport Docks which could better meet the city's economic development objectives if brought into alternative, productive, employment generating uses.

4.20 Employment Land in Monmouthshire

- 4.20.1** The adopted Monmouthshire Local Development Plan (February 2015) outlines the land use framework for Monmouthshire up to 2021.
- 4.20.2** LDP Policy S9 '*Employment Sites Provision*' explains that provision will be made for a suitable range and choice of sites for industrial and business development (classes B1, B2 and B8). This includes:
- a) 37 hectares at Magor suitable for employment development of regional or sub regional significance;
 - b) Around 5-6 hectares at each of the main towns of Abergavenny (Llanfoist), Chepstow and Monmouth; and
 - c) The protection of existing employment land and premises that continue to be required for their existing purpose.
- 4.20.3** LDP Policy SAE1 identifies sites for new industrial and business development. Those most directly related to the M4 CaN proposals are at Wales One, Quay Point and Gwent Europark, all of which are located at Magor⁴⁵. These sites comprise 36.9ha of land, with an identified job potential estimated to be in the region of 3,832⁴⁶.

⁴⁵ See Appendix A1.6 for further detail.

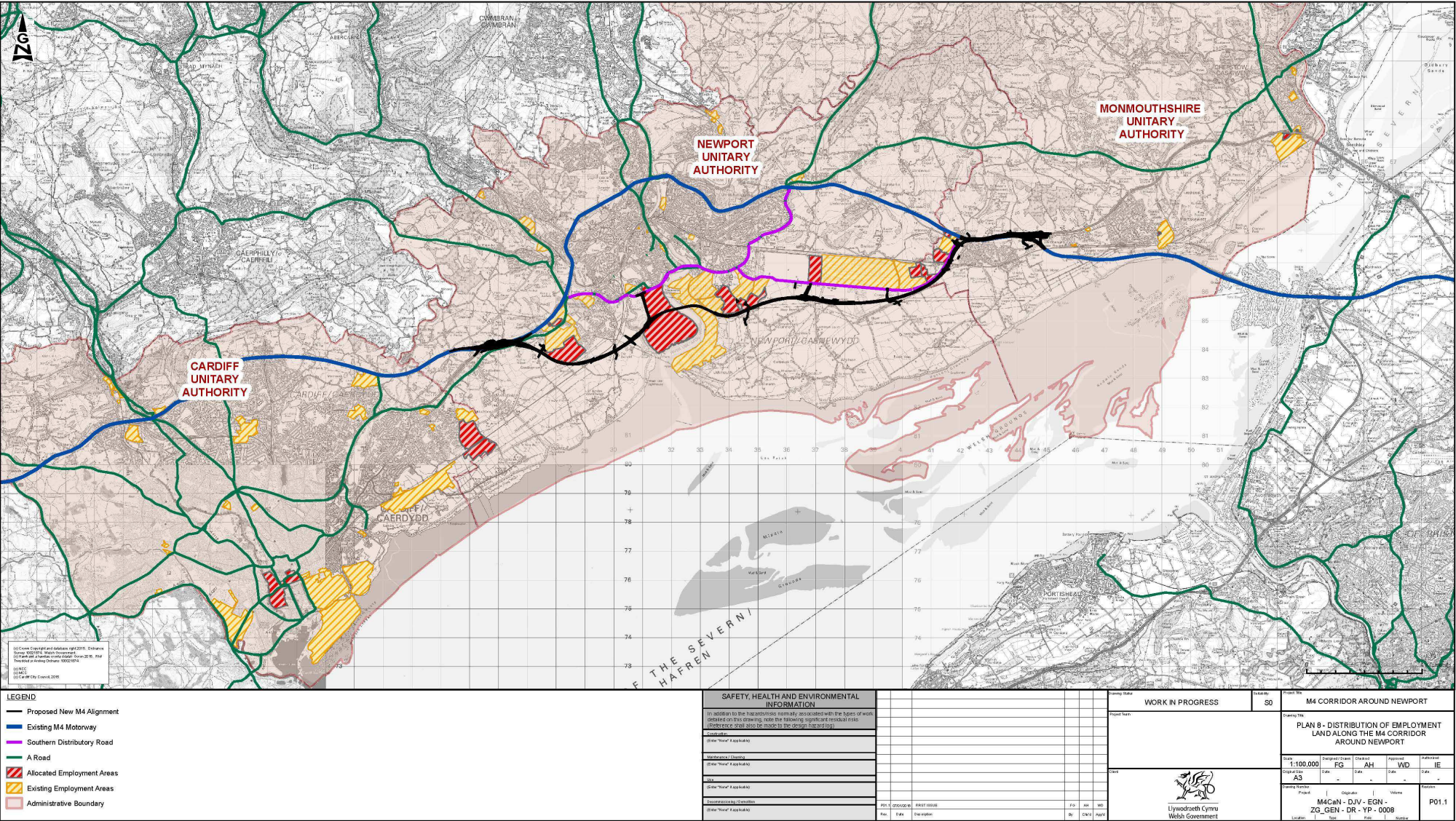
⁴⁶ Monmouthshire County Council estimate, 2014

4.21 Employment Land in Cardiff

- 4.21.1** Between 2011 and 2012, a three-stage Employment Land Study was undertaken to set out the supply position and assessment of future requirements across the Cardiff Unitary Authority Area⁴⁷.
- 4.21.2** The recently adopted Cardiff Local Development Plan (2016) provides the land use framework for Cardiff until 2026. The LDP Key Policy 1 makes provision for a range and choice of opportunities to deliver 41,100 new dwellings and 40,000 new jobs in Cardiff between 2006 and 2026.
- 4.21.3** The LDP proposes two strategic employment allocations; Cardiff Central Enterprise Zone and South of St Mellons Business Park which is accessed from the east via Junction 28 of the M4. The Enterprise Zone is a 56 hectare, city centre site incorporating Cardiff Central Train Station. It will be an employment-led scheme with other mixed-uses, focused on financial and business services. South of St. Mellons Business Park, located in the east of Cardiff comprises 31 hectares of employment space. The site would consist of low density, high quality office units, and B1 (b) research and development businesses. The allocation could be readily integrated into the existing St Mellons Business Park.
- 4.21.4** The LDP states that 'South of St Mellons' is a high quality site close to the strategic highway network, capable of attracting inward investment opportunities for high value and knowledge-based sectors.
- 4.21.5** Figure 19 shows all employment land allocations in Newport, Cardiff and Monmouthshire in relation to the M4.

⁴⁷ The relevant Cardiff Employment Land and Premises Study – Stage 1: Supply Audit (2011) report sets out an audit of the supply position across the Cardiff Unitary Authority area. The relevant Cardiff Employment Land and Premises Study – Stage 2: Assessing Future Requirements (2011) report sets out an updated assessment of future employment sites and premises requirements in Cardiff over the period 2006-26. The Cardiff Employment Land and Property Study - Stage 3: Gap Analysis (2012) report brings the first two stages together.

Figure 19 Employment land allocations in Newport, Cardiff and Monmouthshire



4.22 Conclusions

- 4.22.1** The study area contains a population of around 2.9 million and around 1.3 million jobs. Employment is concentrated in the urban centres of Bristol, Newport, Cardiff, Bridgend and Swansea which form the 'M4 Corridor'. The importance of the M4 itself is highlighted by the clustering of jobs in close proximity to M4 junctions in South Wales where topography and planning policy allows.
- 4.22.2** Given that there is no single dominant urban centre, commuting patterns in the study area are highly complex. Car is the dominant mode of transport, accounting for 77% of commuter trips in South Wales. Between 1991 and 2011, the proportion of commuters travelling by car has increased in South Wales. The average distance travelled by commuters has also increased.
- 4.22.3** The population of the study area is projected to increase by around 14% between 2011 and 2037. This growth will place increased pressure on the transport network.
- 4.22.4** Gross Value Added (GVA) provides a measure of the total value of goods and services produced by a region's economy (less the value of inputs secured from elsewhere) and is a commonly used measure of the state of an economy. The total GVA of the study area was £66.4bn in 2014. Of this, South Wales contributed £33.6m which represents approximately 62% of the total Welsh economy. There is a longstanding disparity between the economic performance of Wales and the rest of the UK. Over the last 10 years, this gap has widened slightly.
- 4.22.5** Analysis of the local development planning context highlights that there are a range of allocated employment sites in Newport, Monmouthshire and Cardiff that are in close proximity to the proposed new motorway. Each of the LDP recognises the importance of transport and access to the motorway network in attracting new investment and employment to these sites.

5 The Problem

Chapter Summary

- The M4 motorway provides the primary east-west strategic road link in South Wales.
- Issues with the existing M4 corridor around Newport relate to increasing congestion, increasing journey times and unreliable journey times arising from day to day variability and that associated with incidents which are all related to a lack of network resilience.
- Such issues have been highlighted by the business community as having a negative effect on perceptions of Wales as a business location.
- Growing demand is expected to exacerbate traffic issues on the existing M4 around Newport.

5.1 Introduction

- 5.1.1** This section of this report provides an overview of current conditions on the M4 around Newport.

5.2 Existing Traffic Flows

- 5.2.1** Traffic flows are often measured in terms of Annual Average Daily Traffic (AADT). Table 12 shows the AADT obtained from the base year M4 CaN traffic model for each section of the M4 between Junction 23A and Junction 29 during 2014.

Table 12: 2014 AADT, Junction 23a to Junction 29

Section	AADT
J23A – J24 (Magor to Coldra)	73,200
J24 – J25 (Coldra to Caerleon)	93,300
Brynglas Tunnels	68,400
J26 – J27 (Malpas to High Cross)	102,700
J27 – J28 (High Cross to Tredegar Park)	103,100
J28 – J29 (Tredegar Park to Castleton)	104,800

- 5.2.2** This data shows that traffic levels are highest on the M4 to the west of Junction 24, at which point vehicles join the M4 from the A449 in the north, as well as from Newport itself. The largest flows are experienced on the westernmost section between Junction 28 and 29. The traffic levels are restricted by the 2-lane section through the Brynglas Tunnels, which are relieved by the Brynglas Relief Road connecting Junction 25A to the A4042 Malpas Relief Road (constructed in 1995). The 3-lane sections between the Tunnels and Castleton (Junction 29) carry the highest volume of traffic on the M4 around Newport.

5.2.3 Based on the M4 CaN traffic model, of the vehicles using the M4, on average:

- a) 77% are cars, of which 20% are used for commuting and 11% for business purposes;
- b) 11% are Heavy Goods Vehicles (HGVs); and
- c) 12% are Light Goods Vehicles (LGVs).

5.2.4 The highest concentration of commuting traffic (up to 24% of all vehicles) is experienced west of the Brynglas Tunnels.

5.3 Capacity and congestion

5.3.1 The M4 around Newport displays characteristics of both a rural motorway and urban motorway as defined by the Design Manual for Roads and Bridges⁴⁸ (DMRB). DMRB uses the concept of the Congestion Reference Flow (CRF) as a measure against which to judge acceptable performance for rural roads and rural motorways. When the ratio of flow to CRF is 80% or above, it is considered that operational problems arise from traffic congestion will be experienced, with increased risk of accidents occurring and issues relating to journey time reliability. Severe operational problems can be expected when the ratio is 100% or above. Table 13 shows the estimated CRF for different sections of the M4 around Newport based on the base year traffic model.

Table 13: 2014 Congestion Reference Flows, Junction 23a to Junction 29

Section	2014 CRF	2014 AADT	AADT / CRF
J23A – J24 (Magor to Coldra)	111,100	73,200	66%
J24 - J25 (Coldra to Caerleon)	123,900	93,300	75%
Brynglas Tunnels	77,400	68,400	88%
J26 – J27 (Malpas to High Cross)	120,800	102,700	85%
J27 – J28 (High Cross to Tredegar Park)	114,700	103,100	90%
J28 – J29 (Tredegar Park to Castleton)	122,100	104,800	86%

5.3.2 The results show that all sections from the Brynglas Tunnels through to Junction 29 at Castleton are currently operating with daily flows over 80% of CRF, indicating that they are subject to operational problems at times, with frequent congestion expected during peak periods.

5.3.3 The performance of urban roads and urban motorways is assessed by comparing the peak hour flows against theoretical capacity. An operational assessment has therefore also compared the one-way peak hour flows on the M4 with the theoretical capacity, or maximum

⁴⁸ Design Manual for Roads and Bridges, Volume 5, Section 1, Part 3, TA 46/97, Annex D, February 1997

hourly throughput, and the results of this assessment are shown in Table 14.

Table 14: 2014 Peak Hour Flows and Capacities, Junction 23a to Junction 29

Section	1-way Capacity	2014 Peak Hour Flow	Ratio of Flow to Capacity
	(vehs/hr)	(vehs/hr)	
J23A – J24 (Magor to Coldra)	5,600	3,600	64%
J24 – J25 (Coldra to Caerleon)	5,600	4,400	79%
Brynglas Tunnels	4,000	3,300	83%
J26 – J27 (Malpas to High Cross)	5,600	4,900	88%
J27 – J28 (High Cross to Tredegar Park)	5,600	5,300	95%
J28 – J29 (Tredegar Park to Castleton)	5,600	4,900	88%

5.3.4 Consistent with the CRF assessment, it is generally accepted that once hourly flows reach about 80% of the theoretical capacity, operational problems can be expected. The data suggests that the Brynglas Tunnels and the sections of the M4 to the west of the tunnels are likely to experience significant operational problems at peak times.

5.4 Journey Time Reliability

5.4.1 The reliability of journey times can be measured by analysing the variability of journey times during the day. The consequence of a high degree of variability in journey times is that travellers are unable to accurately predict their arrival time. This has two effects. Firstly, it requires individual users to allow more time to complete their journeys to account for the variability and avoid being late. This imposes costs on users – in lost time – that they would not otherwise face. Secondly, poor reliability results in inconvenience and imposes further costs on businesses. As noted in Chapter 3, the reliability of the transport network has implications for the performance of particular sectors of economic activity and reliable transport networks can facilitate the adoption of more efficient practices or production methods.

5.4.2 It should be noted that the traffic model, which provides the basis for the economic appraisal of the scheme, generates *average* journey times and speeds at peak and off-peak times. Therefore, the quantified economic benefits given in the Economic Appraisal Report and in Chapter 8 of this report exclude any benefits resulting from improved journey time reliability.

5.4.3 Variability of journey times can stem from recurring congestion at the same period each day (day-to-day variability) or from non-recurring events, such as incidents.

- 5.4.4** The quantitative analysis presented in this section relates specifically to day-to-day variability in travel speeds. Variability resulting from incidents, which can lead to severe congestion and as such excessive increases in travel times, is discussed separately under the heading of network resilience.
- 5.4.5** Trafficmaster data⁴⁹ from May and June 2014 was used to analyse the variability of travel speeds on the M4 around Newport. Conditions on the M4 around Newport are compared with a comparator section of the M4 between Junction 34 and Junction 37. The comparator section has been selected on the basis of it being a dual three lane motorway, which carries annual average daily traffic volumes of the same order of magnitude as the new motorway is forecast to carry in the design year of 2037.
- 5.4.6** The Trafficmaster data used for this analysis has been processed to include only observations from Mondays to Thursdays. Incidents which led to abnormally low speeds were filtered out to ensure that only typical weekday day-to-day variability was captured. As such, it should be noted that the data suggests a significantly lower level of journey time variability compared to the actual level experienced by users given that variability is also a product of major traffic incidents.
- 5.4.7** Figures 20 to 23 illustrate the variability of car speeds based on the Trafficmaster data. The figures show the average (median) speed for each section of the M4, the minimum and maximum (or free flow) speed in the sample of observation (following the removal of outliers). The *standard deviation* of speeds is also shown. This is a way of expressing the difference of each journey time observation compared to the average journey time as a single value.

⁴⁹ Trafficmaster data is based on in-car GPS devices, as well as location trackers fitted to fleet vehicles, light goods vehicles, heavy goods vehicles, buses, and luxury cars.

Figure 20: Variability in car speeds (eastbound, morning peak period)

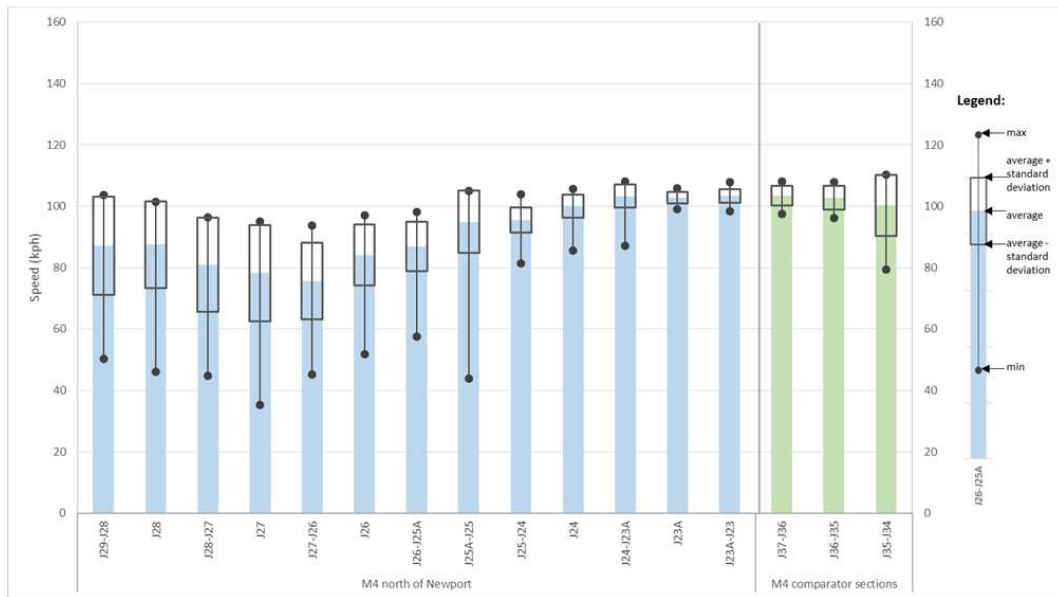


Figure 21: Variability in car speeds (westbound, morning peak period)

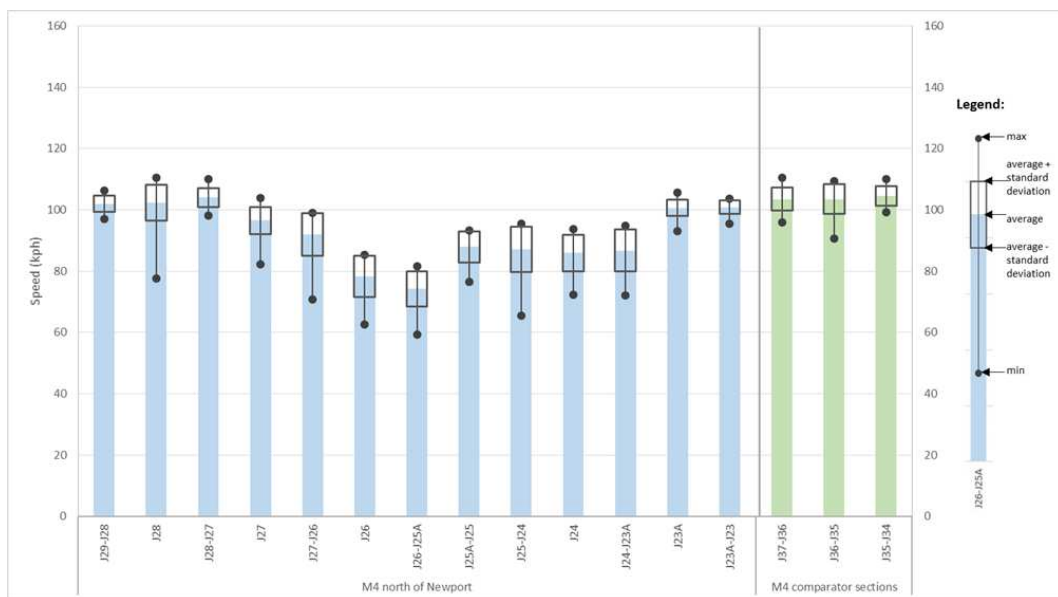
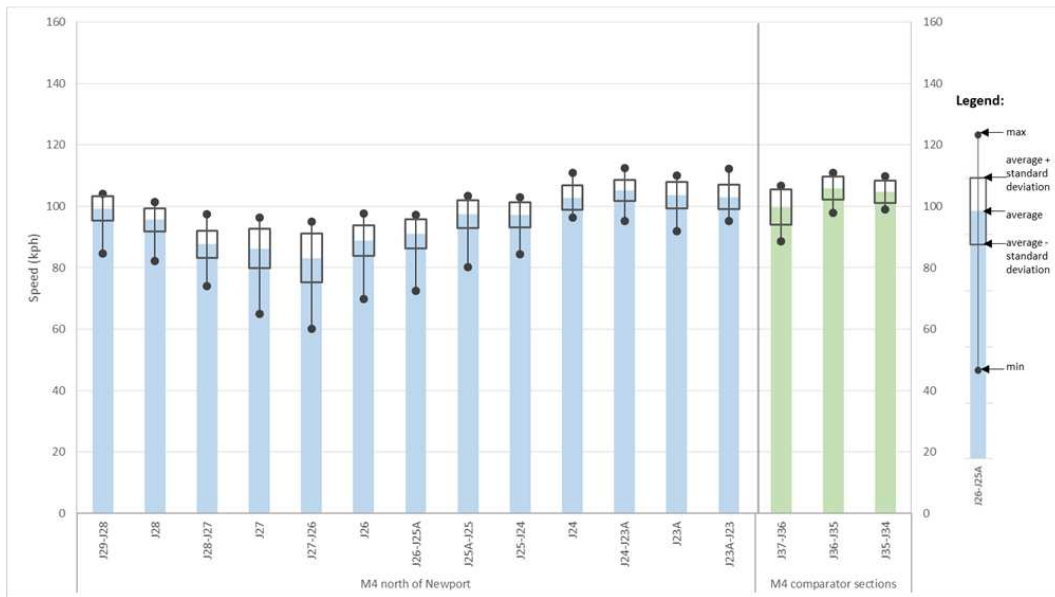
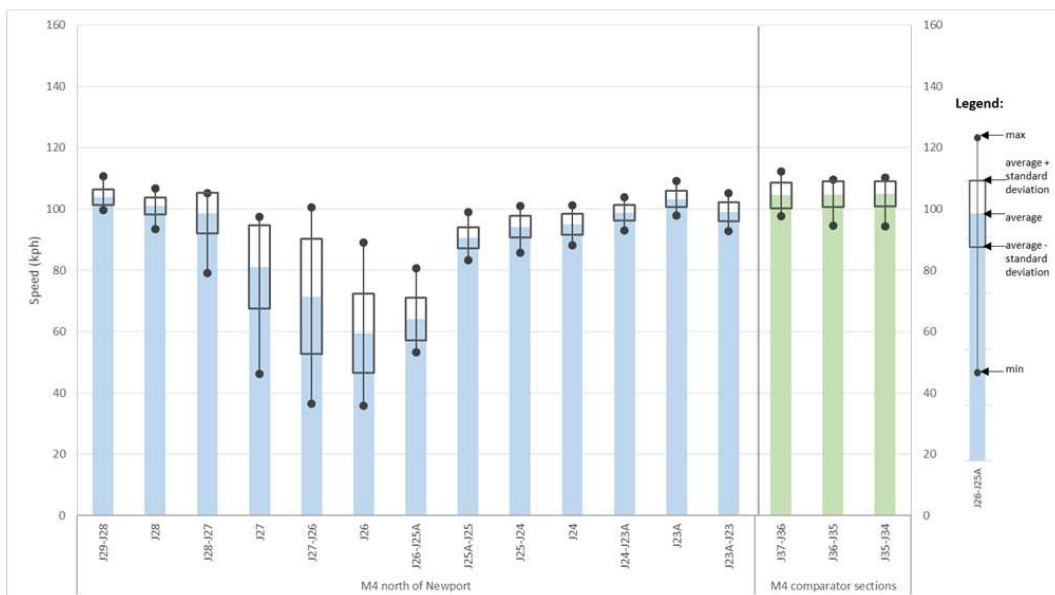


Figure 22: Variability in car speeds (eastbound, evening peak period)**Figure 23: Variability in car speeds (westbound, evening peak period)**

5.4.8 The comparator sections of the M4 generally exhibit higher average speeds and less variation in car speeds (indicated by the minimum and maximum observed speed) compared to the M4 north of Newport.

5.4.9 The analysis also highlights problems of congestion at the Brynglas Tunnels and demonstrates how such issues result in both reduced speed and increased variability. In the morning peak, the highest levels of variability are generally experienced on all sections west of Brynglas Tunnel in the eastbound direction. In the evening peak, the highest levels of variability are found between Junction 27 and Junction 26 in the westbound direction.

- 5.4.10** The westbound direction in the morning peak and the eastbound direction in the evening peak generally show less variability in car speeds.
- 5.4.11** The westbound sections of the M4 around Brynglas Tunnel show a significantly lower average travel speed than the eastbound equivalent during the morning and evening peak period. In part, this is the result of the 50mph speed limit that is permanently in place in the westbound direction on the approach to the Brynglas Tunnels⁵⁰.
- 5.4.12** In general there is some degree of correlation between the level of congestion and the variability of journey times. This is because congestion leads to stop-start driving conditions which can vary significantly from one day to another. Variability in journey times does not always directly correspond to the most congested sections on the motorway network. For example, the back of the queue caused by the limited capacity of Brynglas Tunnel may extend for several kilometres at times and consequently impact journey time reliability on the approach to the Brynglas Tunnel more than the tunnel itself. The road geometry as well as physical attributes such as lane widths and the presence or lack of a hardshoulder, also have some impact on the level of variability in journey times that is experienced even when a road operates well within its theoretical capacity.

5.5 Network Resilience

- 5.5.1** As noted, the reliability of the network is determined not only by the day-to-day variability of journey times due to levels of congestion, but also by the frequency and severity of traffic incidents and the impact this has on the network.
- 5.5.2** At present, strategic and local traffic is largely channelled through two key locations; Tredegar Park on the west side of Newport and the Coldra on the east side. Whenever an incident occurs anywhere in the vicinity of these locations, the lack of alternative routes creates significant operational problems on the highway network.
- 5.5.3** Variability resulting from traffic incidents, which can lead to severe congestion and as such excessive increases in travel times, is not modelled and is less quantifiable. As a result a qualitative analysis must be undertaken on the impact of improvements in resilience referred to above. It is clear that the impact of the scheme on network resilience are an important contributor to the overall economic benefit of the M4 CaN proposals. The business community often cite the improvement in resilience as a key benefit of the scheme. In 2014, the CBI commented: *'The recent spate of incidents along this stretch of road point to the pressure the network is already under. Accidents that lead to severe disruption and delay along the main motorway route to South Wales significantly impact the economy in the short-*

⁵⁰ This speed restriction has been in place as a consequence of reduced lighting in the tunnel since it was damaged by a lorry fire in the westbound tunnel bore on 26 July 2011.

*term and through a loss of confidence in the region's competitiveness, in the long-term.*⁵¹

5.6 Existing Traffic Conditions and Perceptions

- 5.6.1** In relation to the wider economic impacts of M4 CaN, it is important to consider, not just the modelled impact of the scheme on journey times and accessibility, but also how the scheme could affect the perceptions of people and businesses of the quality of the transport network and the ease of access.
- 5.6.2** Concerns over the functioning of the M4 corridor have been expressed by the business community in South Wales. These concerns are highlighted in a recent open letter from members of the business community in relation to the M4 CaN proposals.
- 5.6.3** They state: *'The constant disruption and delay along the main motorway route across South and West Wales caused by the Brynglas tunnel bottleneck around Newport significantly damages the Welsh economy and negatively impacts upon Wales' standing as a globally competitive business location.'*⁵²
- 5.6.4** This echoes previous statements by the CBI in Wales who have described the M4 as *'not fit for purpose'* and have suggested that a new motorway around Newport is the *'number one priority for a large number of CBI members'*⁵³.
- 5.6.5** Importantly, as the primary route in and out of South Wales, it would be logical to assume that issues experienced on the M4 around Newport specifically, will affect perceptions of people who live and work *outside* Wales. This point has also been made by the business community in South Wales who identify that, *'Economies that fail to invest in infrastructure – not just in rail and road but digital too – put at risk not only the potential for indigenous businesses to grow, but inward investment also'*.⁵⁴
- 5.6.6** In this respect, the potential impact of traffic issues on the M4 around Newport have been noted by the Prime Minister who described the Bryn Glas tunnels as a *'foot on the windpipe of the Welsh economy'*⁵⁵.

5.7 Future Traffic Conditions

- 5.7.1** The Department for Transport's Road Traffic Estimates for Great Britain 2014⁵⁶ confirm that:

⁵¹ Emma Watkins: M4 relief road would unlock a wave of growth in South Wales. Western Mail (May 2014)

⁵² Open letter from CBI Wales and leading Welsh businesses to Welsh politicians - Delivery of M4 Black Route is vital for the Welsh economy

⁵³ CBI Wales Chair, restated in: <http://www.walesonline.co.uk/business/business-news/m4-relief-road-around-newport-7227326>

⁵⁴ Open letter from CBI Wales and leading Welsh businesses to Welsh politicians - Delivery of M4 Black Route is vital for the Welsh economy

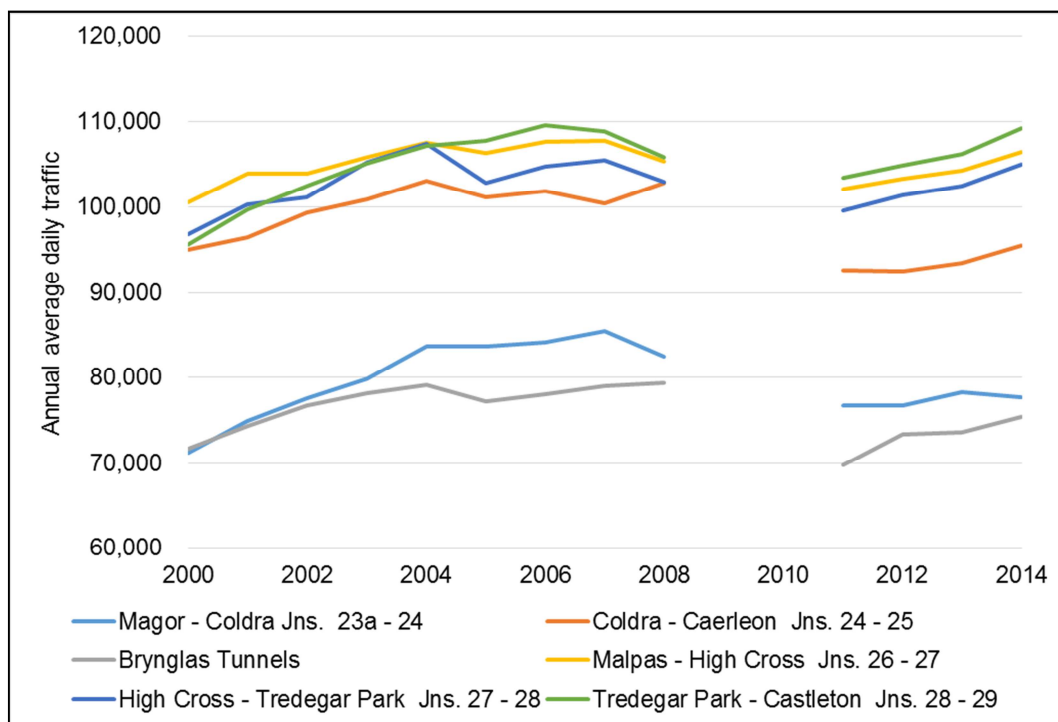
⁵⁵ Prime Minister David Cameron

- a) Between 2010 and 2013 levels of traffic were broadly stable, but between 2013 and 2014 traffic on all types of road increased at an average rate of 2.4%;
- b) Car traffic increased by 1.9%, the largest annual increase since 2002;
- c) LGV traffic saw the largest percentage increase of 5.5%, the highest growth recorded for a single year;
- d) HGV traffic increased by 2%, the largest year-on-year increase since 2004;
- e) Road Transport continues to be the main transport mode for individuals and businesses, with 90% of passenger kilometres by road (2013) and 68% of freight goods moved by road (2010);
- f) UK GDP fluctuations often mirror motor vehicle traffic trends, with fluctuations in road traffic levels tending to coincide with changes in the economy; and
- g) Traffic has increased in all regions of Great Britain with Wales and the East of England experiencing the largest percentage increases.

5.7.2 Figure 24 demonstrates how the traffic growth trends at the Great Britain level are reflective of those at the M4 around Newport level. The rate of growth on the M4 around Newport shows an increase of between 2.1% and 2.8% between 2013 and 2014.

5.7.3 The figure shows how traffic growth has increased by around 4.6% on average between Magor and Castleton over the period 2012 to 2014. It also indicates that recovery has been stronger on the west side of the Tunnels. The slower growth in traffic levels on the east side may be related to the capacity constraint of the Tunnels themselves and/or the opening of the A4810.

⁵⁶ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/428671/annual-road-traffic-estimates-2014.pdf

Figure 24: Traffic growth on the M4 around Newport⁵⁷

5.7.4 Figure 24 is based on observed traffic count data rather than traffic model outputs. It should be noted that current traffic volumes, particularly on the sections to the west of the tunnel, have returned to the pre-roadworks traffic levels in 2008. This follows the completion of major roadworks (2009-2011) on the M4 around Newport, and the emergence of the economy from recession (Q2 of 2008 up to and including Q2 of 2009)⁵⁸.

5.8 Future Traffic Forecasts

5.8.1 Future year traffic forecasts have been prepared for a Do Minimum scenario and for a road network which includes the proposed scheme, and are shown in Table 15. For appraisal purposes, the following future years are modelled:

- 2022 (assumed year of scheme opening); and
- 2037 (design year).

⁵⁷ Major roadworks were in place on the M4 between Junction 24 (Coldra) and Junction 28 (Tredegar Park) from early 2009 to early 2011, which included resurfacing, barrier works and the installation of infrastructure to support the installation of the M4 Variable Speed Limit (VSL). In addition to a temporary 50mph speed limit over these sections (enforced by traffic cameras) for the duration of the works, the traffic management for the works consisted of a combination of narrow running lanes, overnight road closures and frequent contraflow working over different sections. Many of the ATC sites were destroyed by the works, while the roadworks themselves, along with the temporary 50mph speed limit, are likely to have caused some suppression of trips using the M4. Consequently, ATC data on these sections of the M4 between early 2009 and early 2011 is largely unavailable and/or unreliable and has therefore not been considered within this report.

⁵⁸ Office for National Statistics

Table 15: Annual average daily traffic forecasts in vehicles (2-way central growth), Do Minimum

Link	2014 (Base Traffic Model)	2022 (Forecast)	2037 (Forecast)
J23-J24	73,200	92,300	106,200
J24-J25	93,300	111,500	129,500
Brynglas Tunnels	68,400	79,800	91,400
J26-J27	102,700	118,400	132,500
J27-J28	103,100	116,500	130,900
J28-J29	104,800	124,100	139,300

5.8.2 The results show that, in the Do Minimum situation (without the scheme), traffic volumes on links of the existing M4 around Newport would increase by between 27% and 45% by 2037, with the heaviest flows experienced on the sections west of the Brynglas Tunnels.

5.8.3 Table 16 shows the estimated CRF measure for different sections of the M4 around Newport based on the 2037 forecast traffic model in the Do Minimum scenario.

Table 16: 2037 Congestion Reference Flows, Junction 23a to Junction 29, Do Minimum

Section	2037 CRF	2037 AADT	AADT / CRF
J23A – J24 (Magor to Coldra)	110,700	106,200	96%
J24 – J25 (Coldra to Caerleon)	126,900	129,500	102%
Brynglas Tunnels	92,900	91,400	98%
J26 – J27 (Malpas to High Cross)	138,700	132,500	96%
J27 – J28 (High Cross to Tredegar Park)	126,900	130,900	103%
J28 – J29 (Tredegar Park to Castleton)	131,400	139,300	106%

5.8.4 The results show that all motorway sections between Magor and Castleton are forecast to operate with daily flows over 80% of CRF, indicating that they would frequently be subject to operational problems, with significant congestion expected during peak periods. It should be noted that this is the case despite the fact that the CRF benchmark increasing by up to 20% in the 2037 Do Minimum scenario as compared to the base traffic model⁵⁹.

5.8.5 When traffic levels approach the CRF of various M4 sections around Newport, the M4 CaN traffic model predicts that some trips to divert onto the local road network as they attempt to avoid delays caused by queuing traffic and stop-start conditions. This diversion of trips would

⁵⁹ Congestion Reference Flow (CRF) is calculated based on traffic attributes which change over time. These attributes include the proportion of daily flow that occurs in the peak hours, the percentage of heavy goods vehicles during peak hours and the directional split of traffic during the peak hours.

lead to an increase in traffic congestion on the local road network. The diversion of this traffic means that traffic flows quoted in the table above are not fully reflective of the amount of traffic that would use the M4 if the congestion along the corridor was reduced.

- 5.8.6** In the absence of intervention, it can be concluded that increased traffic flows will result in higher levels of congestion resulting in longer delays for users, less predictable journey times and therefore higher transport costs for businesses, commuters and other users.

5.9 Conclusions

- 5.9.1** The M4 motorway provides the primary east/west strategic road link in South Wales. High levels of traffic on the motorway around Newport result in problems of congestion, particularly in the morning and evening peak periods.
- 5.9.2** The business community has expressed concern over traffic issues on the M4 and has highlighted the potential of such issues to negatively influence people's perceptions of Wales as business location.
- 5.9.3** Levels of traffic on the M4 around Newport are forecast to grow. Increased demand will place greater pressure on the M4 resulting in longer delays and increased transport costs for businesses, commuters and consumers.

6 Traffic Impacts of M4 CaN

Chapter Summary

- The proposed motorway to the south of Newport is predicted to carry some 65,000 – 71,000 vehicles per day by 2037, resulting in a significant reduction in traffic on the existing M4
- The proposed scheme will deliver reduced congestion, lower journey times, improved reliability and enhanced network resilience.

6.1 Introduction

- 6.1.1** This Chapter considers the impact of the M4 CaN proposals on traffic conditions.

6.2 Forecast Traffic Flows

- 6.2.1** Future year traffic forecasts have been prepared for a Do Minimum scenario and for a road network which includes the proposed scheme, and are shown in Table 17. For appraisal purposes, the following future years are modelled:

- 2022 (assumed year of scheme opening); and
- 2037 (design year).

Table 17: Annual average daily traffic forecasts in vehicles (2-way central growth)

Link	2014	2022		2037	
	Base	Do Minimum	M4CaN scheme	Do Minimum	M4CaN scheme
J23-J24	73,200	92,300	39,200	106,200	48,000
J24-J25	93,300	111,500	60,300	129,500	74,500
Brynglas Tunnels	68,400	79,800	48,800	91,400	61,700
J26-J27	102,700	118,400	77,600	132,500	91,300
J27-J28	103,100	116,500	74,500	130,900	87,400
J28-J29	104,800	124,100	73,200	139,300	84,100
J23-Glan Llyn (M4CaN)		-	56,500	-	69,600
Glan Llyn-Docks Way (M4CaN)		-	57,400	-	71,000
Docks Way-J29 (M4CaN)		-	54,800	-	65,400

- 6.2.2** The proposed motorway to the south of Newport is predicted to carry some 65,000 – 71,000 vehicles per day by 2037, resulting in a significant reduction in traffic on the existing M4, where flows would

be expected to remain below current levels. The new road would therefore take about half of all traffic to the new section of motorway relative to the do minimum scenario. The existing M4 would continue to carry traffic connecting north of Newport, such as to the A4042 and A449. It should be noted that around 75% of the HGV movements on the existing M4 would transfer onto the new route.

6.3 Increased Capacity and Reduced Congestion

6.3.1 Table 18 shows the estimated impacts on traffic congestion using CRF calculations for the observed Do Minimum (without the scheme) and Do Something (with the scheme) scenarios for traffic volumes on the different sections of the M4 around Newport.

Table 18: Forecast future congestion reference flows, Junction 23a to Junction 29

Section	2037 Do Minimum AADT/CRF	2037 Do Something AADT/CRF	% Change AADT/CRF
J23A – J24 (Magor to Coldra)	96%	68%	-28%
J24 - J25 (Coldra to Caerleon)	102%	80%	-22%
Brynglas Tunnels	98%	77%	-21%
J26 – J27 (Malpas to High Cross)	96%	75%	-20%
J27 – J28 (High Cross to Tredegar Park)	103%	82%	-21%
J28 – J29 (Tredegar Park to Castleton)	106%	73%	-32%

6.3.2 The results show that without the scheme, all sections would be operating with daily flows near to or over 100% of CRF, indicating that they would be subject to severe operational problems at times, with severe congestion expected during peak periods. With the scheme, all sections excluding J27-J28 would be operating below 80% of CRF, indicating that they would be operating within capacity.

6.3.3 It is important to appreciate that the results only show differences in average journey times under typical operating conditions. The journey time reductions do not include situations when there are incidents and accidents, when network improvements can also be anticipated. The improvements in resilience are addressed further below.

6.3.4 Further information on future traffic forecasts for the road network is contained in the Traffic Forecasting Report for the scheme.

6.4 Lower Average Journey Times

6.4.1 Figure 25 demonstrates the journey time savings (under average AM peak conditions) that would result from the scheme both as a result of the provision of a faster route and as a result of reduced congestion

on the existing route. The changes in journey times are based on conditions in the design year of 2037.

6.4.2 The largest journey time savings are evident for trips to and from areas of Newport. For example, a trip between Magor and Junction 32 of the M4 would take around 10 minutes less as a result of the scheme. Journeys to the Glan Llyn site to the South of Newport from Cardiff would be some 12 minutes quicker. The journey time from Cardiff to Bristol Temple Meads would reduce by 7 minutes.

6.4.3 Again, these journey time savings are under typical conditions, and do not include the improvements when incidents and accidents take place. Resilience improvements are addressed further below.

Figure 25: Accessibility matrix (Change in Average Journey Time in 2037 as a result of the scheme)

Origin\Destination	Cardiff Central Station	M4 J32	Newport Station	Newport Docks	Queensway Meadows/ Coleg Gwent	Glan Llyn	Caerleon	Llanfrechfa Grange Hospital (Cwmbran)	Usk	Magor	Chepstow	Bristol Temple Meads
Cardiff Central Station	-	0	-1	-2	-4	-12	-3	-2	-4	-9	-6	-7
M4 J32	1	-	-2	-3	-5	-13	-3	-2	-5	-10	-7	-8
Newport Station	-1	-1	-	0	-1	-4	1	0	-1	-6	-1	0
Newport Docks	-1	-1	0	-	-2	-6	0	0	-3	-12	-9	-10
Queensway Meadows/ Coleg	-5	-5	-3	-4	-	0	0	-3	-2	-9	-4	-5
Glan Llyn	-12	-12	-3	-6	0	-	0	-2	-2	-8	-4	-5
Caerleon	-2	-2	-1	-2	-2	-2	-	0	0	-7	-1	-1
Llanfrechfa Grange Hospital (Cwmbran)	-1	-1	-1	-2	-1	-1	0	-	0	-6	-1	0
Usk	-3	-3	-1	-2	-2	-2	0	0	-	-7	-4	-3
Magor	-10	-10	-8	-11	-8	-5	-5	-7	-7	-	-6	-6
Chepstow	-6	-6	0	-6	1	-3	3	1	0	-5	-	0
Bristol Temple Meads	-7	-7	-1	-7	0	-5	1	0	0	-4	0	-

6.6 Improved Network Resilience

- 6.6.1** As noted, the reliability of the network is determined not only by the day-to-day variability of journey times, but also by the frequency and severity of traffic incidents.
- 6.6.2** The new motorway would mean that east west journeys through Newport would no longer be reliant on a single route, reducing the delay and disruption caused by traffic incidents.
- 6.6.3** The scheme would reduce the costs imposed on businesses, consumers and commuters of traffic incidents. As noted, the traffic model represents typical operational conditions on the highway network in terms of average flows and speeds on a normal day of operation. The model does not reflect those occasions when a major incident may have occurred which results in severe reduction in network performance. In such instances there are higher than usual levels of congestion, during which journey times significantly increase. Therefore the benefits of improved resilience are not included in the economic appraisal of the scheme and are also excluded from the quantitative analysis presented in Chapter 8. In respect of network resilience improvements, qualitative judgements must be made.

6.7 Conclusions

- 6.7.1** The proposed motorway to the south of Newport is predicted to carry some 65,000 – 71,000 vehicles per day by 2037, resulting in a significant reduction in traffic on the existing M4, where flows would be expected to remain below current levels. The new road would therefore take about half of all traffic to the new section of motorway. The existing M4 would continue to carry traffic connecting north of Newport, such as to the A4042 and A449.
- 6.7.2** In summary, the M4 CaN is expected to:
- a) Reduce journey times for east-west movements by alleviating congestion and providing a faster and more direct route through South Wales. In 2037, it is expected that average AM peak time journey times for travel between Junction 23 and Junction 29 will be lower by around 8 minutes in the eastbound direction and by around 10 minutes in the westbound direction;
 - b) Improve conditions and reduce journey times for users of the existing route travelling to and from Newport and the southern part of Monmouthshire;
 - c) Improve the reliability of journeys in South Wales by increasing capacity and reducing the day to day variability of journey times;
 - d) Increase the resilience of the trunk road network to traffic incidence by providing relief to the Junctions at Tredegar Park on the west side of Newport and the Coldra on the east side of the

City, whilst also providing a sufficient strategic alternative route for east-west journeys through South Wales.

- 6.7.3** The quantified economic benefits of the scheme included in the Economic Assessment Report and presented in Chapter 8 of this report are based on changes in average journey times under typical operating conditions. The quantified benefits do not include the benefit of improved reliability and resilience, in respect of which qualitative judgements must be made.

7 Impacts during Construction

Chapter Summary

- The construction of M4 CaN will require over 3,000 construction worker years of employment.
- The contractor for the scheme has committed to ensuring 20% of labour costs relate to new entrant trainees.
- In addition to direct employment impacts, spending on goods and services – and subsequent multiplier effects – will positively impact on GDP and employment in the local area.

7.1 Overview

7.1.1 This section of the report provides an analysis of the economic impacts of the scheme during its construction phase. This focuses on three types of potential impact during construction:

- a) Direct impacts – the employment of those directly engaged in the design and construction of M4 CaN;
- b) Indirect impacts – the wider potential of the scheme to impact the economy as a result of the purchasing of goods and services required; and
- c) Disruption during construction – the potential temporary impacts of the scheme on the economy and the local transport network during its construction.

7.1.2 The information presented within this section is based on information available at Key Stage 3 provided by the Construction Joint Venture project team.

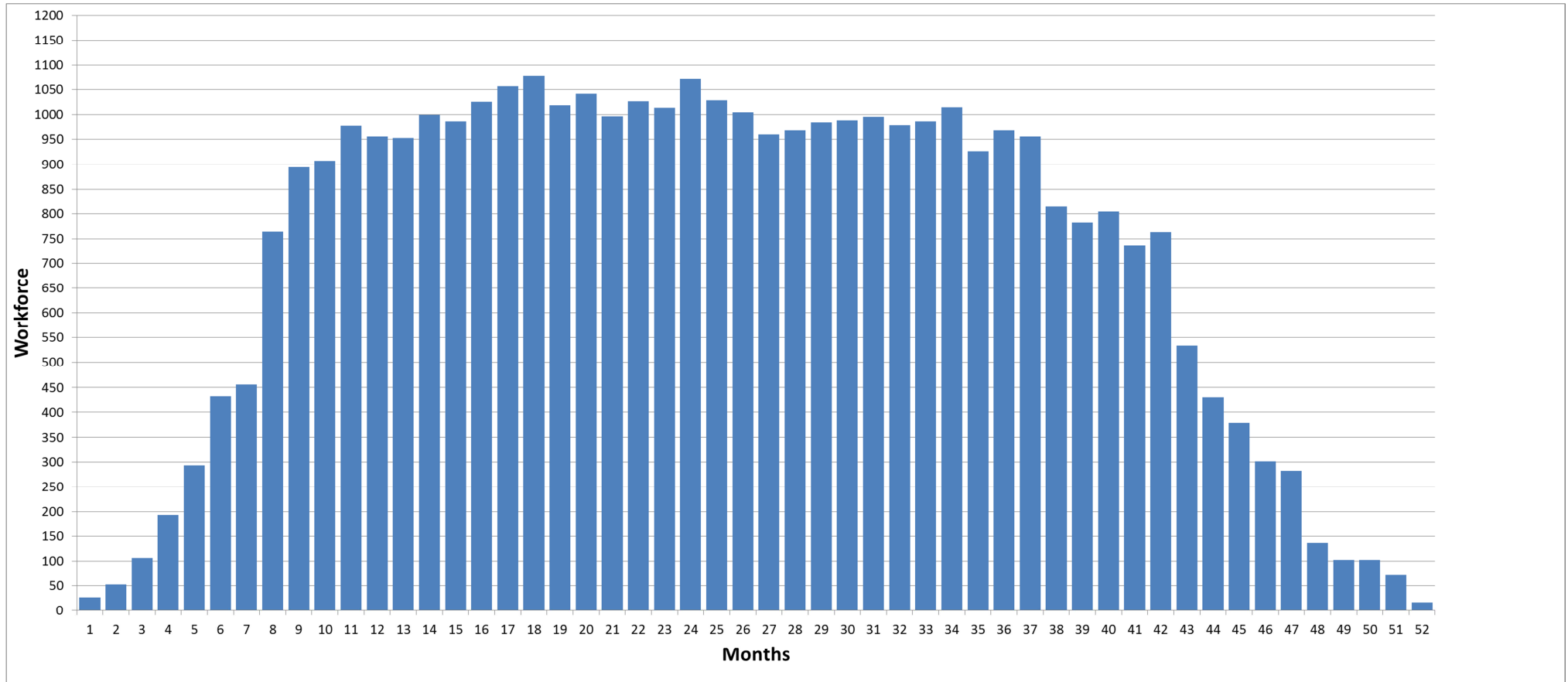
7.2 Direct impacts

7.2.1 If the Welsh Ministers decide to proceed with the scheme, it is intended to start construction in spring 2018 and open after a period of approximately 42 months. The total duration of the construction period, including pre-construction and enabling works, and post opening works would be 52 months. The new section of motorway would open in autumn 2021 and the reclassification works to the existing M4 would be complete in autumn 2022. However, programmed dates and construction periods are subject to change and depend on factors such as the actual start date, weather conditions and unforeseen engineering conditions experienced on site.

7.2.2 Based on current construction costs estimates, over the course of the construction period a total of 3,112 construction worker years would be required to deliver the project. This equates to an average of over 700 people employed on the scheme every month over the duration

of the construction period. As shown in Figure 26 the level of employment would likely peak at around 1,000 people per month.

- 7.2.3** Highway construction requires a range of occupations and skillsets. This scheme, by its nature, will demand resources in various specific disciplines (heavy civil works, specialist earthworks, piling, structural steel, cable stays and so on).
- 7.2.4** The extent to which these construction jobs could be filled by local workers depends on the availability of suitably skilled local people and the contractor's approach to recruitment. This, in turn, is influenced by the contractual requirements placed upon the contractor in respect of recruitment and training policies.
- 7.2.5** Targeted Recruitment and Training (TR&T) requirements have been identified within the works information for the project team, set by the Welsh Government as the Client organisation. As a minimum, the contractor is required to ensure that 12% of the total labour costs relate to the employment of new entrant trainees who have an apprenticeship, trainee or employment contract with the contractor or a subcontractor, and are engaged in a training programme that is accepted by the Welsh Government as being appropriate. The Construction Joint Venture has committed to achieving 20% of labour costs from new entrant trainees which will serve to maximise the economic benefits of the construction period both in the short and long term.
- 7.2.6** The project team's policy is to take best practice from each of its partners to favour local recruitment when the required level of expertise and availability will permit. The project team will also liaise with local authorities to exchange information on current employment and training schemes to help facilitate local employment benefits and adopt best practices from other projects.
- 7.2.7** During construction there will also be a requirement for some accommodation to cater for the temporary workforce. At this stage it is assumed by the contractor that all of the workforce would arrange their own accommodation locally, with the majority staying in Cardiff, Newport and Monmouthshire areas during works.
- 7.2.8** It should be noted that the spending by workers incomes would have further knock on effects on the economy, or 'multiplier' impacts. These would come about both as a result of the spending of workers employed on the scheme who are residents of the local area, as well as the spending of workers temporarily located in Wales. This induced effect is expected to have a temporary positive impact on the local economy, particularly for firms in the service sector.

Figure 26: Estimated Direct Employment During Construction (persons employed each month)

7.3 Indirect impacts

7.3.1 The construction of the scheme would further require the procurement of around £543m of goods and services, including materials and equipment with their associated costs. The likely value of goods and services purchased and type of products required are summarised below, grouped into relevant categories:

7.3.2 Materials – estimated total value of approximately £440m:

- a) Building works and General Civils: £11m
- b) Equipment and finishes (such as signage, fencing, road markings, lighting etc.): £112m
- c) Demolition works: £3m
- d) Earthworks and drainage: £152m
- e) Metals (such as steel, cable stays, joints): £120m
- f) Concrete (precast and slip form types): £6m
- g) Temporary works, services and supplies (such as buildings, electrics, water etc.): £36m

7.3.3 Equipment – estimated total value of approximately £103m:

- a) Air tools and compressors: £1m
- b) Lights and lighting: £1m
- c) Concrete, pumps, fillers: £28m
- d) Scaffolding and cranes: £11m
- e) Heavy plant and machinery: £9m
- f) Gantries: £4m
- g) Formworks: £30m
- h) Drainage and covers: £10m
- i) Other (such as radios, fuels, protective clothing etc.) : £9m

7.3.4 The costs are estimations based on available information at Key Stage 3 and are subject to change, whilst further information is set out in the Buildability Report (see Environment Statement Appendix 3.1).

7.3.5 The project team has expressed a commitment to local purchasing (procurement) policies when possible and appropriate. For example, for standard procurement, the contractor would favour local purchasing. The local definition depends on the type of purchase but for small and standard goods and services, local would likely correspond to the South Wales and Bristol markets, whereas for more specialised items the notion of local is likely to expand to the UK

market. The opportunity to procure locally would be on a case by case basis, based on the availability of appropriate local suppliers. For example, for this scheme the contractor would:

- Procure bespoke steel formwork and reinforcement bars that could be manufactured by local companies, taking into account the existing supply chain in South Wales but subject to availability;
- Use multiple local precast concrete yards and would need operatives to work there, who would likely be locally employed and trained; and
- Hire significant amounts of plant and equipment (e.g. cherry picker, mobile crane, scaffolding, welding machines, concrete pumps, trailer and tractors, jacks, dumpers etc.) that could be hired locally, taking into account the existing supply chain in South Wales but subject to availability.

7.3.6 Although the precise level of spend in the local economy is difficult to forecast with accuracy at this stage of the project, the contractor for the scheme estimates that 65% of the goods and services procured will be purchased from local suppliers.

7.3.7 It should be noted that limits to the capacity of the construction sector in the local area will also limit the potential impact of the scheme on construction sector output and employment locally. In response to an increase in demand for construction goods (resulting from the scheme), there will be some scope for the construction sector to increase capacity by recruiting and training new workers (an effect reinforced by the proposed approach to delivery), by using capital stock (machinery and equipment) more intensively, or by investing in new capital stock.

7.3.8 However, to some extent, the M4 CaN will divert resources from other construction projects. Such projects may need to be serviced by construction firms from outside the study area. Furthermore, increased demand for construction may have an impact on construction costs locally. Whilst materials costs tend to be determined at a national or global scale, an increase in demand may result in some increase in local wage and construction cost inflation.

7.4 Disruption during construction

7.4.1 During the construction phase and as a result of physical works, there may be some disruption to the local transport network, which could have a slight and temporary negative impact on economic activity in some locations. However, given that the scheme is largely an offline construction project (works to construct new infrastructure rather than works to modify existing infrastructure), disruption and potential associated negative impacts would be limited and largely restricted to the works connecting the proposed new section of motorway route into the existing transport network at its interchanges and intermediate junctions.

- 7.4.2** Another potential source of disruption during the construction phase would be through the use of the existing transport network by construction traffic. This would be partially mitigated through careful planning of construction traffic routes and associated traffic management aimed at minimising the extent to which works and construction traffic may impede users on the network.
- 7.4.3** To provide an indication of the potential impact that construction traffic could have on identified routes, including likely diversions required, a summary is provided based on contractor information as available at Key Stage 3.
- 7.4.4** A significant proportion of heavy vehicle movements would take place at either end of the proposed route, at Magor and Castleton, primarily lorry movements for earthworks. Two primary highway network routes have been selected for the purposes of this assessment, including Newport Road at Magor, and A48 Castleton. It is estimated that at the peak of the construction period, there would be an average of 45 lorry movements using Newport Road, Magor and 27 lorry movements using A48 Castleton per hour. These averages are movements per hour based on a 10 hour working day.
- 7.4.5** In terms of disruption with traffic management measures imposed on the network, a summary is provided in Table 19. It shows how a series of temporary lane reductions and speed restrictions would be required. These would be required primarily to help ensure worker and public safety, as well as facilitate the necessary access arrangements to the construction site areas.

Table 19: Indicative traffic management at Magor and Castleton during construction phases

Phase	Months	Castleton	Magor
A	15	(1) M4, west of J29 to west of J28:- 50mph speed limit (2) A48(M) near J29:- 50 mph speed limit (3) A48 at Pound Lane:- 1 lane each way , 40mph speed limit (4) A48(M) w/b diverge at J29 relocated, 1 lane, 50mph speed limit	(1) M4, J23A to mainline railway bridge:- 50mph speed limit (2) M48, east of J23:- 1 lane each way, 50mph speed limit (3) A4810, J23A to Llandeenny rbt:- 30mph speed limit (4) B4245, Undy to Rogiet:- 30mph speed limit
B	4	(1) M4 e/b diversion onto new link, with 5 lanes between J29 and J28, 50mph speed limit – Reduces to 4 lanes about half way (2) M4 w/b, J28 to west of J29, 50mph speed limit (3) A48(M) e/b near J29:-	(1) M4, J23A to mainline railway bridge:- 50mph speed limit (2) M48, east of J23:- diversion onto new link and new rbt, 1 lane each way, 50mph speed limit (3) A4810, J23A to Llandeenny rbt:- 30mph

Phase	Months	Castleton	Magor
		50 mph speed limit (4) A48(M) w/b diverge at J29 relocated, 1 lane, 50mph speed limit (5) A48 at Pound Lane:- 1 lane each way, 40mph speed limit	speed limit (4) B4245, Undy to Rogiet:- 30mph speed limit
C	11	(1) M4 e/b diversion onto new link, with 5 lanes between J29 and J28, 50mph speed limit – Reduces to 4 lanes about half way (2) M4 w/b, J28 to west of J29, 50mph speed limit (3) A48(M) e/b near J29:- 50 mph speed limit (4) A48(M) w/b diverge at J29 relocated, 1 lane, 50mph speed limit	(1) M4, J23A to mainline railway bridge:- 50mph speed limit (2) M48, east of J23:- diversion onto new link and new rbt, 1 lane each way, 50mph speed limit (3) B4245, Undy to Rogiet:- 30mph speed limit
D	9	(1) M4 e/b diversion onto new link, with 5 lanes between J29 and J28, 50mph speed limit – Reduces to 4 lanes about half way (2) M4 w/b, diversion onto new link, 3 lanes between J28 to west of J29, 50mph speed limit (3) A48(M) e/b near J29:- 50 mph speed limit (4) A48(M) w/b:- 2 lane diverge from new w/b M4 link, 50mph speed limit	(1) M4, J23A to mainline railway bridge:- 50mph speed limit (2) M48, east of J23:- diversion onto new link and new rbt, 1 lane each way, 50mph speed limit (3) B4245, Undy to Rogiet:- 30mph speed limit

7.4.6 It is considered that the traffic management requirements and the impact this would have on the network during construction could have a minor adverse, albeit temporary effect on the local communities and economies.

7.4.7 The construction phase will also have implications for operations at Newport Docks. The Buildability Report (see Environment Statement Appendix 3.1) describes the engagement and interfaces with ABP during the construction phase.

7.5 Conclusions

7.5.1 During the construction phase, the scheme is expected to employ an average of 700 people per month over the 52 month construction period. The contractor has committed that 20% of the total labour requirement for the scheme will be made up of new entrant trainees who have an apprenticeship, trainee or employment contract with the contractor or a subcontractor, and are engaged in a training programme. Although the direct employment effects of the scheme are temporary, the investment in training associated with the scheme is expected to have a lasting impact on the construction sector in the region.

7.5.2 Further to the direct employment, the construction of M4 CaN would require the procurement of approximately £543m value of goods and services, of which around £440m would be materials and associated works, and around £103m would be equipment costs. The contractor for the scheme estimates that 65% of the goods and services procured will be purchased from local suppliers. This would have a substantial positive, albeit temporary, impact on the level of output and employment in the construction sector in the study area.

7.5.3 It should be noted that the spending by workers incomes would have further knock on effects on the economy, or 'multiplier' impacts. These would come about both as a result of the spending of workers employed on the scheme who are residents of the local area, as well as the spending of workers temporarily located in Wales. This 'induced effect' is expected to have a temporary positive impact on the local economy, particularly for firms in the service sector.

7.5.4 Traffic management measures out in place during the construction period, as well as construction traffic associated with the scheme, would have a minor adverse, albeit temporary, effect on the transport network and therefore on the local economy.

8 Impacts during Operation

Chapter Summary

- **M4 CaN will reduce transport costs for businesses leading to higher GDP.**
- **Further GDP benefits will result from improved reliability and network resilience.**
- **Lower transport costs and improved accessibility will enhance access to markets and enable firms to compete more effectively in domestic and international markets.**
- **M4 CaN will improve access to employment opportunities for residents and broaden the effective pool of labour for firms.**
- **Improved accessibility will generate higher productivity and GDP by strengthening agglomeration effects in South Wales and the South West.**
- **M4 CaN will improve perceptions of Wales as a business location and improve access to employment sites, increasing investment and employment.**

8.1 Introduction

- 8.1.1** This Chapter of the report considers the ways in which the M4 CaN is expected to impact on the economy once the scheme is operational. Where quantitative evidence is provided, the analysis is focussed on the 'design year' of the scheme of 2037.

8.2 Transmission Mechanisms

- 8.2.1** The literature review provided in Chapter 3 set out a range of ways in which transport improvements can affect economic performance at a local and regional level. Based on this evidence, the economic context to the scheme (Chapter 4) and the ways in which M4 CaN is expected to affect transport conditions (Chapter 6), a range of 'transmission mechanisms' have been identified through which the scheme will impact on the economy of the study area. These are as follows:
- a) **Reducing transport costs for businesses** in the study area by providing faster and more reliable transport for business travellers and for the movement of goods (Section 8.3);
 - b) Improving the functioning of the labour market in South Wales by **increasing access to employment opportunities** for workers and improving access to a suitable workforce for firms (Section 8.4);
 - c) **Improving productivity** by fostering agglomeration effects within South Wales and the South West of England and reducing travel times to London (Section 8.5);

- d) Stimulating **land use change and new investment** by improving access to key employment sites in the south of Newport (Section 8.6);
- e) **Improving perceptions of South and South West Wales** as a place to visit and do business (Section 8.7).

8.2.2 Each of these transmission mechanisms are considered in further detail in the remainder of this Chapter.

8.3 Business Costs and Efficiency

8.3.1 As set out in Chapter 5, congestion on the existing M4 around Newport results in delays for users at peak times and unreliable journeys. This imposes costs on businesses both as a result of longer journey times for business travellers and for the movement of goods, but also because of the disruption caused by traffic incidents. As traffic levels increase, the costs imposed on businesses in the study area will increase.

8.3.2 The combined effect of reduced congestion, faster journey times and improved network resilience resulting from the M4 CaN proposals will therefore result in lower transport costs for businesses in the study area.

8.3.3 The direct benefits of the scheme for business users are calculated based on outputs from the traffic model. The monetised benefits for businesses of lower journey time savings are estimated by applying a value of time which reflects the cost to the business of lost productive time spent travelling⁶⁰. Cost savings for businesses comprise time and cost savings accruing to business travellers in addition to heavy goods vehicles.

8.3.4 Such cost savings are included in the economic appraisal of the scheme as benefits accruing to businesses and they represent a positive impact on GDP. The purpose of this analysis is to consider the spatial distribution of such benefits and the effects on businesses in the study area.

8.3.5 Because the traffic model is based on average journey times, cost savings and efficiency benefits related to improved reliability and resilience are excluded from the quantification of business user benefits.

8.3.6 In practice, it is difficult to accurately trace the spatial distribution of transport cost savings. When production costs are reduced, the ultimate beneficiary of the improvement may not necessarily be the original user (or in this case business). In practice, the benefits may ultimately be shared between a 'customer' and 'supplier'. Under competitive conditions, the initial beneficiary of lower transport costs

⁶⁰ We are aware that Department for Transport has been out to consultation on new Values of Time. They are still to advise of the outcome of the consultation and whether the new Values of Time will be incorporated into WebTAG. It will be up to Welsh Ministers to decide whether to adopt any changes

may pass on the cost saving to other businesses or consumers in lower prices. In a similar way, a reduction in fuel prices paid by hauliers would be reflected to some degree in the haulage costs faced by manufacturers or retailers.

8.3.7 Furthermore, changes in transport costs and accessibility will also affect competition between firms. The improvements brought about by the M4 CaN will effectively reduce production costs, enabling firms in the study area to compete more effectively in markets over a wider area. By extension, it also needs to be acknowledged that the M4 CaN could also have the effect of reducing costs for firms outside the study area competing in local markets. As noted in Chapter 3 of this report, the net effect of competition will vary across different sectors of activity.

8.3.8 Notwithstanding these complexities, the traffic model contains information on the origins and destinations of trips which benefit from the scheme. This can be used as a basis for approximating the cost savings accruing to the study area. In effect, such cost savings are 'first round' impacts, given that the final impact will depend on supply chain relationships between firms and competitive effects.

8.3.9 It should be noted that the traffic model does not contain information on the location of the business affected. Therefore, for a freight movement with one 'trip end' in the study area, it is not possible to identify whether the operator of the vehicle is a firm in the study area or a firm located elsewhere. Cost savings have therefore been split equally between the origin and destination of travel. Given that, in practice, cost savings may be shared between the 'supplier' and 'customer', it is considered that this approach provides a reasonable approximation of the spatial distribution of cost savings accruing to the businesses in study area. The results of this analysis are given in Table 20. Results are given in annual terms for the design year of 2037 and over the 60 year appraisal period in line with the economic appraisal of the scheme.

8.3.10 The analysis suggests that cost savings for businesses in the study area are estimated to be in the region of £40m per annum by 2037 (expressed in 2014 prices). Businesses in South Wales are the main beneficiaries, receiving £34m (£0.7bn PV 2010 over the 60 year appraisal period). These benefits derive from business travel and goods movements in broadly equal proportions.

8.3.11 Over the 60 year appraisal period, the cumulative GVA impacts of the scheme would be approximately £0.8bn (PV 2010), of which £0.7bn are estimated to accrue to the South Wales economy.

8.3.12 It should be noted that these are considered to be conservative estimates of the impact of the scheme on business costs and efficiency. User benefits calculated in the traffic model are based on savings in *average* journey times (in addition to changes in vehicle operating costs). Therefore, no quantification of the benefits to businesses of a more reliable and resilient transport network has been undertaken. As noted in Section 3, businesses are likely to

place particular value on reliability and resilience given the costs associated with disruption as well as the opportunities that a reliable transport network affords to pursue more efficient business practices. It is considered that this presents an additional unquantified benefit of the scheme.

Table 20: Approximate spatial distribution of business cost savings

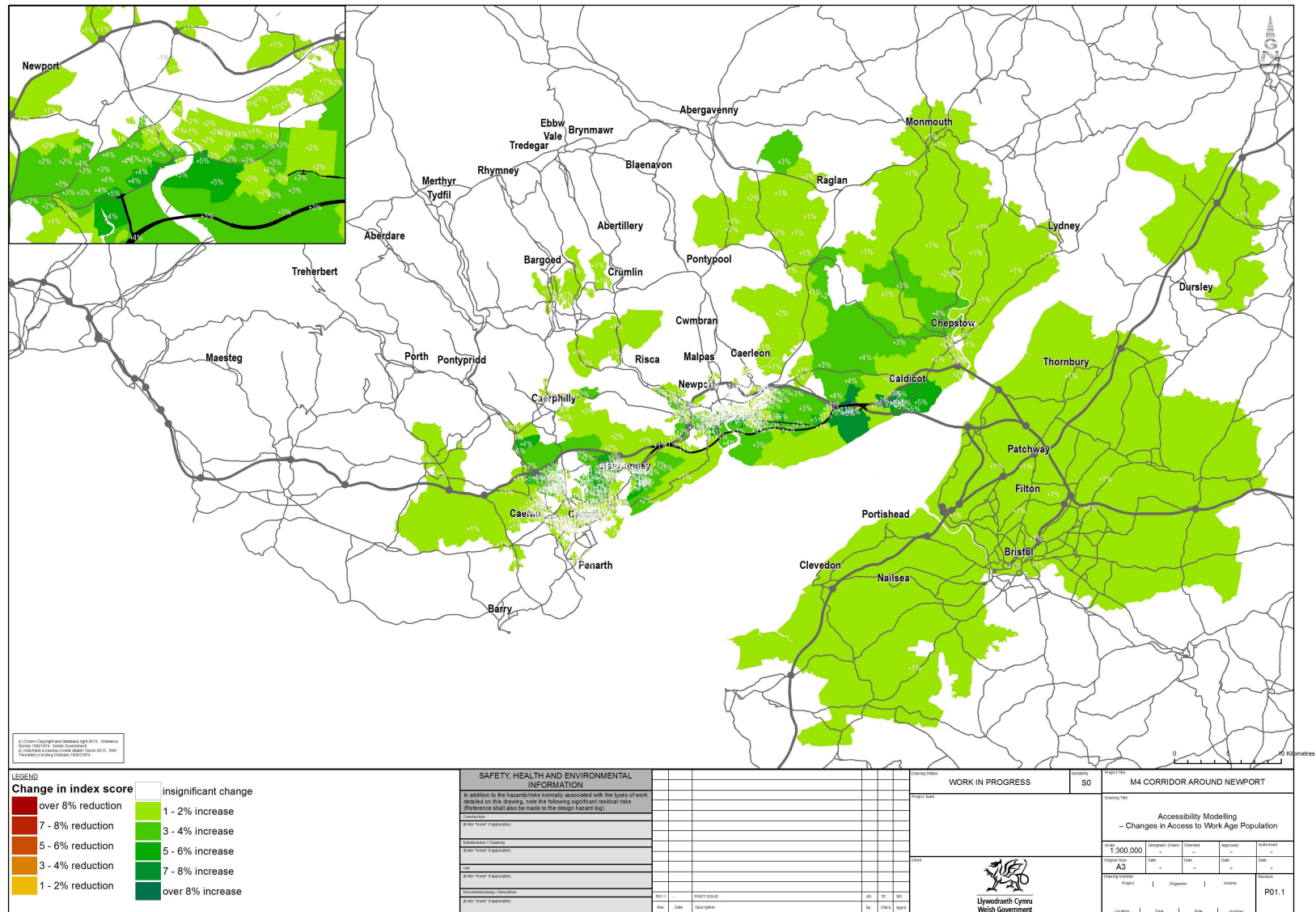
Zone	Annual GVA Impacts in 2037 (£m 2014 Prices)			60 Year Appraisal (£m, Present Value 2010, 2010 Prices)
	Business travel	Heavy Goods Vehicles	Total	Total
Swansea	0.6	1.0	1.6	34.3
Bridgend and Neath Port Talbot	1.0	1.4	2.5	52.1
Cardiff and the Vale of Glamorgan	2.7	1.6	4.3	93.8
Central Valleys	1.0	2.1	3.0	66.4
Gwent Valleys	1.2	2.4	3.5	73.4
Monmouthshire and Newport	9.9	9.4	19.3	371.0
Bristol, City of	1.3	1.2	2.5	49.7
BaNES, North Somerset and South Gloucestershire	1.8	1.3	3.1	62.0
Total Study Area	19.4	20.4	39.8	802.6

8.4 Labour Market Impacts

8.4.1 As identified in Section 4, commuting movements in the study area are highly complex with the main urban centres of Cardiff, Newport and Bristol drawing their workforce from a wide area. The M4 around plays an important role in facilitating commuting movements into Newport from the local authorities from the North and East (in particular Caerphilly, Torfaen and Monmouthshire). The M4 also facilitates east-west commuting flows, particularly between Cardiff and Newport, but also cross-border commuting flows between South Wales and the South West of England.

8.4.2 As considered in Section 3, facilitating movements of commuters is one of the primary ways in which transport affects the economy. Improving the access for firms to a pool of suitably skilled labour is one way through which transport improvements can lead to higher productivity. By widening the effective area over which firms can recruit, this makes it easier for firms to fill vacant positions, or to find workers with the right skills for the job. As a result, access to a skilled workforce is also likely to be an important determinant of firm location.

- 8.4.3** Accessibility modelling has been used to measure the impact of the scheme on the labour market. Two measures of accessibility are considered here: access to jobs (access to workplace employment for residents) and access to the labour force (access to people of working age for firms).
- 8.4.4** The impact of M4 CaN can be illustrated by comparing the number of accessible jobs or the size of the accessible workforce under the Do Minimum (without the scheme) the Do Something scenario based on journey times calculated in the M4 Traffic Model. The analysis has been undertaken in the design year (2037).
- 8.4.5** An *accessibility index* has been constructed for the purposes of this analysis. The accessibility index calculates labour market catchment areas using a distance deterrence function that reflects the fact that the longer the travel time, the less attractive the employment opportunity will be. The deterrence parameter is derived from analysis of the National Travel Survey on the distances people travel to work. This provides a more representative measure of the effective change in access that would result from the scheme.
- 8.4.6** In Figure 27, residents of the areas shaded in green experience at least a 1% increase in the number of jobs accessible by road as a result of the scheme. The map indicates that improvements in access to employment for areas in Newport and Monmouthshire are of particular significance. Access to jobs for a resident of Magor would increase by 7% to 8% as a result of the scheme, whilst the number of jobs accessible from the centre of Newport would increase by approximately 3% to 5%. It is also notable that the benefits of improved access to jobs extend westward beyond Cardiff, and eastward into the South West of England. Additionally, a 1% to 2% increase in access to jobs for parts of Bristol, South Gloucestershire and North Somerset are expected.
- 8.4.7** Figure 28 shows changes in access to workers from the perspective of firms (or prospective firms) in the study area. The patterns are similar for the employment accessibility maps. A firm located in Magor would experience a 7-8% increase in the size of the accessible workforce by road. Access to workers from Newport City Centre is expected to increase by 3-5%.
- 8.4.8** As for the assessment of business cost savings, the accessibility modelling is based on changes in average journey times. In practice, poor journey time reliability will act as a deterrent to commuters and therefore the impact of the scheme on reliability and resilience is also relevant to the impact of the scheme on labour markets.



8.4.9 The figures presented in this section are illustrative of the impact of M4 CaN on changes in access to employment. How such changes are manifested in changes in commuting patterns and decisions over where to live and work will depend on a variety of factors and such impacts will play out over time.

8.4.10 The accessibility model demonstrates that the M4 CaN would improve access to employment opportunities in the study area and would have the effect of widening the effective pool of labour available to firms. This would help to ensure that the labour market in the study area functions as a single market, rather than a number of smaller, separate travel to work areas serving each of the urban centres. In the context of the analysis of productivity in South Wales presented in Chapter 3 of this report, and the lack of a major conurbation in South Wales, this could be considered to be of some importance. The productivity benefits associated with improvements in accessibility in the study area are considered in the next section of this report.

8.5 Agglomeration Effects and Productivity

8.5.1 As noted in Chapter 3, the productivity gap between Wales and the rest of the UK is, in part, explained by relative lack of economic density or mass. The M4 CaN will act to help overcome this by reducing the costs of travel, effectively bringing firms and workers closer together (as illustrated in Section 7.5).

8.5.2 The productivity benefits of bringing firms and workers closer together are termed agglomeration effects. Such impacts additional to the direct transport user benefits captured in the traditional economic appraisal and the cost savings experienced by businesses estimated for the study area in Section 7.2 of this report.

8.5.3 As set out in Chapter 6, the M4 CaN will reduce journey times being the cities of Swansea, Cardiff, Newport and Bristol. Venables *et al* (2015) highlight the potential for improved transport links between cities to enable cities to specialise in particular sectors, to grow clusters of manufacturing or service activity and to develop sector specific advantages. This is a further means through which M4 CaN could contribute to higher levels of productivity.

8.5.4 Agglomeration effects of transport improvements can be estimated based on approximate empirical estimates of the relationship between accessibility (measured by transport costs) and productivity (GVA per worker). A methodology for the calculation of agglomeration effects on GVA is provided in WebTAG (Unit A2.1). This methodology has been employed using on the outputs of the M4 CaN traffic model.

8.5.5 The calculation of agglomeration benefits is based on a measure of the density of an economy. The WebTAG approach to assessing agglomeration effects applies a measure called 'effective density'. The effective density of an area is calculated based on the generalised costs of travel between zones and the number of jobs within each zone. Effective density for each zone is calculated for the

‘do minimum’ and ‘do something’ scenarios based on the outputs of the traffic model. An empirical relationship between effective density and productivity growth is applied to estimate the effect of the scheme on GVA per worker.

8.5.6 As shown in Table 21, the effect of M4 CaN is to increase the effective density of the economy of the study area. The effect is significantly higher in Newport and Monmouthshire than surrounding areas of the study area, albeit the benefits are more widespread than these two areas. Overall, the agglomeration effects of M4 CaN are expected to result in an increase in the GVA of South Wales of approximately £19m per annum in 2037 or £39m for the study area as a whole. In present value terms over the whole appraisal period, the total impact would be £0.4bn (PV 2010) in South Wales and £0.7bn (PV 2010) in the study area as a whole.

Table 21: Change in effective density and impacts on GVA

Zone	% Change in Effective Density*	% Change in GVA per worker 2037	Annual Impacts on GVA in 2037 (2014 prices)	Impacts on GVA – 60 Year Appraisal Period (Present Value 2010, 2010 Prices)
Swansea	0.7%	0.02%	1.1	19.9
Bridgend and Neath Port Talbot	0.9%	0.04%	1.8	33.2
Cardiff and the Vale of Glamorgan	0.8%	0.01%	1.3	44.5
Central Valleys	0.5%	0.02%	0.8	15.9
Gwent Valleys	0.4%	0.03%	1.3	25.4
Monmouthshire and Newport	3.7%	0.23%	12.3	214.8
Bristol, City of	0.5%	0.03%	6.7	124.7
BaNES, North Somerset and South Gloucestershire	0.8%	0.05%	13.5	249.8
Total Study Area	1.2%	0.04%	38.8	728.3

*Weighted average across the four industry sectors and aggregated from model zones used in the calculation of agglomeration benefits

8.5.7 Along with agglomeration effects, peripherality has also been identified as a factor which explains the productivity gap between Wales and the UK. More peripheral areas are at a relative disadvantages because they are relatively more distance from markets and from a pool of specialist suppliers. As a result, there are fewer opportunities to contract with or collaborate with other firms and less scope for businesses in peripheral areas to grow and achieve economies of scale. These effects are distinct from, and additional to, agglomeration effects that occur at a regional level and which are captured above.

8.5.8 The scheme will reduce travel times to London and the South East (as well as to and from other UK regions) which will act to reduce the actual and perceived peripherality of South Wales.

8.5.9 It is difficult to be precise about how such a change will affect levels of productivity in South Wales and therefore the magnitude of any impacts on GVA. However, as noted in Section 3, statistical relationships between travel times to London (by road) and productivity have been estimated in previous academic research undertaken by UWE for the Welsh Government⁶¹. This research found that the productivity of the average firm fell by 0.7% for every 10% increase in travel time.

8.5.10 This relationship can be used to provide an approximate indication of the scale of GVA impacts that could be expected as a result of the M4 CaN's role in reducing journey times to London.

8.5.11 This calculation is set out in Table 22.

Table 22: Change in travel time to London and impacts on GVA

	Impact on GVA in 2037 £m 2014 Prices
Gross Value Added (South Wales) ⁶²	47,268
Change in GVA for 10% reduction in car travel time to London	7%
Change in GVA for 1% reduction in car travel time to London	0.7%
Approximate change in average travel time between South Wales and London due to M4 CaN	-6% ⁶³
Approximate Percentage Increase in GVA resulting from M4 CaN	0.04%
Annual Impact on GVA of South Wales in 2037	20.7
Impact on GVA of South Wales over 60 Year Appraisal Period (Present Value 2010, 2010 prices)	529.5

8.5.12 Based on the findings of UWE's productivity research, the effect of the M4 CaN in reducing the relative peripherality of South Wales – as measured by travel times to London – is estimated to be in the region of £20m per annum or £0.5bn (PV 2010) of GVA over a 60 year appraisal period.

⁶¹ Understanding the productivity variations between Wales and the UK (2006). University of the West of England and the University of Bath. Re-stated in Productivity in Wales: the impacts of peripherality on spatial patterns of productivity (2010). University of the West of England.

⁶² Estimated based on assumed growth rate of 1.5% per annum from 2014 to 2037

⁶³ Estimated based on a 10 minute saving on assumed travel time of approximately 2 hours 40 minutes – Central Cardiff to Central London.

- 8.5.13** As noted in Chapter 3, a further study is currently being undertaken by UWE for the Welsh Government to update the research on the determinants of productivity in Wales. The early results of this research continue to show a similar relationship between peripherality and levels of productivity.
- 8.5.14** The direct business cost savings can be brought together with the assessment of the productivity benefits of increased agglomeration and reduced peripherality to provide an estimate of the total impact of the scheme of productivity (as measured by GVA). It should be noted this estimate excludes a range of other impacts on GVA due, for example, to land use changes resulting from the scheme. Furthermore, the calculations also exclude the benefits of the scheme deriving from improvements in journey time reliability and network resilience. Therefore, the GVA impacts provided in this Section are likely to significantly underestimate the total long term impact of the scheme on the GVA of the study area.
- 8.5.15** It is also the case that lower transport costs and changes in productivity affects competition between firms in different areas. Competition effects will also influence the distribution of GVA impacts across the study area.
- 8.5.16** The combined impact of business cost savings and productivity benefits (linked to increased agglomeration and reduced peripherality) is expected to contribute in the region of £74m to the GVA of South Wales, each year, by the design year of 2037. Across the Study Area as a whole, the impact on GVA is estimated to be £99m per annum.
- 8.5.17** Over the 60 year appraisal period, the GVA impacts of the scheme would total £1.6bn (PV 2010) in South Wales and £2.1bn (PV 2010) for the study area as a whole.

Table 23: Combined Impact on GVA of Business Cost Savings and Productivity Benefits⁶⁴

Area	Annual Impact on GVA in 2037 (£m 2014)				Impacts on GVA – 60 Year Appraisal Period (Present Value 2010, 2010 Prices)
	Business Cost Savings	Agglomeration Impacts	Reduced Peripherality	Total	Total
Study Area (South Wales)	34.3	18.6	20.7	73.7	1,574
Study Area (South West of England)	5.6	20.2	-	25.7	486
Total Study Area	39.8	38.8	20.7	99.3	2,060

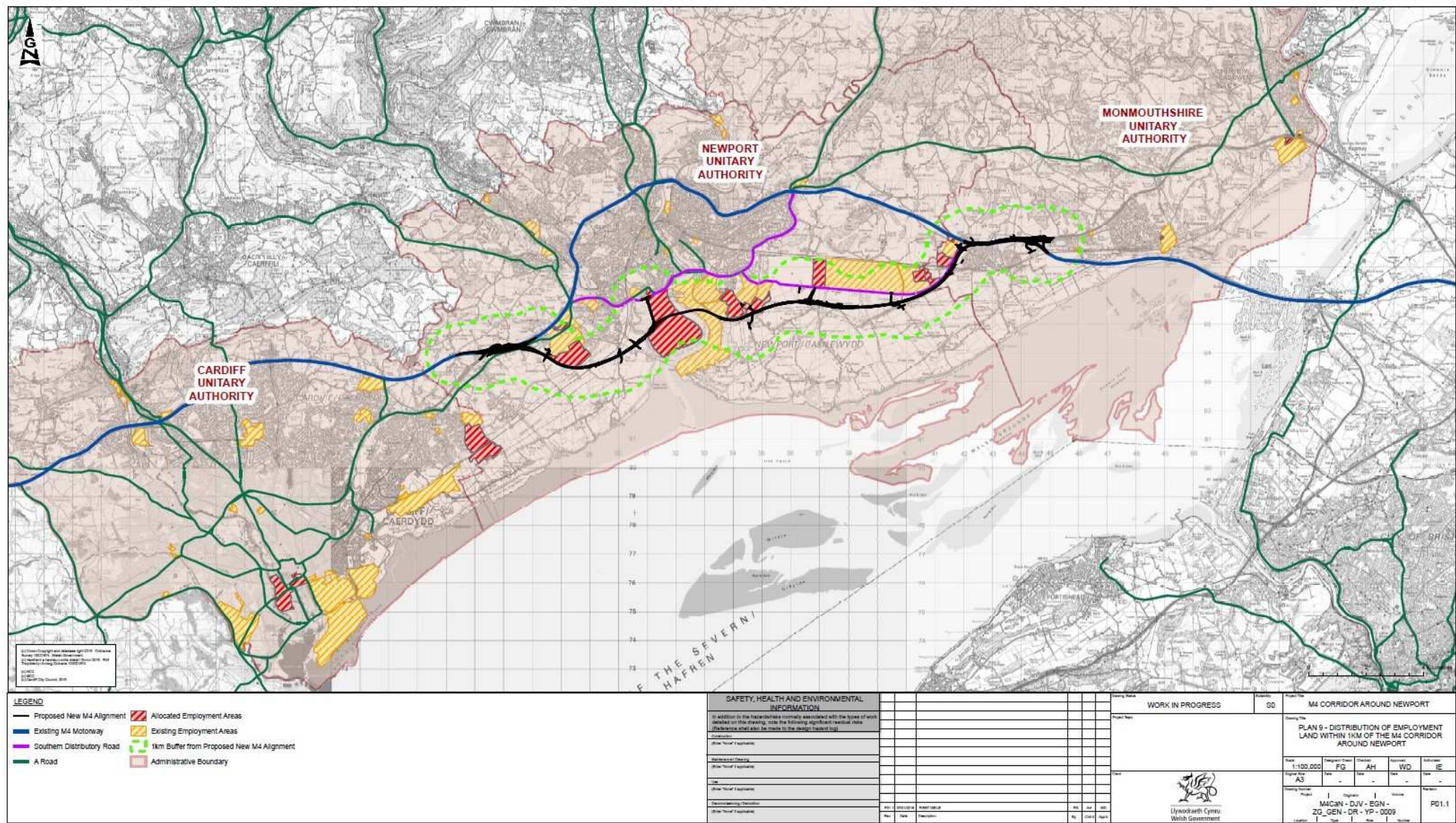
8.6 Land Use and Investment

- 8.6.1** The M4 CaN is expected to influence land use and investment in two interrelated ways. Firstly, the scheme will improve access to current and potential employment sites adjacent to the proposed route of the new motorway. The improvement in accessibility afforded by the new route and the creation of two new motorway junctions to the south of Newport is expected to increase the attractiveness of these sites for investment.
- 8.6.2** Secondly, the new motorway would be expected to improve perceptions of South Wales more generally as a business location more generally, affecting land use patterns across a wider area.
- 8.6.3** Evidence from the literature review suggests that there is a positive relationship between improvements in accessibility and business formation and employment at a local level, primarily as a result of new business entry (Gibbons et al 2012). Previous investments in the trunk road network in Wales have also been shown to have encouraged new investment (WERU 1996).
- 8.6.4** There is no established empirical method for predicting the effects of improved transport links on land use. Whilst there is evidence to suggest that the quality and reliability of transport infrastructure has an influence on businesses investment decisions (CBI, 2014), every transport improvement differs in context and impact such that it is difficult to predict how a specific transport improvement will affect business perceptions and investment decisions in practice.

⁶⁴ Agglomeration impacts have not been calculated for outlying areas in the study area and, as such, are blank in this table.

- 8.6.5** Despite this complexity, it is instructive to consider the potential for M4 CaN to influence land use and investment at a local level by examining the local planning context, the availability of potential employment sites and the effect that the scheme will have on access to these sites.
- 8.6.6** Figure 29 shows the employment sites located in close proximity to the scheme. A number of sites have been identified which would experience an improvement in accessibility as a result of having reasonably direct access to the new motorway. These sites – located in Newport and Monmouthshire – are broadly within a 1km radius of the scheme.
- 8.6.7** In practice, improving the M4 around Newport will improve access to locations over a much wider area. An example of this is the 'South of St. Mellons' Business Park, a 31 hectare allocated site located to the east of Cardiff. Although not directly adjacent to the scheme, the site would be accessed from the east via Junction 28 of the M4 and therefore improvements to the corridor will make this more attractive to investment. Therefore defining a boundary within which to assess land use changes is a crude but necessary approach.

Figure 29: Employment Sites Adjacent to the Proposed Motorway to the South of Newport



- 8.6.8** Table 24 provides details of the allocated employment land sites in close proximity to the new motorway in Newport and Monmouthshire (as defined by the Local Development Plans and supporting evidence base documents). An exercise has also been undertaken to demonstrate the capacity of these sites to cater for new investment and employment.
- 8.6.9** The total area of the sites identified is 181 hectares. This excludes the area covered by existing planning applications approved for these sites. A plot ratio of 0.4 has been applied to this total employment land area to provide an indication of the possible scale of development on these sites once built out. The plot ratio is determined using the Employment Land Review Guidance Note (ODPM, 2004)⁶⁵ and is intended to reflect the possible density of development. Applying this plot ratio, it is estimated that the sites alongside the new motorway corridor have a theoretical capacity to cater for in the region of 724,000 square metres of employment space (gross external area) in close proximity to the proposed new section of motorway.
- 8.6.10** Using the Employment Density Matrix within the Homes & Communities Agency (HCA) Employment Density Guide⁶⁶, it is possible to ascertain the likely level of job creation potential of these sites. Employment density varies between different use classes and types of business. For the purposes of this exercise a mean average has been calculated for each use class as set out below:
- a) B1 – 1 jobs per 12m²
 - b) B2 – 1 job per 36m²
 - c) B8 – 1 job per 77m²
- 8.6.11** For B1 and B2 use classes the job density benchmark apply only to the net internal area of employment space, and as such a reduction of 20% on the gross external area has been applied. This is consistent with Paragraph 2.10 of the HCA Employment Density Guide, which states that for office space the gross figure is typically 15-20% higher than net internal space. Where there are a mix of uses, for conservatism, a density of 1 job per 47m² (light industrial) has been applied.

⁶⁵ Whilst the ODPM Guidance has recently been withdrawn and replaced by the Planning Practice Guidance, it remains the key reference relating to the appropriate plot ratios for employment land uses. Whilst no comparable guidance is available in Wales, the ratio 0.4 is consistent with that applied and referenced in the Newport LDP Employment Background Paper - Employment Land Review (March 2013)

⁶⁶ HCA Employment density guide, final report (November 2015)

Table 24: Theoretical employment capacity of employment allocations within 1km area either side of the proposed new section of motorway⁶⁷

LDP Ref	Site Name	Developable Employment Area (Ha)	Gross External Area (sqm 000s)	Net Internal Area (sqm)	Use Classes	Theoretical Employment Capacity of Site
EM1 (i)	Duffryn	34.8	139,000	111,200	B1 and B2	3,089
EM1 (iii)	Celtic Springs	6.0	24,000	19,200	B1	1,600
EM1 (iv)	Solutia	42.6	170,581	136,465	B1, B2 and B8	2,904
EM1 (ii)	East of Queensway Meadows, South of Glan Llyn	27.0	108,000	86,400	B1, B2 and B8	1,838
EM1 (ii)	Celtic Business Park (Llanwern Former Steel Works Eastern End)	33.6	134,500	107,600	B1, B2 and B8	2,289
EM1 (v)	Gwent Europark	0.0	-	-	B8	0
SAE1c	Gwent Europark, Magor	13.3	53,200	42,560	B8	665
SAE1b	SAE1b & SAW1b - Quaypoint, Magor	19.6	78,400	62,720	B1, B2 and B8	1,334
SAE1a	SAE1a Wales One, Magor (West)	4.0	16,000	12,800	B1	1,067
Total		180.9	723,681	578,945	-	14,786

⁶⁷ Note: Figures may not total due to rounding

- 8.6.12** Table 24 suggests that, if fully developed, the sites adjacent to the new route could cater for in the region of 15,000 jobs. At current rates of GVA, these jobs would be associated with around £0.5bn of GVA per annum.
- 8.6.13** It should be noted that this represents the *capacity* of these sites. Whether this capacity is realised in practice will depend on whether there is sufficient demand for employment land. It is important to consider therefore, that this level of employment exceeds the total increase in employment predicted for Newport (Newport City Council ELR, 2013). However, given that the existing ELR concludes that *'if the new M4 is confirmed the Council will need to re-appraise its whole employment land strategy'* this highlights the potential for M4 CaN to significantly change market conditions in Newport.
- 8.6.14** In their analysis of the property market in South Wales, Jones Lang Lassalle (JLL 2015) suggest that *'the M4 corridor continues to enjoy the strongest market conditions in South Wales with Cardiff the focal point in terms of demand for distribution, trade counter and other industrial uses'*.
- 8.6.15** In addition to the sites in Table 24, Newport Docks is also allocated as an employment site. Although excluded from this analysis, as noted in Section 5 and set out in Newport's LDP, there is a surplus of land within Newport Docks which could be brought into alternative, productive, employment generating uses.
- 8.6.16** The importance of access to the motorway network for business was highlighted in Figure 4 which showed that existing M4 junctions attract high levels of employment. The number of jobs within 1km of existing junctions in South Wales varies from 434 jobs (Junction 33) to 5,956 jobs (Junction 32). Of the 12 junctions considered, 8 have local employment of in excess of 3,000 jobs. The employment land assessment confirms the capacity for new employment creation of at least the same scale as the most densely develop junctions of the M4 in South Wales.
- 8.6.17** The M4 will afford improved access to the sites listed in Table 26. As a result of the scheme, potential businesses located at these sites will face lower transport costs than they would under a 'do minimum' scenario, as well as improved access to a workforce. The significance of the journey time savings for travel to/from these sites is illustrated in Figures 30 and 31.
- 8.6.18** The figures show the changes in journey times between the Do Minimum (no new motorway) and the Do Something (new motorway), for journeys originating from Glan Llyn, one of the sites listed in Table 24. The figure demonstrate that there would be journey time savings of around 13 minutes for a journey using the M4 from the west and a saving of around 5 minutes for journeys using the M4 from the east.
- 8.6.19** Given the evidence presented in Chapter 3 relating to the importance to businesses of the reliability of the transport network, the improved resilience afforded by the M4 will also play a role in enhancing the perceived quality of these sites.

Figure 30: Journey time savings from Glan Llyn westbound

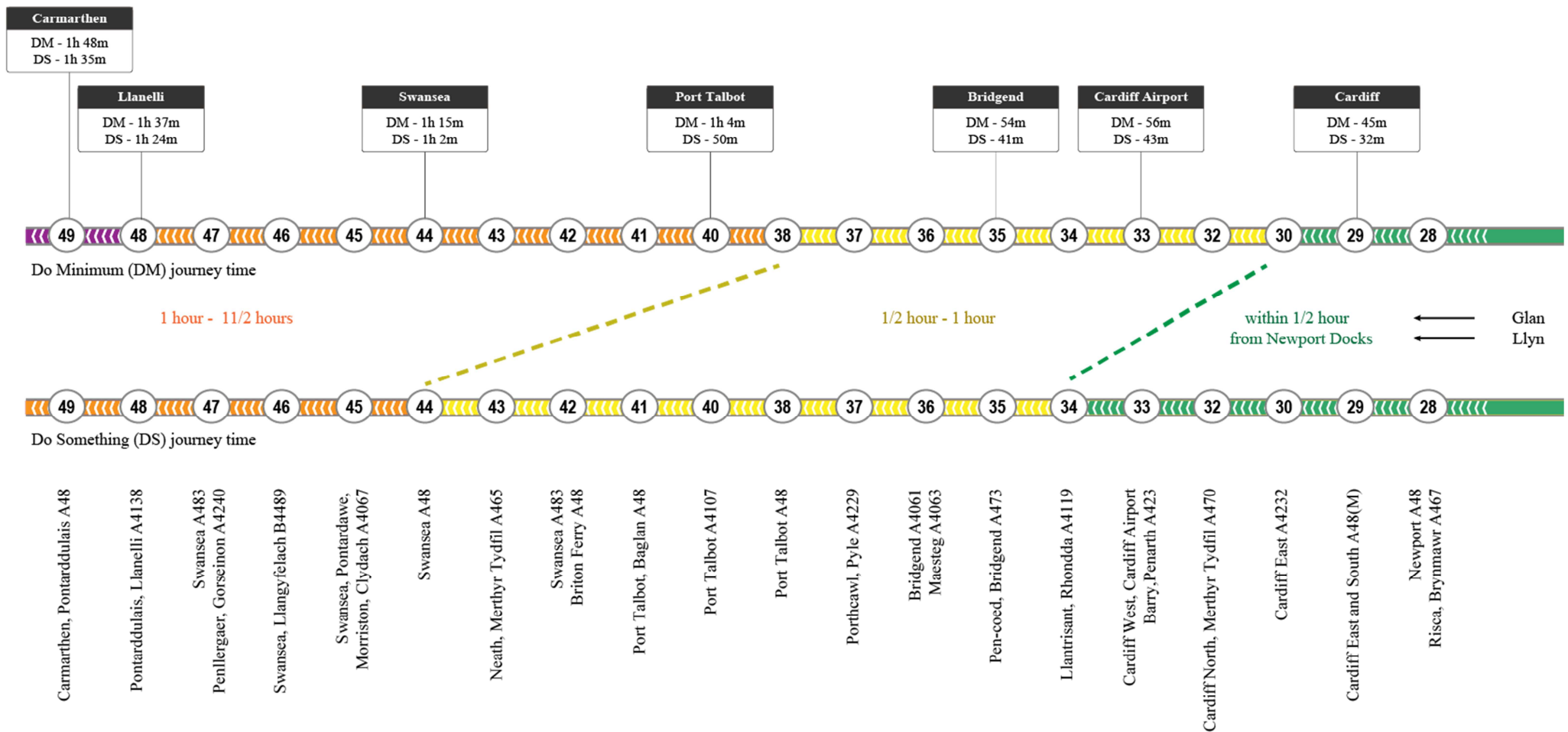
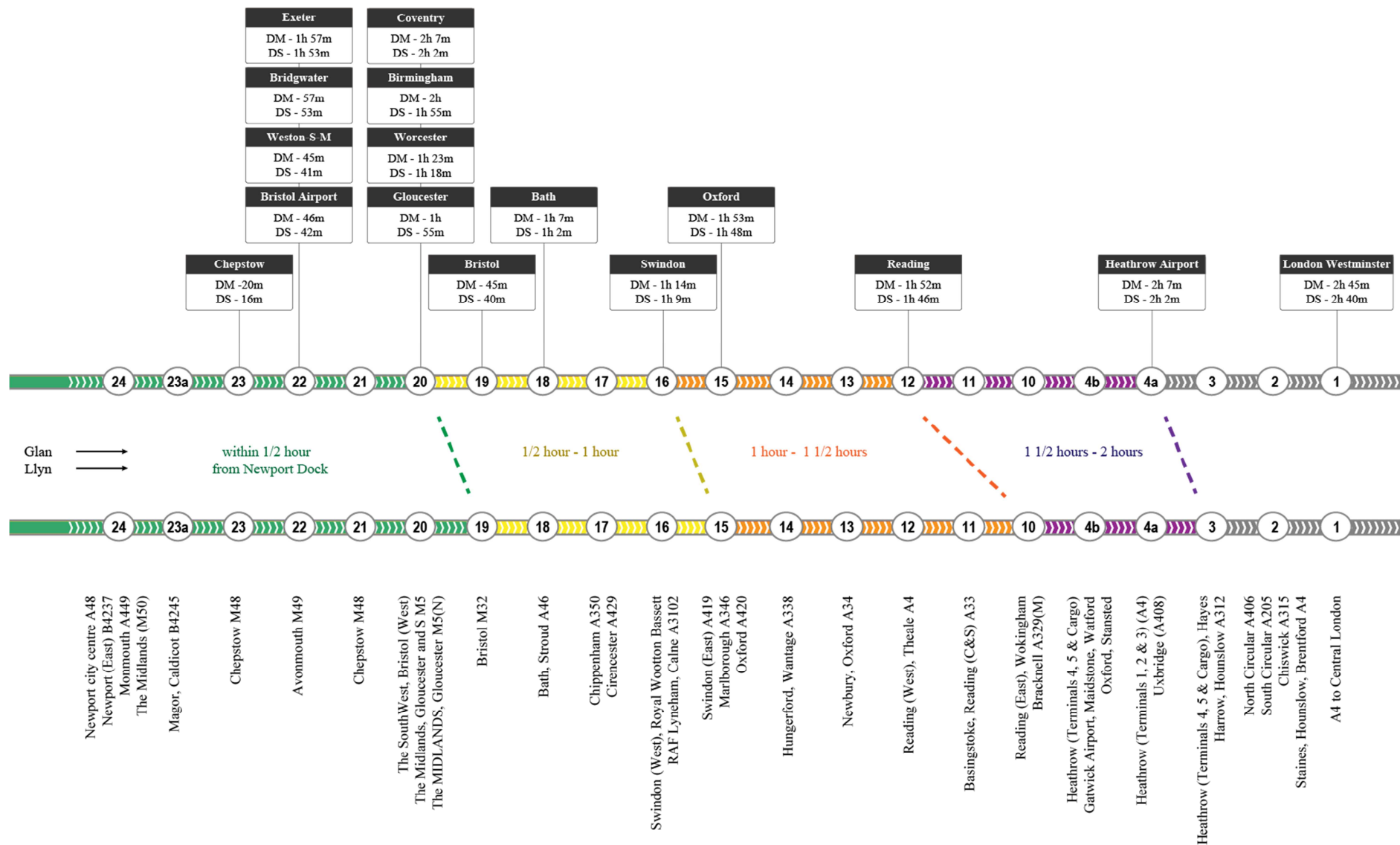


Figure 31: Journey time savings from Glan Llyn eastbound



- 8.6.20** In practice, there are a wide range of factors that determine business location and investment decisions. Transport and accessibility will be just one factor considered by potential investors alongside costs and land or rents, site area, development costs, access to markets and access to a suitably skilled workforce. However, given the improvement in journey times highlighted in Figures 30 and 31 (in addition to the improvement in access to the labour force) – and the as existing patterns of employment around M4 junctions (Figure 4) – it is reasonable to conclude that the effect of a new motorway to the south of Newport will be to make these sites more attractive for investment and that this will positively contribute to the rate and scale of employment creation at these sites.
- 8.6.21** Discussions with commercial property agents in South Wales have indicated that there is a lack of high quality commercial sites within the region of sufficient scale to attract large investments. Agents confirmed that, given the area of development land available potentially available, direct motorway access and improved connectivity could result in large scale, higher value investment along the M4 corridor.
- 8.6.22** This echoes the findings of JLL's 2014 property market review which stated that, *'the proposed M4 relief road may offer an opportunity to develop a new bespoke distribution park. As we move to a 'just in time' economy in both 'B2C' and 'B2B' markets so we are losing e-commerce and distribution investment to Avonmouth'*⁶⁸. Both the Glan Llyn and Europark sites could facilitate such development, whilst further taking advantage of the proposed new junctions at the former steelworks site and at Magor from the proposed new motorway.
- 8.6.23** Newport City Council has confirmed that enhanced connectivity is seen as a priority for action to deliver economic growth in Newport. Newport's strategic location on the M4 corridor is seen as a critical advantage in attracting business investment. The wider connectivity of the city by road and rail, including the proximity to Cardiff and Bristol are all important determinants Newport's economic success.
- 8.6.24** Similarly, Monmouthshire County Council have identified that the industrial development in the County is likely to be focused along the M4 Corridor in the south of the county. They further identify that the bottleneck at the Brynglas Tunnels in Newport is perceived to be a negative issue by existing communities and potential investors.
- 8.6.25** Some of the new investment attracted to south of Newport and Monmouthshire is likely to represent a relocation of activity from other parts of the study area, rather than wholly additional employment. However, as highlighted in Chapters 4 and 5 of this report, the M4 corridor and the scheme itself are of regional or national importance. It is therefore reasonable to conclude that the scheme will deliver a net overall increase in investment in the study area, rather than

⁶⁸ Cardiff Capital Region – Draft Property Strategy for Employment Sites & Buildings (Jones Lang Lassalle)

simply a redistribution of employment from one part of the study area to another.

8.6.26 The 'two-way' road debate is also relevant in this context. As noted, an improvement in accessibility may result in an expansion of local economic activity (and therefore an increase in demand for employment space) by enabling firms to compete over a wider area. However, it may also enable firms based outside the local area to compete in local markets without the need for a local presence (such that demand for employment space falls). Such forces are also likely to affect the distribution of economic benefits between the urban areas *within* the study.

8.6.27 As noted in Section 3 of this report, where there are efficiency advantages in large scale production, there will be a tendency for economic activity to concentrate in a 'core' economic region. This may manifest itself if firms choosing to serve the study area from a base outside the study area given that transport costs allow them to serve the study area more easily from further afield. Equally, for other firms and industries, improved accessibility will lead to a decentralisation of economic activity with firms taking advantage. In conclusion, it is not expected that effect of competition would offset the increase in demand for employment land due to improved accessibility.

8.7 Perceptions of South Wales as a Place to Visit and Do Business

8.7.1 Current traffic conditions on the M4 around Newport have a negative impact on the both the actual and perceived quality of the transport network amongst the public and the business community. This is evident from the comments made by members of the business community and politicians set out in Chapter 5 which identify that problems on the M4 '*significantly damages the Welsh economy and negatively impacts upon Wales' standing as a globally competitive business location.*'

8.7.2 Given that the M4 facilitates such a high proportion of trips in and out of Wales, as is seen as the primary gateway to Wales, such negative perceptions may have wider implications for the economy. Whilst the *direct* impacts of M4 CaN (when assessed on the basis of the origins and destinations of users) are likely to be concentrated in South East Wales, business over a much wider area are dependent on the route for the movement of people and goods.

8.7.3 Although perceptions are difficult to measure, economic impacts are ultimately the culmination of a vast array of decisions made by individuals (consumers) and businesses about where to live, work and spend leisure time. In respect of transport, such decisions will be influenced by the way people perceive the ease of access, rather than necessarily a calculation of average journey times.

8.7.4 The fact that the M4 around Newport is perceived negatively by the business community and others is likely to be related both to day to

day congestion and delay, but also because of the delays caused by traffic incidents which cause the greatest disruption. The improved resilience of the M4 CaN proposals will therefore contribute to improving perceptions of the M4 and ease of access to South Wales more generally.

8.7.5 Negative perceptions of the M4 are likely to affect Wales' prospects for attracting new inward investment. Commercial property agents, engaged to inform this assessment, have identified that businesses are attracted to Wales by the good quality of life, low turnover of staff, and the strong but low cost employment base. They also identify that the existing problems are exacerbated by the perception that there is only one route in and out of Wales, the existing M4, which suffers from reliability and resilience problems. They suggest that improvements to the reliability and resilience of the M4 CaN would make Wales more attractive by reducing existing perceived barriers to the South East market.

8.7.6 Whilst it is difficult to isolate precisely where and when the improvements would be *pivotal* to a decision to invest in South Wales or South West Wales, transport will be an important factor in determining location for a range of business sectors. Therefore it is reasonable to conclude that the scheme will contribute to the overall quality of the business environment. Importantly, whilst the analysis provided in Section 8.6 focussed on a specific range of sites adjacent to the new route, in reality the functioning of the M4 is likely to influence investment decisions over a much wider area of South Wales and South West Wales.

8.7.7 It is also important to consider how traffic issues on the M4 affect the decisions of individual consumers. This is particularly pertinent to Wales given the importance of the visitor economy. A 2009 study calculated that the visitor economy contributes £6.18bn or 13% to Wales' GDP⁶⁹. This was higher than any other country in the UK.

8.7.8 In 2014, there were nearly 10 million domestic overnight visitors to Wales⁷⁰. These visits were associated with expenditure in the Welsh economy of £1.7bn. A proportion of these visits will be those visiting family and friends, or travelling on business. Such visitors may be relatively insensitive to traffic conditions. However, holiday tourism specifically accounted for 6.4 million overnight visits and £1.3bn of expenditure.

8.7.9 As for inward investment decisions, because the M4 provides a point of access for visitors to the whole of South Wales, any implications of M4 CaN on the visitor economy are likely to be widespread. Clearly, West Wales attracts a disproportionate number of holiday visits and the economy of this part of Wales is highly dependent on tourism. In Pembrokeshire, for example, the visitor economy is estimated to account for 15% of all jobs, compared to 6% of employment across Wales as a whole (Wales Tourism Alliance, 2010).

⁶⁹ Wales Tourism Definitive Value Report 2010 (Wales Tourism Alliance)

⁷⁰ The GB Tourist Statistics 2014 (TNS, Visit Wales, Visit England, Visit Scotland)

- 8.7.10** Whilst this area is physically remote from the scheme, the area is dependent on the M4 to provide access for visitors. Importantly, of the overnight domestic holiday makers in 2014, 88% travelled by car as their main mode of transport. Given the role of the M4, it would be reasonable to conclude that the majority of tourists to South Wales and South West Wales experience the M4 around Newport during their visit.
- 8.7.11** Should visitors experience significant delays due to disruption on the M4, it would be logical to expect - particularly those on shorter overnight or weekend visits - that this will influence their overall experience of their visit to Wales and therefore their likelihood of returning.
- 8.7.12** In this regard it is instructive that tourism operators (including Bluestone, located in Pembrokeshire) are amongst businesses calling for improvements to the M4 around Newport⁷¹.

8.8 Other Impacts – Impacts on Newport Docks

- 8.8.1** The M4 proposals include a new bridge crossing of the River Usk, which has several commercially operated wharves. The bridge and approach viaducts also cross the Newport Docks, owned and operated by Associated British Ports (ABP), between North and South Dock. A proposed junction on the west side of the River Usk in Newport Docks would connect into the A48 Newport Southern Distributor Road (SDR). This would provide improved access to central Newport and the Newport Docks themselves.
- 8.8.2** Engagement has been ongoing since the late 1990s between the Welsh Government, its consultants and ABP, as well as the other operators along the River Usk. Alternative routes proposed by ABP have been considered during development work, and the proposed new section of motorway has been developed cognisant of ABP's operations. There would be a minimum clearance of 25.5m above design docks water level of 7.56m Above Ordnance Datum (AOD). Over the River Usk, a minimum clearance of 32m would be provided above Mean High Water Springs Level of 6.49m AOD. The Usk crossing would also require the purchase of operational land at the Docks.
- 8.8.3** In order to provide evidence to inform the Welsh Government's consideration of the potential impacts on the Newport Docks, Global Maritime Consultancy Ltd has undertaken an assessment of vessel activity and prepared a shipping analysis⁷².
- 8.8.4** The following conclusions are extracted from the Global Maritime Shipping Analysis report:

⁷¹ Open letter from CBI Wales and leading Welsh businesses to Welsh politicians - Delivery of M4 Black Route is vital for the Welsh economy

⁷² Draft M4 Corridor around Newport Shipping Analysis, Global Maritime Consultancy Ltd., July 2015

- 9.1.3 The impact on the number of ships visiting Newport will be affected following the closure of the Uskmouth coal fired power station in March 2014.
 - 9.1.4 The refurbishment in 2011 of the Swansea drydock facilities, has had a negative impact on the vessels visiting Bailey's drydock.
 - 9.1.7 The Port of Newport is located in a strategically important area of the UK, being close to important international shipping lanes that converge at the western edge of the English Channel.
 - 9.1.8 There are four areas within the South dock that could be developed and provide an additional 1,115m of serviceable quay frontage.
 - 9.1.9 There are alternative vessels available for charter with air drafts less than 25.2m that have similar cargo carrying capacity to those ships unable to navigate beyond the proposed new viaduct.
 - 9.1.10 Cargo handling in Newport has decreased significantly by approximately 29% from 2004 to 2013.
 - 9.1.11 There has been a large reduction in the number of vessels visiting the North Dock, the previous study (2004 – 2008) which counted 235 vessel movements from 171 unique vessels. The current study (2010 – 2015) has counted 138 vessel movements from 77 unique vessels. This equates to a 59% reduction in vessel movements and a 45% reduction in unique vessel visits to the North Dock.
 - 9.1.12 Cargo weight handled per vessel caller has decreased significantly (63%), reflecting a change in the utilisation of vessels, this is a clear indicator that there has been a decrease in the size of vessels.
- 8.8.5** This analysis indicates that, of unique vessels using the North Dock for the study period (June 2010 to February 2015), approximately 88.4% of ships would be unimpeded to access the North Dock beneath the proposed new motorway bridge.
- 8.8.6** Furthermore, the report concludes that the small percentage of vessels that may be prevented from passing beneath the new M4 viaduct due to their air draft could berth at alternative wharfs and berths within Newport Docks and the River Usk, as there is spare capacity in the South Dock and River Usk.

- 8.8.7** ABP were provided with copies of the most recent Shipping Analysis report (as referred in 8.8.3) at a meeting on 27 July 2015. ABP responded on 14 January 2016 with advice from Brookes Bell Safety at Sea, which disagreed with the findings of the report.
- 8.8.8** The agreed minutes of the meeting of 27 July 2015 record that questions regarding the economic impact of the proposed new motorway on the docks were tabled for ABP response. No responses to these questions have been provided by ABP to assist with this wider economic assessment.
- 8.8.9** ABP assert that the proposed new section of motorway would have significant impact on the operation of Newport Docks.
- 8.8.10** It is clear that the Docks has an important direct and indirect role in the economies of Newport and South Wales as a whole and therefore impacts on port operations need to be considered alongside the potential benefits of the improved access that would be brought about by the provision of a junction at Docks Way.
- 8.8.11** Based on assessment carried out on behalf of the Welsh Government, it is concluded that the impact of the M4 on Docks operations are likely to be slight and therefore the implications for the wider economy would be limited.
- 8.8.12** As noted, the provision of a new motorway junction could contribute to making this area more attractive for investment with associated commercial and economic benefits. Therefore, operational considerations need to be balanced against the benefits of improved transport links to Newport Docks.

8.9 Conclusions

- 8.9.1** The assessment of impacts during operation are summarised in Table 25.

Table 25 - Summary Impact Assessment

Impact	Assessment
Lower transport costs for businesses	<ul style="list-style-type: none"> Direct impact on the GVA of £40m (£0.8bn) in the study area as a whole.
Efficiency benefits of improved reliability and network resilience	<ul style="list-style-type: none"> Easier to plan journeys and reduced costs of disruption for logistics firms and 'just in time' operators.
Improved access to markets	<ul style="list-style-type: none"> Average journey time savings of 10 minutes for journeys between South Wales and England.
Improved access to	<ul style="list-style-type: none"> Improved access to employment for large

Impact	Assessment
employment for residents	parts of the study area (for example, a resident of Magor would be able to access 7% more jobs by car as a result of the scheme).
Widened access to a labour force for firms	<ul style="list-style-type: none"> • Scheme results in an expansion in the size of the accessible workforce for large parts of the study area (for example, a business located in Newport would experience an effective increase in labour force catchment of between 3% and 5%).
Productivity benefits of strengthened agglomeration effects	<ul style="list-style-type: none"> • Positive impact on GVA of £39m per annum (£0.7bn PV 2010) in the study area as a whole.
Productivity benefits of reduced peripherality	<ul style="list-style-type: none"> • Further GVA impact of approximately £20m per annum in 2037 (£0.5bn PV 2010) in South Wales.
Increased investment and employment	<ul style="list-style-type: none"> • New motorway access to employment sites to the south of Newport with capacity for 15,000 jobs (equivalent to approximately £0.5bn of GVA per annum); • Improved access to sites adjacent to the existing M4 corridor; • Improved perceptions of Wales as a location for investment.

9 Overall Conclusions

- 9.1.1** The purpose of the Wider Economic Impact Assessment is to assess the likely effects of the M4 CaN on the local and regional economy. This is distinct from the Economic Assessment Report which assesses the overall value for money of the scheme based on a combination of economic and other benefits measured at a UK level, following the methodology set out in the DfT's WebTAG.
- 9.1.2** The strategic importance of the M4 corridor to the economy of South Wales and South West Wales is widely recognised. The M4 is the most heavily used transport route through South Wales and provides the primary means of access to the rest of the UK for over 70% of Wales' population and economy. The importance of the M4 is reflected in the views of the business community in South Wales and South West Wales.
- 9.1.3** The construction of a scheme of this nature will have economic impacts in its own right. During the construction phase, the scheme is expected to employ an average of 700 people per month over the 42 month construction period. The contractor has committed that 20% of the total labour requirement for the scheme will be made up of new entrant trainees who have an apprenticeship, trainee or employment contract with the contractor or a subcontractor, and are engaged in a training programme. Although the direct employment effects of the scheme are temporary, the investment in training associated with the scheme is expected to have a lasting impact on the construction sector in the region.
- 9.1.4** Further to the direct employment, the construction of M4 CaN would require the procurement of approximately £543m value of goods and services, of which around £440m would be materials and associated works, and around £103m would be equipment costs. The contractor for the scheme estimates that 65% of the goods and services procured will be purchased from local suppliers. This would have a substantial positive, albeit temporary, impact on the level of output and employment in the construction sector in the study area.
- 9.1.5** During the operational phase, the scheme is expected to impact the economy of the study area in the following ways:
- a) **Reducing transport costs for businesses** in the study area by providing faster and more reliable transport for business travellers and for the movement of goods;
 - b) Improving the functioning of the labour market in South Wales by **increasing access to employment opportunities** for workers and improving access to a suitable workforce for firms;
 - c) **Improving productivity** by fostering agglomeration effects and reducing travel times to London;

- d) Stimulating **land use change and new investment** by improving access to key employment sites in the south of Newport (Section 8.6);
- e) **Improving perceptions of South and South West Wales** as a place to visit and do business (Section 8.7).

- 9.1.6** The M4 CaN scheme will result in lower journey times and reduce transport costs for businesses in the study area defined for this assessment. Even before the effects of traffic incidents and atypical delays are considered, cost savings for businesses in the study area are estimated to be £40m (2014 prices) each year by the design year of 2037. In practice however, the scheme will also improve journey time reliability and will reduce the delays associated with traffic incidents which will result in further cost savings and efficiency benefits for businesses.
- 9.1.7** In addition to the *direct* cost savings set out in the EAR, the scheme is expected to contribute to higher levels of productivity in the study area by enabling improved interaction between businesses and widening the effective pool of labour and skills available to firms. Such effects are termed agglomeration effects. Agglomeration effects resulting from the scheme are expected to contribute a further £39m (2014 prices) to the GVA of the study area.
- 9.1.8** Research suggests that economic performance in Wales is also influenced by Wales' relative peripherality (UWE 2006 and 2010). By improving access between South Wales and the rest of the UK, further productivity benefits might be expected. Whilst it is difficult to be precise about the magnitude of such benefits, applying evidence from the research would suggest that further productivity benefits in the region of £20m (2014 prices) per annum could be expected in South Wales by 2037 as a result of lower travel times between South Wales and other parts of the UK.
- 9.1.9** Combining these impacts together, the scheme is expected to deliver higher GVA (Gross Value Added) of £99m (2014 prices) per annum in the study area in 2037 or £2.1bn (Present Value 2010) over a 60 year appraisal period. In South Wales specifically, the impact on GVA would be £74m per annum by 2037 or £1.6bn (PV 2010) over 60 years.
- 9.1.10** It should be noted that the GVA estimates above underestimate the total impact of the scheme given that they are based on changes in average journey times under typical operational conditions on the highway network in terms of average flows and speeds on a normal day of operation. The quantitative analysis does not reflect those occasions when a major incident has occurred which results in severe reduction in network performance. Such incidents will impose additional costs on the economy. As noted, the additional capacity and resilience afforded by the scheme will further reduce the costs to businesses of unreliable journeys and incident related delays with resultant higher productivity gains than those quantified above.

- 9.1.11** The GVA estimates also exclude the impacts of changes in land use and investment resulting from the scheme. The M4 CaN, by creating two new junctions to the south of Newport, will provide improved access to a number of currently allocated employment sites in Newport and Monmouthshire. It has been estimated that these sites have the capacity to cater for in the region of 15,000 jobs that would be associated with GVA of around £0.5bn per annum. The M4 CaN proposals will be to make these sites more attractive for investment.
- 9.1.12** Any impacts of the scheme on the operation of Newport Docks need to be considered alongside the benefits of improved access to this area. Based on the assessment carried out by Global Maritime Consultancy Ltd on behalf of the Welsh Government, it is concluded that the impact of the scheme on Newport Docks operations are likely to be relatively slight and therefore the implications for the wider economy would be limited.
- 9.1.13** More generally, the M4 CaN is expected to contribute positively to perceptions of South and South West Wales as a location for investment. This conclusion is supported by many in the business community. Furthermore, the vast majority of overnight holidaymakers to Wales travel by car. Therefore, it would be reasonable to assume that the majority of tourists visiting South and South West Wales will experience the M4 around Newport during their visit. Delays caused by disruption on the M4 corridor will impact negatively on visitor's perceptions of South and South West Wales as a place to visit.
- 9.1.14** Whilst the *direct* measurable impacts of M4 CaN are likely to be concentrated in South East Wales, the economies of a much wider area are dependent on the route for the movement of people and goods. Although more difficult to measure, the benefits that the scheme will deliver in improving perceptions of the ease of access to Wales could be felt more widely across the whole of South and South West Wales.

A1 Appendix A – References

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