Economic growth and the strategic road network

This report was commissioned by Highways England to inform the emerging Strategic Economic Growth Plan (SEGP) and better understand the relationship between economic growth and the strategic road network. This report does not inform or relate to planning matters or investment decisions.

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Executive Summary

This document presents an evidence review of relevant strategic policy documents and major national and international research on the relationship between transport investment and economic growth, particularly with reference to investment in highways and roads.

Highways investment can support economic growth through four principal mechanisms.

Improving productivity: The ability of investment to reduce business costs and subsequent effects on increasing competition between firms and creating agglomeration economies improves the productivity of UK businesses. Changes in productivity are the ultimate determinant of economic growth and UK productivity has historically been weak in comparison to its international competitors. Nationally, productivity also varies significantly across regions of England, meaning that improving productivity is also a regional priority. The link between investing in transport infrastructure and enabling economic growth through increasing productivity and trade is supported by academic and applied research.

Increasing trade: Reducing domestic and international transport costs, through connections to international gateways, supports exports by UK businesses. Gains from international trade can support economic growth nationally and firms which trade internationally may be more productive.

Facilitating investment: Investment in housing and businesses may be facilitated by reducing transport costs. Whilst domestic investment may be displaced from elsewhere, the ability of transport improvements to attract globally mobile investment in particular may support national economic growth. This not only increases output but may also increase productivity, through capital formation and technology transfer.

Reducing unemployment and increasing labour supply: Reducing commuting costs may increase labour supply and create larger labour markets, resulting in better matching of firms and workers and reducing job search times. However, evidence from the UK suggests that given the already extensive network, the potential of achieving this through further investment may be limited.

In reviewing the evidence it is important to distinguish between net national and local economic growth, in particular in relation to employment and investment impacts. Whilst transport investments can contribute to significant changes in investment in economic activity and employment in the local area, the net effect at a national level may be much smaller or neutral if investment and jobs are not additional but instead displaced from different locations[1]. The WebTAG guidance issued for consultation suggests a default assumption of 0 net additionality in levels of economic activity and employment (although there may still be productivity gains through agglomeration).

While the literature provides a clear picture of how transport investment in general can affect economic output and growth, empirical evidence has little to say directly about the economic impact of specific interventions. The literature suggests that the following considerations will be relevant in understanding the impact of a specific investment:

- The impact of investment depends on the rest of the network. Impacts can therefore be enhanced by considering connectivity to the broader transport network and major strategic infrastructure investments, such as HS2.
- Local context influences the case for investment. Therefore, a strategic approach should be taken whereby transport investment should enable existing and demonstrable growth and address specific limitations, rather than aiming to instigate growth in otherwise poorly performing areas.
- Long-term commitments to transport investment allow for private investment to respond.
- Once an advanced network is in place, as in the UK, additional investment has less effect. Interventions should therefore focus on the efficiency of the existing network rather than extending it.
- The extent of benefits from investment are likely to be dependent on how projects are selected, prioritised, planned and implemented[2].

[1] For a detailed discussion of these issues, see the 2014 report *Transport Investment and Economic Performance* by Venables, Laird and Overman for DfT.
[2] World Bank, 2014.

1. Introduction

1.1. Study Context

This document forms the output of an evidence and literature review undertaken during the development of the evidence base for the Strategic Economic Growth Plan (SEGP) of Highways England (HE). It sets the context for the SEGP and establishes a well-founded rationale for HE playing a significant role in the pursuit of national and sub-national growth priorities.

This document forms part of a suite of 6 evidence reports produced to support the production of the SEGP. These are:

1. Economic growth and the SRN
2. Commercial development and the SRN
3. International gateways and the SRN
4. Socio-economic analysis, future forecasts and the SRN
5. Assessment of growth impacts
6. Economic value of the SRN

Atkins has undertaken an evidence review of relevant strategic policy documents and major national and international research on the relationship between transport investment and economic growth, particularly with reference to investment in highways and roads. This has included *Transport Investment and Economic Performance: Implications for Project Appraisal* (TIEP) and the Eddington Report, as well as key DfT policy publications and academic research. The report also reflects Atkins' own experience in major transport investment and local, regional and national economic development.

1.2. Key messages

Highways investment can provide for economic growth by increasing productivity, increasing trade, facilitating investment and reducing unemployment and increasing labour supply. Some key figures included in this document relating to the ways in which transport and roads investment can support economic growth are collected in Box 1.

Of these, the evidence is strongest that the SRN supports economic growth nationally by increasing productivity and increasing trade, whilst facilitating investment is important for local economic growth. Productivity is a key determinant of economic growth and UK productivity has historically been weak in comparison to its international competitors.

The evidence suggests that highways investment can:

- **Improve productivity** through reduced business costs, agglomeration economies and increased competition.
- **Facilitate investment**, and therefore facilitate local economic growth through encouraging mobile activity to locate in a particular location and through unlocking land for housing and employment uses.
- **Increase trade** by reducing transport costs domestically and internationally, by improving access to international gateways.
- **Reduce unemployment and increase labour supply** by increasing the scale of labour markets and improving access to jobs. However, evidence from the UK suggests that given the already extensive network, the potential of achieving this through further investment may be limited.

1.3. Structure

The structure of the rest of this document is as follows. Chapter 2 provides evidence on the economic rationale for investing in the SRN to support economic growth, focusing on productivity, investment, trade and unemployment/labour supply. The chapter also discusses the aggregate relationship between transport investment and economic output, as well as providing a conclusion of key messages from the evidence. Chapter 3 provides thematic summaries of the relationship between the SRN and economic growth, related to the themes of people, businesses, international gateways and nationally significant infrastructure projects.

Box 1: Key Figures on Transport Investment and Economic Growth

- The Eddington Report identifies a consensus estimate that a 1% increase in the public capital stock (a very broad measure of infrastructure) results in a 0.2% increase in GDP for a developed economy.
- Transport is key for improving the productivity of businesses. Increasing productivity is a national priority given the most recently available data suggests that in 2014, UK output per working hour was 18% below the G7 average.
- Previous work by Atkins has estimated the wider economic costs of congestion could reach £55bn by 2025 (2007 prices).
- Current projections suggest the cost of congestion to the freight industry will be £14bn in 2040. The sector provides 9% of UK GVA directly, and provides essential services to other activities.
- Agglomeration effects on productivity have been found to be non-existent beyond 80 minutes driving time.
- Estimates suggest falling transport costs since 1960 boosted international trade by 10% to 17.5% and UK GDP by 2.5% to 4.4%.
- Estimates suggest a 1% increase in freight costs reduces trade by 1.3% to 3.5%. Infrastructure accounts for 40%-60% of the variation in these costs.
- 24% of businesses surveyed by the BCC in 2012 cited the quality of connections to international gateways as a barrier to exporting.
- Ernst & Young's *European Attractiveness Survey 2015* indicated that investors see transport and logistics infrastructure as the third most important factor in choosing a location, behind only political transparency and stability and the country or region's domestic market
- Studies by Atkins for Midlands Connect indicated that a 10% reduction in general road journey times could increase employment by 127,000 by 2026, but this is dependent on other growth enabling conditions such as employment sites, housing and skills.

2. The Strategic Road Network and Economic Growth: The case for investment

2.1. Introduction

The evidence suggests that relevant investment in the SRN can support economic growth through four key mechanisms:

- Improving productivity, through improving efficiency, facilitating agglomeration economies and increasing competition, as well as potential benefits through investment and international trade;
- Increasing trade domestically and internationally;
- Facilitating investment by businesses and developers, as well as supporting inward investment; and
- Reducing unemployment and increasing labour supply.

Of these, improving productivity and increasing trade are likely to be of the greatest relevance for national economic growth. The SRN is important for supporting investment by domestic firms and attracting inward investment. This is key for supporting local and regional economic growth, though may be less relevant for national output as the increase in economic activity and employment near the investment is likely to be the result of displacement from other locations. The evidence suggests that the ability of SRN investment to reduce unemployment/increase labour supply is less significant, though possible through reducing costs of commuting.

Through these mechanisms, the evidence suggests that transport investment can contribute to economic growth at the local and national level. The evidence reviewed generally relates to transport investment of all types. Whilst there is less evidence specific to the impacts of investment in roads, the importance of the SRN for business use suggests that the broader evidence would be relevant.

Section 2.2 provides a brief discussion of the evidence on the effect of transport investment on national GDP. Sections 2.3 to 2.6 discuss the theory and evidence regarding these mechanisms in further detail, highlighting how transport investment, and specifically SRN investment, can support economic growth. Section 2.7 discusses the relevance of appraisal methodologies in understanding the contribution of the SRN to economic growth.

2.2. Transport investment and national economic growth

The literature identifies two ways in which transport investment, including SRN investment, can affect national GDP: directly, as capital investment; and indirectly through reducing transport costs and enabling the four key mechanisms outlined above and discussed in more detail below. It is these additional mechanisms that provide the argument for transport investment specifically.

Estimates suggest that infrastructure investment does yield a Gross Domestic Product (GDP) benefit beyond the direct effect as capital investment. The Eddington Report identifies a consensus estimate that a 1% increase in the public capital stock (a very broad measure of infrastructure) results in a 0.2% increase in GDP for a developed economy. This relates to the absolute level of GDP, not the rate of growth, which is less studied.

However, the empirical research on this issue has limitations. Estimates based on the effect of past infrastructure investment do not guarantee that this will be achieved from future investment[3]. Studies also often do not distinguish infrastructure investment by type[4]. Even where roads are distinguished from other investment, stock measures such as total road length are used (see for example Calderon et al, 2011). These studies therefore do not provide any information on the impact of particular road or transport schemes and

[3] Gramlich, E.M., 1994.
[4] See Gramlich (1994) and Romp and De Haan (2007) for reviews of this literature

also do not provide any information on the impact of investment in improved network efficiency or resilience. This is likely to be the key area for improvement of the SRN in the future, for example through the creation of smart motorways as outlined in the National Infrastructure Plan 2014.

2.3. Improving productivity

Productivity is the key long-term determinant of the rate of economic growth. The UK continues to face a significant productivity gap compared with other industrial nations. The most recently available data indicate that in 2015, output per hour worked in the UK was 18% below the average of other G7 members. The issue has become particularly severe since the Great Recession of 2008-9[5].

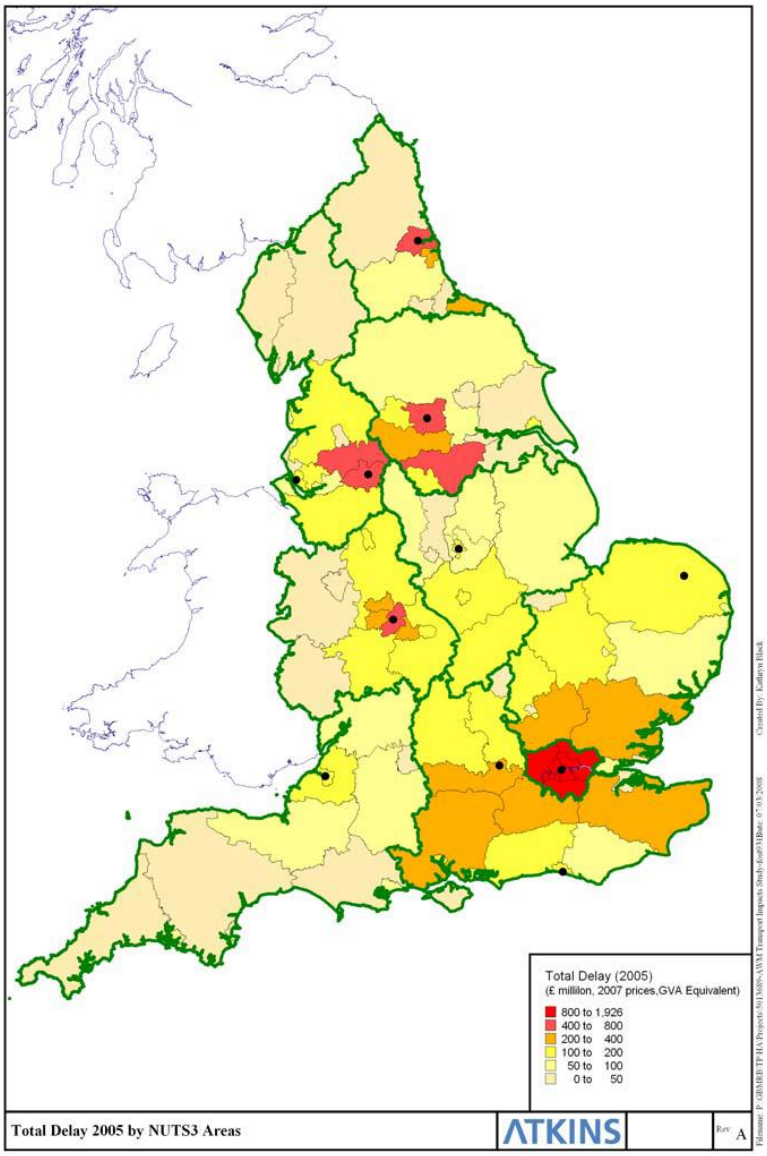
Improving productivity is therefore a major national priority. As productivity varies significantly across regions of the UK and England, improving productivity is also an important regional priority. Highways investment which reduces transport costs can improve productivity through a range of mechanisms, discussed in turn below.

2.3.1. Reducing business costs

The cost of congestion is a significant issue in the UK. The World Economic Forum's Global Competitiveness Report, which evaluates factors determining the productivity of national economies, ranked the quality of the UK's roads infrastructure as 29th in the world. This was below most other major Western economies[6]. Previous work by Atkins has estimated the wider economic costs of congestion across England for 2005 at least £25 billion and projections indicated this could rise to £55bn by 2025 (2007 prices). The same study found that the associated GVA loss (based on impacts on business productivity) is projected to be £28 billion in 2025, equivalent to around 1.7% of total GVA[7]. The results of this work by region are mapped in **Figure 1** below. More recent research suggests costs of congestion in the UK are set to rise from approximately USD 12.6bn in 2013 to approximately USD 21bn in 2030, purely in terms of direct costs to users[8].

[5] ONS. October 2016. International Comparisons of Productivity – Final Estimates: 2015.
[6] World Economic Forum. 2016. The Global Competitiveness Report.
[7] Atkins. 2008a. Economic Costs of Congestion in the Regions.
[8] CEBR. 2014. 50% Rise in Gridlock Costs by 2030.

Figure 1: Distribution of congestion costs across England, 2005



Source: Atkins (2008a)

The principal benefit of any transport investment is the reduction of transport costs, in terms of both time and pecuniary costs. This may occur either through reduced congestion or journey times, improvements in network reliability and through improving inter-modal connectivity. Where travel costs to businesses fall, the efficiency of businesses and the labour productivity of workers is improved. Whilst it is impossible to remove congestion on the road network completely, SRN investment has a clear role in mitigating it. Though congestion will eventually rise again, this would be an indicator of increased economic activity following investment.

Reduction in costs to businesses, in a perfectly competitive market, would be passed on to consumers through reductions in price and ultimately largely transferred to other elements of the market economy, such as increased property rents, as noted by TIEP[9]. However, in imperfectly competitive markets businesses may be able to directly benefit by using cost savings elsewhere, for example investing in expanded production. DfT's current appraisal methods recognise this and recommend that an additional 10% be applied to estimates of business time savings to reflect the effects of imperfect competition.

[9] Venables, A.J. et al, 2014. Transport investment and economic performance (TIEP): Implications for project appraisal.

Reduced costs also facilitate the other mechanisms through which transport supports economic growth discussed below: for example, as identified in the Eddington Report, agglomeration is constrained by costs associated with congestion.

Reduced transport costs are likely to be distributed unequally across economic sectors[10]. Vehicle-intensive industries are likely to experience greater productivity growth following roads investment[11]. For example, historical evidence from the US has indicated that amongst manufacturers, heavy goods manufacturers are most likely to benefit from highways investment[12]. As part of the evidence base for the Strategic Economic Growth Plan, Cambridge Econometrics have identified several 'SRN sensitive' sectors in the UK, including land transport, warehousing and storage, retail and manufacturing sub-sectors. Together, these SRN sensitive sectors employed over 8 million people in Great Britain in 2014, representing 28% of total employment[13].

The freight and logistics industry is likely to be a major beneficiary from the reduction of transport costs through investment in highways. Current projections suggest the costs of congestion to the freight industry alone will be £14bn in 2040[14]. The freight industry is an important sector for employment and output in its own right, accounting for 9% of UK GVA and 7% of total employment in 2014, and also provides essential services to almost all other economic sectors[15]. Using the SIC 2007 definitions, the transportation and storage sector accounted for 4.5% of workforce jobs and 4.5% of GVA in the UK in 2014[16]. Therefore ensuring its productivity is important for the UK economy.

2.3.2. Competition

Reduced transport costs are equivalent to a reduction in trade barriers. As firms gain access to larger markets through reduced transport costs, they also increase their exposure to competitors. This competitive process should reduce prices, increase output and stimulate innovation. However, as noted in the Eddington Review (2006), the impact of any improvement to the already advanced SRN is likely to be fairly marginal and hard to measure.

2.3.3. Agglomeration

Where productivity benefits accrue from a particular location, businesses may cluster or 'agglomerate' there. The proximity of firms may be the initial source of productivity benefits, or might provide additional benefits. Agglomeration is a central economic explanation for cities. Significant examples of sector-specific agglomerations (localisation) include the financial sector in the City of London and the clustering of technology firms in locations such as Cambridge. Benefits are also generated by cross-sector agglomerations (urbanisation).

Reduction of transport costs may itself constitute a competitive advantage, benefitting businesses in a particular region leading to agglomeration. This is highlighted by the DfT in *Action for Roads*, which cited the example of large logistics hubs. In research undertaken to support the SEGP, Cushman & Wakefield note that the success of logistics and industrial properties is dependent on efficient access to suppliers and customers, and therefore access to the SRN. This research also showed that many large industrial property schemes are located across the Midlands, to benefit from a central location and good access to the M40, M6 and M1[17].

Research into road improvements in the UK found that improved road accessibility increased the number of firms and therefore employees in a local area, but not employment in existing firms[18]. This suggests that the main impact of road improvements was to create agglomeration and increase competition in an area, rather than existing firms alone being able to capture benefits. The effect of this may however be to displace firms

[10] SACTRA, 1999. Transport and the economy: full report.
[11] Fernald, 1999. Roads to Prosperity? Assessing the Link between Public Capital and Productivity. Federal Reserve Board.
[12] Duranton, G. et al. 2013. Roads and Trade: Evidence from the US. *Review of Economic Studies*. **81** (2), 681-724.
[13] Based on sectors identified by Cambridge Econometrics and data from the Business Register and Employment Survey. This data measures total employment by industry and therefore includes the self-employed as well as employees.
[14] DfT. 2013. Action for Roads: A network for the 21st century
[15] DfT. 2011. The Logistics Growth Review: Connecting People with Goods.
[16] ONS Workforce Jobs and Regional GVA data.
[17] Cushman & Wakefield. July 2016. Highways England Strategic Economic Growth Plan: Property Market Overview.
[18] Gibbons et al. 2012. New Road Infrastructure: the Effects on Firms. SERC Discussion Paper 117

and employment from elsewhere rather than creating additional employment. There may however be productivity benefits from a particular location, due to agglomeration economies.

There are three causes of agglomeration benefits identified in the literature[19]:

- Reduced supply chain costs, due to proximity lowering transport costs between firms and to final markets. Transport investment can therefore support this form of agglomeration economies, for example by improving business-to-business and supply chain connectivity. Access to a large pool of suppliers also allows for more choice of input providers, which benefits businesses.
- Deep labour markets, allowing greater specialisation, better matching of firms and workers and greater labour market competition. This can also encourage innovation, entrepreneurship due to access to a wide range of potential employers[20]. Transport investment facilitates this form of agglomeration economy, for example by improving connectivity between or within towns and cities.
- Knowledge spillovers, whereby innovation spreads quickly between firms and workers operating in close physical proximity, improving productivity. However, this form of agglomeration is less relevant for highways investment as is based on increasing actual density rather than increasing effective density by reducing transport costs. Where actual density is high, transport investment may still have a role in supporting agglomeration by relieving congestion.

Estimates produced to support the Northern Way initiative estimated productivity gains from agglomeration of £235-500m per year from transport improvements, depending on the exact intervention implemented. Agglomeration is also one of the central arguments behind using transport improvements to develop the Northern Powerhouse as a single functional economic area[21]. Previous work appraising the wider economic benefits of road schemes by Atkins has found that agglomeration benefits represented the majority of wider economic benefits and were equivalent to 16-18% of conventional benefits[22].

Agglomeration often occurs with firms of a particular sector. Sectors do not benefit from agglomeration equally and impacts are larger for certain sectors. Empirical research suggests industries which benefit the most from agglomeration are generally in the service sector, particularly the business services, banking, finance and insurance, transport, storage and communications, real estate and distribution, hotels and catering sectors[23]. The agglomeration elasticities identified in the current WebTAG unit[24] reflect this, suggesting that productivity in the producer services sector is particularly responsive to agglomeration[25]. Agglomeration is by nature spatially limited and research has found that benefits decline significantly beyond 40 minutes driving time from an agglomeration centre, and disappear beyond 80 minutes[26]. The importance of transport infrastructure in facilitating agglomeration economies is therefore clear.

Improved transport provision can also mitigate congestion, a diseconomy of agglomeration. Agglomeration can be self-reinforcing, as more productive and high earning workers in the dominant sectors spend money locally, creating local demand in the traded service sector[27]. Land demand – for business and housing – often follows economic agglomeration, which is likely to influence use of the SRN.

2.3.4. Conclusion

This discussion has demonstrated how SRN investment can improve business productivity. This is principally through reduced transport costs, as captured in conventional economic appraisal. SRN investment can improve productivity through other mechanisms however, particularly through agglomeration economies. Additionally, the effects of SRN investment on trade, investment and labour markets can improve productivity

[19] Krugman, P. 1991. Geography and Trade. MIT Press.
[20] Glaeser, E. 2011. Triumph of the City. Penguin Press; New York.
[21] HM Government & Transport for the North. March 2015. The Northern Powerhouse: One Agenda, One Economy, One North.
[22] Atkins. 2008b. A11 Wider Economic Impacts Study; Atkins. 2010. A5-M1 Link Road Wider Economic Benefits.
[23] Graham, D.J. 2007. Agglomeration Economies and Transport Investment. OECD-ITF Joint Transport Research Centre Discussion Paper 2007-11.
[24] DfT, 2014, WebTAG Unit A2-1, Wider Impacts
[25] Graham, D.J. 2005. Wider Economic Benefits of Transport Improvements – Link Between Agglomeration and Productivity Stage 1.
[26] Rice et al. 2006. Spatial Determinants of Productivity: Analysis for the Regions of Great Britain. Regional Science and Urban Economics. 36(6), p. 727-752
[27] Atkins. 2014. River Crossings: East of Silvertown Crossings. Supporting Technical Documentation.

as well as output or employment, as discussed in subsequent sections. The What Works Centre for Local Economic Growth concluded, although drawing on a small number of studies, that there was some evidence for positive impacts of roads investment on productivity[28].

2.4. Increasing trade

Reduced transport costs can improve the profitability and therefore the extent of trade between markets, either within the country or internationally. Increased exports by UK companies increase economic output nationally. Estimates suggest that falling transport costs since 1960 boosted international trade by 10%-17.5% and UK GDP by 2.5% to 4.4%[29]. Estimates based on international data suggest that a 1% increase in freight rate costs reduces trade by 3.5% to 1.3%. Whilst infrastructure is only one determinant of transport costs, variation in infrastructure is estimated to account for 40%-60% of the variation in transport costs (this uses an aggregate infrastructure index including rail, road and telephone)[30].

Access to international gateways is key for international trade and therefore for the UK economy. Ports are conventionally highlighted in the literature as a critical infrastructure element for international trade and in 2013 accounted for 95% of the UK's imports and exports in terms of tonnage[31]. In recent decades, transport of manufactured goods by air has grown faster globally than transport by sea, particularly for high value goods[32]. International tourism to the UK is also dependent on international gateways.

Ports and airports are dependent on the quality of connecting infrastructure. A survey by the British Chambers of Commerce found that only 19% of businesses in England believed international transport connections were a barrier to exporting, 24% believed the quality of domestic connections were a barrier[33]. This is particularly relevant for the SRN, which carries two thirds of all freight traffic in England[34]. This is reflected in major SRN projects, such as the A5036 Princess Way improvements for access to the Port of Liverpool, or A160/A180 improvements to serve the Ports of Immingham and Grimsby.

As well as potentially increasing exports, highways investment which increases trade and access to global value chains could allow for greater specialisation and exploitation of economies of scale of export-oriented firms in services and manufacturing, which improves productivity[35]. Trade allows countries to produce goods according to their comparative advantage, creating mutually beneficial gains from trade. Whilst there may be firms who lose out to international competition, a shift into more competitive activities will improve the efficiency of the economy in the long run. Firm-level evidence suggests that internationally trading firms are more productive. Though causality is debated, it is certainly plausible that the ability to import better quality intermediate and capital goods and exposure to international competition through exports improves firm productivity[36]. This may then lead to productivity 'spillovers' to other firms in the industry, particularly if facilitated by agglomeration economies (see Section 2.3.3).

SRN investment therefore potentially supports economic growth through trade by reducing domestic and international transport costs, particularly by providing access to international gateways which are critical for the UK economy. This allows UK firms to expand their domestic and international trade and improve productivity through economies of scale and taking advantage of global supply chains.

[28] What Works Centre for Local Economic Growth. July 2015.
[29] Crafts, N. and T. Leunig. 2005. The historical significance of transport for economic growth and productivity. Eddington Transport Study: Research Annexes Volume 1.
[30] Behar, A. and A.J. Venables. 2010. Transport Costs and International Trade. *University of Oxford Department of Economics Discussion Paper Series.*
[31] DfT. 2014. Transport Statistics Great Britain 2014.
[32] Hummels, D. 2007. Transportation Costs and International Trade in the Second Era of Globalization. *Journal of Economic Perspectives.* **21** (3), pp. 131-154.
[33] British Chambers of Commerce. 2012. Exporting is good for Britain and transport connections support trade.
[34] DfT. 2013.
[35] Venables et al, 2014
[36] See for instance: Fernandes and Isgut. 2005. Learning-by-Doing, Learning-by-Exporting and Productivity. World Bank WPS3544; and Amiti and Konings. 2005. Trade Liberalization, Intermediate Inputs and Productivity. IMF Working Paper.

2.5. Facilitating investment

2.5.1. Business and housing

Investment in the SRN can create profitable investment opportunities. This applies to business investment or investment in housing due to increased demand for housing in a specific area or resolved site access issues. Investment made possible by transport investment is captured in WebTAG appraisal as 'dependent development'[37]. Investment by businesses typically increases local employment, output and/or productivity. Investment in housing supports local labour supply and can further reduce costs for businesses[38].

This relationship is also relevant for investment in major infrastructure projects. For example, DfT's *Action for Roads* highlights the importance of M25 upgrades for investment in the London Gateway development.

There is a lack of good evidence on the exact effect of transport investment on private investment. Other considerations, such as local labour supply, may be more significant[39]. Nonetheless, evidence from the British Chambers of Commerce demonstrates that 40% of respondents felt that transport infrastructure hinders the expansion of their business[40].

The effect of investment on national economic growth depends on whether investment is 'additional' or is activity displaced from elsewhere, which is typically assumed in appraisal[41]. This issue is addressed in detail in TIEP. Transport investment does appear to be able to influence the location of activity. Studies in the US have found that highways investment results in sub-regional displacement of locally traded activities closer to highways[42]. If investment is not additional there may be no net impact on aggregate output. As noted in the Eddington Review, academics and policymakers have consistently warned against a 'build it and they will come' approach to transport investment, which likely only causes displacement. It is possible that, in certain cases, non-additional activity is more productive in the location of the investment or leads to little displacement due to high local unemployment (so resources are not taken from elsewhere)[43].

2.5.2. Innovation

Cost savings following transport investment can plausibly facilitate innovation by businesses which can further contribute to productivity. One example is the development of 'just in time' inventory controls as commonly associated with Nissan Motor Manufacturing UK in Sunderland but also widespread throughout the retail sector. However, there is a lack of evidence on the role of transport investment in supporting innovation.

2.5.3. Globally mobile activity

Ernst & Young's *European Attractiveness Survey 2015* indicated that investors see transport and logistics infrastructure as the third most important factor in choosing a location, behind only political transparency and stability and the country or region's domestic market[44]. As discussed above, the SRN is key to transport and logistics infrastructure in the UK. In an increasingly globalised economy, the ability of a country or region in attracting inward investment is important for economic growth and transport is a key determinant of location decisions. An example in the UK is the concentration of international companies along the M4 corridor, which provides good access to the rest of the SRN, London and Heathrow.

Inward investment provides employment and increases economic output. Though from a national perspective there may still be issues of displacement, these are likely to be less relevant for investment in globally mobile activity focusing on internationally traded goods and services. Additionally, there is evidence that inward

[37] DfT,2016, WebTAG Unit A2.3 Transport Appraisal in the Context of Dependent Development
[38] Glossop. 2008. Housing and economic development: Moving forward together. Centre for Cities/Housing Corporation Centre for Research and Market Intelligence.
[39] Venables et al, 2014
[40] British Chambers of Commerce. 2008. The Congestion Question: A Business Transport Survey.
[41] Venables et al, 2014
[42] Chandra, A. and E. Thompson. 2000. Does public infrastructure affect economic activity? Evidence from the rural interstate highway system. *Regional Science and Urban Economics*. **30**, 457-900.
[43] Venables et al, 2014
[44] Ernst & Young. 2015. European Attractiveness Survey.

investment increases productivity, for example by facilitating the transfer of technology across national borders[45] [46].

2.5.4. Conclusion

SRN investment can therefore support economic growth by facilitating investment. Supporting housing and employment site investment is key for local economic growth, though the national impact is often unclear and is likely to be considerably smaller than the local impact as a result of displacement of activity from other areas. SRN investment can also support innovation by firms which improves productivity and makes the UK more competitive in attracting globally mobile activity.

2.6. Reducing unemployment and increasing labour supply

SRN investment allows for larger labour market areas, as workers are able to travel further to work without incurring additional costs. A greater number of firms and workers in the same labour market should result in better matching of jobs and workers. This will not only improve productivity (an agglomeration benefit) but also reduce frictional unemployment (i.e. unemployment experienced whilst searching for a job). This is well established in theory, but there is a lack of empirical evidence[47].

If transport costs fall, workers are also in theory able to accept lower rates of pay for a job the same distance away, or will receive a real wage gain if the wage remains fixed. This may result in greater labour market participation in an area. Previous work by Atkins on scheme wider economic impacts and congestion costs has found that estimated effects on labour market participation are typically limited, as very large savings in travel time would be required[48]. The What Works Centre for Local Economic Growth concluded that in the majority of studies there is no or mixed evidence an effect of roads investment on employment. Positive effects on local employment are possible, but this may result from displacement of existing employment[49].

Transport investment is likely to affect the distribution of jobs. Employment created by investment is subject to the same issues regarding additionality discussed above for investment. Evidence from the US suggests expansion of highways infrastructure does increase the volume of employment in locations better served by highways, but this only indicates displacement of employment from elsewhere[50]. Research to support the Northern Way found that reducing transport times within and between city regions is likely to result in increased employment in urban centres, but a large proportion of this was offset by a reduction in employment in peripheral districts[51]. There may be a productivity gain associated with such a shift due to agglomeration benefits.

Localised labour market failures such as immobility of labour or a local mismatch of skills supply and demand can cause high structural unemployment in a local area. Transport projects which reduce commuting or business costs could increase labour demand and therefore increase employment. This is often a rationale behind using transport investment for regeneration. Displacement in this instance may be mitigated if new jobs are taken by previously involuntarily unemployed individuals living locally. Theory and evidence from the Netherlands suggest such a project would create a clear *welfare* benefit compared to investing in a full employment region, and improve economic performance locally. However, facilitating job creation in a high-unemployment area may improve aggregate productivity less than in a high employment area[52].

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[45] Alfaro, L, S. Kalemli-Ozcan and S. Sayek. 2008. FDI, Productivity and Financial Development. *The World Economy*. **32**(1), pp. 111-135.
[46] Griffith, R., S. Redding and H. Simpson. 2003. Productivity Convergence and Foreign Ownership at the Establishment Level. Centre for Economic Performance. LSE.
[47] Gibbons, S. and S. Machin. 2006. Transport and Labour Market Linkages: Empirical Evidence, Implications for Policy and Scope for Further UK Research.

[48] Atkins. 2007. Economic Costs of Congestion in the East Midlands; Atkins. 2010. Economic costs of congestion in the English regions; Atkins, 2008; Atkins, 2010.
[49] What Works Centre for Local Economic Growth. July 2015.
[50] Duranton, G and M.A. Turner. 2012. Urban Growth and Transportation. *Review of Economic Studies*. **79** (4), 1-36.
[51] Northern Way. 2006. Model Development and Results for Northern Way using the South & West Yorkshire Dynamic Model.
[52] Laird, J. and P. Mackie. 2009. The Northern Way: Strengthening the Assessment of Transport's Wider Impacts on the Economy.

SRN investment therefore could support economic growth by making it easier for workers to find suitable employment opportunities and reducing the time spent searching for jobs. While in theory SRN investment can also induce greater labour market participation and contribute to addressing market failures, the evidence for these is less clear and likely to be conditional on a wider range of policies and interventions.

2.7. Relevance for SRN investment

While the literature provides a clear picture how transport investment in general can affect economic output and growth, empirical evidence has little to say directly about how specific interventions or a particular transport investment, such as a major SRN scheme, may affect the size and growth of the national economy. However, some relevant conclusions that can be drawn from evidence and key policy papers are:

- The impact of investment depends on the rest of the network[53]. Impacts can therefore be enhanced by considering connectivity to the broader transport network and major strategic infrastructure investments, such as HS2.
- Local economic and demographic circumstances influence the case for investment. Therefore, a strategic approach should be taken whereby transport investment should enable existing and demonstrable growth and address specific limitations, rather than aiming to instigate growth in otherwise poorly performing areas. This is relevant for alignment of investment with local objectives (for example with Local Enterprise Partnerships). The What Works Centre for Local Economic Growth, in their review of the evidence on transport, concluded that there was not currently clear evidence for cost-effectiveness of transport investment as an approach to stimulate new economic activity in less economically successful areas[54].
- Long-term commitments to transport investment allow for private investment to respond[55] [56]. This is part of the rationale behind the UK National Infrastructure Plan and the Road Investment Strategies. The long term view has also been viewed as an important success of TfL's approach to investment planning[57]. Providing funding and planning certainty to local authorities has been identified as key for maximising economic growth and regeneration opportunities in relation to HS2, and the same is likely to apply to the SRN[58].
- Once an advanced network is in place, as in the UK, additional investment has less effect. Interventions should therefore focus on the efficiency of the existing network rather than extending it[59].
- The extent of benefits from investment are likely to be dependent on how projects are selected, prioritised, planned and implemented[60].

Highways England have also identified several ways in which their operations could support the growth mechanisms outlined in this document. These are included in Appendix A.

2.8. Conclusion

This section has outlined the mechanisms through which SRN investment can contribute to economic growth locally and nationally, by improving productivity and increasing economic output through reducing costs, agglomeration economies, increased trade, facilitating investment and reducing unemployment.

Of these, the evidence is strongest for the ability of transport investment to improve productivity, through a range of mechanisms, and increasing international trade. While transport investment facilitates further private investment, which is important for local economies, this may be displaced from elsewhere and therefore not provide a net impact at the national level. This is less likely in the case of globally mobile activity. Transport investment can increase labour supply, but there is a lack of consistent clear evidence for such an effect.

[53] World Bank, 2014. Strong, sustainable and balanced growth: enhancing the impact of infrastructure investment on growth and employment. Background note prepared for the G20.
[54] What Works Centre for Local Economic Growth. July 2015. Evidence Review 7: Transport
[55] Eddington, R. 2006. The Eddington Transport Study: Transport's role in sustaining the UK's productivity and competitiveness.
[56] Aghion, P. et al. 2013. Investing for Prosperity: Skills, Infrastructure and Innovation. LSE Growth Commission Final Report.
[57] Worsley, T. and P. Mackie. 2015. Transport Policy, Appraisal and Decision-Making. RAC Foundation.
[58] For example, Atkins' experience in Maximising the Growth and Regeneration Benefits of HS2: Final report.
[59] Eddington, 2006.
[60] World Bank, 2014.

Evidence demonstrates that this results in a positive relationship between transport investment and GDP at a national level, though this evidence is limited in providing insight on what forms of transport investment have the greatest impact on output. However, policy papers and studies do highlight some key recommendations for maximising the economic growth impact of transport investment, presented in section 2.7.

3. The Strategic Road Network: Impacts by theme

3.1. Context

This section outlines the relevant points relating to how the SRN can contribute to economic activity, summarising the evidence presented in the previous chapter under four key themes: People, Businesses, International Gateways and Nationally Significant Infrastructure Projects. These thematic summaries contribute to the rationale for HE playing a significant role in the pursuit of national and sub-national growth priorities.

3.2. People

People can benefit from and contribute to economic growth resulting from SRN investment through effects on the labour markets and the effect on housing provision.

Labour markets: As discussed in section 2.6, the SRN can contribute to reducing unemployment, in terms of providing for increased demand for labour so businesses can expand output, reducing the time spent searching for relevant jobs whilst unemployed and potentially by inducing greater labour market participation by reducing the cost of travelling to jobs. Whilst these issues are of great importance locally, evidence suggests transformational effects of schemes are required to achieve net national impacts (rather than redistribution), potentially combined with other policy interventions such as skills development.

Housing: As discussed in section 2.5.1, SRN investment can facilitate the provision of housing. Housing supply and the costs of housing is a major issue for the UK, particularly in areas of London and the South East. A shortage of housing and associated high housing costs can restrict labour mobility, which is important for supplying labour and skills where there is demand and therefore for economic growth. Research by Shelter suggests housing costs had affected the ability of 12% of people, and 18% of 18-34 year olds, to move for work[61]. Housing provision also supports employment in the construction industry. Expanding housing supply is therefore important for economic growth, both nationally and locally.

Non-work users: Reducing transport costs on the SRN does not only benefit business users, such as the freight industry. Costs are reduced for commuters and for non-work related travel, such as travelling to leisure activities or retail sites. However, this is a welfare benefit, rather than related to economic growth.

3.3. Businesses

The mechanisms associated with SRN investment discussed in section 2 principally apply to businesses. They are briefly summarised here.

Productivity: SRN investment can improve the productivity of businesses through reducing costs and therefore increasing efficiency, which benefits businesses particularly in imperfectly competitive markets, and otherwise benefits both business and consumers. Businesses can also benefit through SRN investment reducing travel time between businesses, creating agglomeration economies. Through increased trade, businesses are also exposed to greater competition which can improve productivity.

Investment: SRN investment can make investment in new or increased economic activity profitable due to reducing costs, either in terms of transport costs, employment costs or simply making potential investment sites more accessible. Investment increases output and typically productivity (either through innovation or economies of scale), contributing to economic growth. Additionally, quality of transport infrastructure is a key determinant in location choices of globally mobile activity. Inward investment resulting from this is important for local and national economic growth.

Trade: Improvements in the transport network reduce the costs of domestic and international trade. This is particularly true of investment in the SRN, which carries two thirds of freight in the UK and provides critical connectivity to international gateways. Increased trade indicates increased demand for and production of goods and therefore represents economic growth. Exports are also important for economic growth and for the

[61] FTI Consulting. 2011. Investment in Housing and its Contribution to Economic Growth. Report for Shelter.

UK's current account. It is also plausible that the ability to import better quality intermediate and capital goods could improve firm productivity, although it also has the potential for negative impacts on the previous domestic suppliers of the imported goods.

3.4. International Gateways

International gateways include ports, airports and the Channel Tunnel crossing. As an island, the economy of the UK is dependent on its access to world markets through these facilities. The role of the SRN in providing access to these gateways is therefore just as critical. Many current areas of significant congestion on the SRN, such as the M25 and Heathrow and Operation Stack on the M20 in Kent, relate directly to international gateways (see below). International connectivity is also an important factor for attracting investment in globally mobile activity.

Investment in the SRN which facilitates access to international gateways supports economic growth through the following:

Imports: Global value chains have meant that imports of intermediate goods are key to the productivity of UK businesses, particularly in manufacturing. The UK currently imports twice as much as it exports through ports[62]. The Nissan Motor Manufacturing UK plant in Sunderland is famous for its 'just in time' approach to supply chains: this would be impossible without reliable imports through international gateways. As discussed previously, productivity is key to economic growth.

Exports: Exporting is key for the expansion of UK businesses, with international demand fuelling economic growth. This cannot be achieved without access to international gateways through the SRN. This is particularly relevant for the manufacturing and agri-food sectors. Exports contribute directly to economic output and contribute to the UK's current account.

Business travel and tourism: Access to international gateways, particularly airports, is also key for exports of UK services through business travel. The importance of Heathrow as an international air travel hub and the growth of other UK airports is dependent on the quality of road access. Amongst selected UK airports, in 2014 the modal share of car or taxi/minicab for passenger access to the airport ranged from 49% (Stansted) to 83% (Manchester) and was on average 64%[63]. The ease of travelling to and within the UK is also important for growth in the tourism sector.

3.5. Nationally Significant Infrastructure Projects

Investment in the SRN has a clear role to play in bringing forward and supporting nationally significant infrastructure projects. These include HS2, infrastructure investment as part of the Northern Powerhouse and commercial investments such as the potential development of a Paramount theme park in North Kent. These projects contribute to economic growth by improving the transport infrastructure of the country and rebalancing economic growth in terms of sectoral and regional focus.

Inter-modal connectivity: Connectivity between transport modes is important for maximising the economic benefits of major transport infrastructure. For example, HS2 stations can provide access to the high speed line for a much larger area if well connected by road. The SRN has been a relevant consideration in particular for the Birmingham and East Midlands Hub stations. This is also clear in the One North transport proposals relating to the Northern Powerhouse.

Centres of economic activity: Other nationally significant infrastructure projects aim to develop economic activity and growth in a particular area, for example in the south bank of the Thames in Kent or in the north of England. Through providing access to specific sites and using transport investment to benefit people, businesses and international gateways (as discussed above), the SRN has a critical role to play in supporting new development.

[62] DfT. 2015. Transport Statistics Great Britain 2015.
[63] DfT. 2015. ^ ibid.

References

Aghion, P. et al. 2013. Investing for Prosperity: Skills, Infrastructure and Innovation. LSE Growth Commission Final Report.

Alfaro, L, S. Kalemli-Ozcan and S. Sayek. 2008. FDI, Productivity and Financial Development. *The World Economy*. **32**(1), pp. 111-135.

Atkins. 2007. Economic Costs of Congestion in the East Midlands; Atkins. 2010. Economic costs of congestion in the English regions

Atkins. 2008a. Economic Costs of Congestion in the Regions.

Atkins. 2008b. A11 Wider Economic Impacts

Atkins, 2010. A5-M1 Link Road: Wider Economic Benefits

Atkins. 2014. River Crossings: East of Silvertown Crossings: Supporting Technical Documentation.

Atkins. 2014. Maximising the Growth and Regeneration Benefits of HS2: Final Report.

Amiti and Konings. 2005. Trade Liberalization, Intermediate Inputs and Productivity. IMF Working Paper.

British Chambers of Commerce. 2008. The Congestion Question: A Business Transport Survey.

British Chambers of Commerce. 2012. Exporting is good for Britain and transport connections support trade.

Behar, A. and A.J. Venables. 2010. Transport Costs and International Trade. *University of Oxford Department of Economics Discussion Paper Series.*

Calderon, C. et al. 2011. Is Infrastructure Capital Productive? A Dynamic Heterogeneous Approach. Policy World Bank Research Working Paper Series 5682.

CEBR. 2014. 50% Rise in Gridlock Costs by 2030.

Chandra, A. and E. Thompson. 2000. Does public infrastructure affect economic activity? Evidence from the rural interstate highway system. *Regional Science and Urban Economics*. **30**, 457-900.

Crafts, N. and T. Leunig. 2005. The historical significance of transport for economic growth and productivity. Eddington Transport Study: Research Annexes Volume 1.

Cushman & Wakefield. July 2016. Highways England Strategic Economic Growth Plan: Property Market Overview.

DfT. 2011. The Logistics Growth Review: Connecting People with Goods.

DfT. 2013. Action for Roads: A network for the 21st century.

DfT. 2014. Transport Statistics Great Britain 2014.

DfT. 2014. WebTAG Unit A2-1, Wider Impacts.

DfT. 2015. Transport Statistics Great Britain 2015.

DfT. March 2015. Road Investment Strategy: for the 2015/16-2019/20 Road Period.

Duranton, G and M.A. Turner. 2012. Urban Growth and Transportation. *Review of Economic Studies*. **79** (4), 1-36.

Duranton, G. et al. 2013. Roads and Trade: Evidence from the US. *Review of Economic Studies*. **81** (2), 681-724.

Eddington, R. 2006. The Eddington Transport Study: Transport's role in sustaining the UK's productivity and competitiveness. Ernst & Young. 2015. European Attractiveness Survey.

Fernald. 1999. Roads to Prosperity? Assessing the Link between Public Capital and Productivity. Federal Reserve Board.

Fernandes and Isgut. 2005. Learning-by-Doing, Learning-by-Exporting and Productivity. World Bank WPS3544

FTI Consulting. 2011. Investment in Housing and its Contribution to Economic Growth. Report for Shelter.

Gibbons, S. and S. Machin. 2006. Transport and Labour Market Linkages: Empirical Evidence, Implications for Policy and Scope for Further UK Research.

Gibbons et al. 2012. New Road Infrastructure: the Effects on Firms. SERC Discussion Paper 117

Glaeser, E. 2011. Triumph of the City. Penguin Press; New York.

Glossop. 2008. Housing and economic development: Moving forward together. Centre for Cities/Housing Corporation Centre for Research and Market Intelligence.

Graham, D.J. 2005. Wider Economic Benefits of Transport Improvements – Link Between Agglomeration and Productivity Stage 1.

Graham, D.J. 2007. Agglomeration Economies and Transport Investment. OECD-ITF Joint Transport Research Centre Discussion Paper 2007-11.

Gramlich, E.M. 1994. Infrastructure Investment: A Review Essay. *Journal of Economic Literature.* **32** (3), 1176-1196.

Griffith, R., S. Redding and H. Simpson. 2003. Productivity Convergence and Foreign Ownership at the Establishment Level. Centre for Economic Performance. LSE.

HM Government & Transport for the North. March 2015. The Northern Powerhouse: One Agenda, One Economy, One North.

HM Treasury. October 2010. National Infrastructure Plan 2010.

HM Treasury. December 2014. National Infrastructure Plan 2014.

Hummels, D. 2007. Transportation Costs and International Trade in the Second Era of Globalization. *Journal of Economic Perspectives.* **21** (3), 131-154.

Krugman, P. 1991. Geography and Trade. MIT Press.

Laird, J. and P. Mackie. 2009. The Northern Way: Strengthening the Assessment of Transport's Wider Impacts on the Economy.

Northern Way. 2006. Model Development and Results for Northern Way using the South & West Yorkshire Dynamic Model.

ONS. October 2016. International Comparisons of Productivity – Final Estimates: 2015.

Rice et al. 2006. Spatial Determinants of Productivity: Analysis for the Regions of Great Britain. Regional Science and Urban Economics. 36(6), p. 727-752

Romp, W. and J. De Haan. 2007. Public Capital and Economic Growth: A Critical Survey. *Perspektiven der Wirtschaftspolitik*. **8** (S1), 6-52.

SACTRA. 1999. Transport and the economy: full report.

Venables, A.J. et al, 2014. Transport investment and economic performance (TIEP): Implications for project appraisal. DfT Commission.

Volterra. 2016. Valuing the Strategic Road Network. Highways England.

What Works Centre for Local Economic Growth. July 2015. Evidence Review 7: Transport

World Bank, 2014. Strong, sustainable and balanced growth: enhancing the impact of infrastructure investment on growth and employment. Background note prepared for the G20.

World Economic Forum. 2016. The Global Competitiveness Report.

Worsley, T. and P. Mackie. 2015. Transport Policy, Appraisal and Decision-Making. RAC Foundation.

Appendix A. Operational support for economic growth

Highways England have identified several ways their operations could support the ability of transport investment to facilitate economic growth. These are:

1. Improving our customer service can facilitate the planning process leading to more investment and development
2. Our investments in road infrastructure can unlock land for development, leading to investment and development.
3. Highways England improving efficiency can reduce the cost of road transport (given that we will be funded from road tax) and this therefore can reduce the costs of production.
4. The long run determinant of growth is technological change. Highways England's role in anticipating and supporting wider technological change that will increase efficiency/productivity. Our R&D programme and support of innovative techniques and technologies could create market leaders in the UK that are then able to win export business.
5. Improved road infrastructure will attract additional domestic tourism – displacing foreign holidays. Increased domestic demand implies growth.
6. Highways England's investments and work with the supply chain have a positive externality on the labour market – increased skills/training increase the productive capacity of the workforce.
7. Our network can impact on the health and productivity of the workforce. Human capital can be reduced by accidents on the network and the health impacts of pollution. Noise disturbance resulting in loss of sleep could also reduce productivity.

If you need help accessing this or any other Highways England information, please call **0300 123 5000** and we will help you.

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