

Adran yr Economi a'r Seilwaith
Department for Economy and Infrastructure

File Ref WG/REB/OBJ0270.3 – GWT/Whitelegg



Llywodraeth Cymru
Welsh Government

Objection Ref OBJ0270

Response to Objector's Evidence: Professor John Whitelegg

(Gwent Wildlife Trust))

1. GROUNDS FOR OBJECTION

1.1. Details

- 1.1.1. Professor John Whitelegg has submitted a Statement of Evidence dated February 2017 in relation to the draft statutory Orders associated with the Welsh Government's proposals for the M4 Corridor around Newport, which has been received via the Programme Officer.
- 1.1.2. The Welsh Government understands the evidence submitted within Professor John Whitelegg's Statement to be based on the following:
1. Stated that evidence nationally and internationally evidence is clear on wider economic impacts and new road building is just as likely to drain jobs away from a local economy as it is to attract them.
 2. Considers that there is a lack of evidence that transport delivers local economic benefits
 3. Considers that new road building is just as likely to drain jobs away from a local economy as it is to attract them.
 4. Considers that spatial factors (peripherality and access to economic mass) are not linked to economic performance.
 5. Considers that there is no evidence that perceptions of the quality of transport influences the decisions of businesses and visitors.
 6. Concerned that building new roads generates new traffic defeating the rationale for new roads.
 7. Stated that the Scheme does not conform with the (The Environment (Wales) Act 2016) by reducing the chances of success in reducing greenhouse gases by 80% on a 1990 base by 2050.
 8. Stated that non-road building options have not been clearly specified or "worked up" in sufficient detail to be tested against the road building option.
 9. Stated that the WebTAG process has not been followed in the assessment of the Scheme. There has not been a sequential approach. The proposal is not in conformity with guidance on Transport Appraisal and it is not acceptable to proceed with a very expensive project that has so blatantly ignored guidance.

10. Concerned that transport interventions that reduce congestion, improve journey time reliability, reduce greenhouse gases and improve air quality are very important indeed and have not been given the attention they deserve.
11. Stated that the Scheme is a very expensive and deeply flawed project and has been justified on inaccurate VFM and BCA calculations.
12. Stated that the Scheme will add 980,000 tonnes of Carbon Dioxide, referring to the Paris agreement on Co2 and WG policy 'Reducing Welsh emissions', Environment Wales Act 2016.
13. Stated that "Beyond Transport infrastructure" published in 2006 reported many of the schemes reviewed have demonstrated significant increases in traffic volumes (in the range of 10-35%, within a period of one to two years after opening).
14. Concerned that a large amount of induced traffic will usually have the effect of cancelling out or minimising the travel time savings that have been predicted for a road scheme.
15. Concerned that the Welsh Government report on traffic forecasting issued in December 2016 makes no reference to the SACTRA report (para 29 above) or induced traffic.
16. Concerned that the Welsh Government report on traffic forecasting ignores the reality of exaggerated and inaccurate forecasts made in the past.
17. Stated that in the Inspector report into the proposed M74 motorway in Glasgow, The Inspector came down firmly against the M74 and accepted the case made by the objectors (Table 4). "it cannot be concluded that the public benefits of the proposal would be sufficient to outweigh the considerable disadvantages". Considers that an objective assessment would reject the assertion that such investments could maintain accessibility improvements over time.
18. Stated that the Scheme has been promoted and developed in an evidence-free environment and cannot deliver its key objectives. The Scheme has ignored the large number of ways in which specific problems can be clearly described and specific solutions based on evidence can be designed to target those specific problems.

2. REBUTTAL

2.1. Points Raised

2.1.1. Some of the above points have already been addressed in proofs of evidence. Others are dealt with by topic by the relevant witness in the following sections, in addition to their general proofs of evidence, to which readers should also make reference in their entirety for a full understanding of the Welsh Government's case. For ease of reference the places where the above points are addressed in this Rebuttal are listed in the table below:

Objector's point reference	Rebuttal paragraph reference	Objector's point reference	Rebuttal paragraph reference
1	2.2.1	10	2.1.2
2	2.2.2	11	2.2.6
3	2.2.3	12	2.4.1
4	2.2.4	13	2.3.2
5	2.2.5	14	2.3.3
6	2.3.1	15	2.3.4
7	2.1.2	16	2.3.5
8	2.1.2	17	2.3.6
9	2.1.2	18	2.1.2

2.1.2. The Objector's points that have already been covered in proofs of evidence are as follows:

1. **Point 7** (Stated that the Scheme does not conform with the (The Environment (Wales) Act 2016) by reducing the chances of success in reducing greenhouse gases by 80% on a 1990 base by 2050) / Proof of Evidence of Matthew Jones WG1.1.1 section 15, 'Carbon'.
2. **Point 8** (Stated that non-road building options have not been clearly specified or "worked up" in sufficient detail to be tested against the road building option) / Proof of Evidence of Matthew Jones WG1.1.1 section 3, 'Background'.

3. **Point 9** (Stated that the WebTAG process has not been followed in the assessment of the Scheme. There has not been a sequential approach. The proposal is not in conformity with guidance on Transport Appraisal and it is not acceptable to proceed with a very expensive project that has so blatantly ignored guidance) / Proof of Evidence of Matthew Jones WG1.1.1 section 10, 'Objectives of the Scheme' and paragraphs 16.3 - 16.5. It should also be noted that WelTAG cross refers to WebTAG in some cases where TAG methodologies should be adopted in assessment, for example as outlined in WG1.1.1 paragraphs 8.6 and 8.7 for traffic forecasting.
 4. **Point 10** (Concerned that transport interventions that reduce congestion, improve journey time reliability, reduce greenhouse gases and improve air quality are very important indeed and have not been given the attention they deserve) / Proof of Evidence of Matthew Jones WG1.1.1 section 3, 'Background'.
 5. **Point 18** (Stated that the Scheme has been promoted and developed in an evidence-free environment and cannot deliver its key objectives. The Scheme has ignored the large number of ways in which specific problems can be clearly described and specific solutions based on evidence can be designed to target those specific problems) / Proof of Evidence of Matthew Jones WG1.1.1 section 3, 'Background' and section 10 'Objectives of the Scheme'.
- 2.1.3. The other points are responded to by specialist topic in turn in the sections following.

2.2. Stephen Bussell (Economics)

- 2.2.1. Response to **Point 1** (Stated that evidence nationally and internationally evidence is clear on wider economic impacts and new road building is just as likely to drain jobs away from a local economy as it is to attract them):
1. Professor Whitelegg makes a number of points in relation to the linkages between transport and the economy. I deal with each of these in turn below.

2.2.2. Response to **Point 2** (Considers that there is a lack of evidence that transport delivers local economic benefits):

1. Professor Whitelegg considers that there is a lack of empirical evidence that highway improvements deliver positive local economic outcomes. Before turning to the literature itself, it is important to consider the challenges associated with making ex-post assessments of the impact of transport investment. For large, complex economies, economic performance is determined by a wide range of factors of which transport is just one. Assessing the impact of a transport intervention requires us to establish the 'counterfactual' – the economic outcomes that would have been realised had the improvement not been delivered. In practice, it is highly challenging to separate out the effects of transport from other factors.
2. These challenges are noted in the recent review of this topic, Transport Investment and Economic Performance: Implications for Project Appraisal (the TIEP review)¹. The TIEP review, is an independent academic report, commissioned by the Department for Transport in 2014, to consider evidence on how transport investment affects economic performance. The TIEP report (page 14) states:

'The effects of transport on investment, employment and GDP – nationally and broken down by area – are also widely researched, but the literature does not supply robust answers to many of the key questions. Establishing evidence is extremely demanding for two fundamental reasons. The first is that of the counterfactual; the outcome of a project is observed, but assessment of what would have happened in the absence of the project has to be inferred in some way. The second is that, even if this can be done with any accuracy for some set of completed projects, experience is only partially transferable to prospective projects.'
3. These issues partly explain the limitations of 'ex-post' evidence of the local and regional impact of transport investments, particularly in respect of case study evidence (the effect of specific transport investments on the economy).

¹ <https://www.gov.uk/government/publications/transport-investment-and-economic-performance-tiep-report> (Document 6.1.23)

4. In considering the evidence for the economic benefits of transport improvements, it is important to distinguish between different types of economic impact. The TIEP review considers three ways in which transport affects the economy and considers the evidence base for each impact in turn. These are user benefits (direct transport cost savings), effects on productivity (including agglomeration effects), and impacts on investment, employment and GDP.
5. In respect of user benefits, that transport congestion and poor journey time reliability imposes costs on economic activity is not disputed in transport economics literature. The assessment of user benefits for the M4CaN Scheme is based on outputs from the M4CaN Transport Model and has been undertaken using the most up to date evidence on the values of travel time savings which were subject to a major review and consultation exercise completed in 2015.
6. Secondly, the TIEP review addresses the relationship between transport and productivity. The review finds substantial and consistent evidence of a positive association between proximity (or 'access to economic mass') and productivity. The TIEP review cites a survey of the literature undertaken by Rosenthal and Strange in 2004 which found that, based on secondary evidence, doubling city size seems to increase productivity by an amount that ranges from roughly 3-8%. Furthermore, the TIEP report concludes that transport is a '*necessary ingredient to securing these benefits*'.
7. The TIEP review also considers the evidence on the impact of transport improvements on investment and employment at different spatial levels. I acknowledge that it is this element that Professor Whitelegg addresses most directly in his Proof of Evidence. However, it seems to me that Professor Whitelegg's conclusion that the economic benefits are unproven is, in part, shaped by the fact that he does not recognise the relationship between transport and productivity (either as a result of lower transport costs or improved accessibility).

8. The TIEP review acknowledges that – in part because of the technical challenges outlined above – the literature in this area does not provide robust answers to many of the key questions, particularly in relation to two aspects: the additionality of employment and investment effects (the extent to which higher employment in a particular region are accounted for by a reduction in activity elsewhere), and the two-way road debate (which I consider in Section 2.2.3 below).
9. However, whilst there are uncertainties, the TIEP report finds substantial evidence that transport improvements do lead to improved economic outcomes in the local area. It concludes that, '[studies which look at the effects of specific projects] *generally find positive effects of large transport projects on measures of economic performance such as local area employment or GDP, although effects for smaller projects are harder to tease out*².
10. Key evidence identified in the TIEP report is as follows:
 - a. McQuaid et al (2004) consider the influence of transport on business location decisions. They find that transport improvements are unlikely to cause firms to move but, for firms who are looking for new premises, accessibility is one of the key factors influencing their choice of a new location;
 - b. Research for the US by Strauss-Kahn and Vives (2009) find that good transport links are one of the main factors attracting office head-quarters to second-tier US cities.
 - c. A number of studies from the US find a positive relationship between improvements in accessibility and the density of local employment.
 - d. In the UK, the most comprehensive investigation of the spatial impacts of highway improvements has been undertaken by the Spatial Economic Research Centre (SERC) in 2012. The SERC study finds 'strong effects' of transport improvements on area employment and on plant counts with a 10% improvement in accessibility leading to an approximately 3% increase in the number of business and employment. SERC conclude that increases in employment are a result of firm entry rather than an increase in the size of existing firms.

² Page 14.

11. That highway improvements can lead to positive local economic outcomes is also supported by evidence closer to home. Contrary to Professor Whitelegg's evidence, there is evidence that the construction of the Severn Bridge has been positive for the economy of South Wales. Professor Whitelegg references the 1973 publication *The economic consequences of the Severn Bridge and its associated motorways* (Cleary, E.J. and Thomas, R.E.). He draws from this research that the Severn Bridge produced no significant relocation of manufacturing establishment as a consequence of the bridge. Although the research did not find any significant relocation of factories, the overall finding for manufacturing was that the bridge had improved prospects for industry in South Wales without weakening those of industry in South-West England³.
12. It is important to highlight the timing of the study, with much of the survey work carried out before completion of the rest of the M4 or the sections of the M5 immediately north and south. This means that the study could not have assessed the full economic impact of the Severn Bridge, given that other areas of the network were incomplete.
13. A second study was carried out by the Welsh Office (1980), by which time these sections of motorway were complete. Similar to above, the Welsh Office study also relied on survey work and quantifying reactions, rather than establishing the net impact on employment. The survey of firms found that:
 - 47% of large manufacturing establishments, 84% of small manufacturers and 85% of distributive firms considered that easier access to markets had "helped to increase business".
 - Of manufacturing firms which had opened factories since the opening of the Bridge, 79% said that access to the (English) motorway network via the M4 and Bridge had been a factor in their choice of location, and 51% said it had been a major factor – though it was thought unlikely that it had been a key factor in many cases.

³ Cited in David Simmonds Consultancy. Case Study: The Severn Bridge. Summarised here: <http://www.davidsimmonds.com/index.php?action=show&title=case-study-evidence-main-report&module=filedownload&src=@random4767836fd9d18>.

The availability of labour and government financial assistance were the most frequently mentioned factors⁴.

14. A third study was carried out by Cambridge Economic Consultants in 1987, which built on previous work to produce more comprehensive estimates of the long-term employment effects of the Severn Bridge and the M4. This study found that the Severn Bridge and M4 increased economic activity and employment in South Wales by about 4%⁵.
15. The SERC study referenced above sheds some light on the issue of additionality (the degree to which any new economic activity attracted as a result of a transport improvement displaces local activity). SERC find that increases in employment are primarily the result of new firm entry – therefore, the employment must have relocated from somewhere. However, when assessing the degree to which jobs are additional we need to be clear on the geographic area we are considering. Clearly it would be unlikely that firms attracted to South Wales as a result of the Scheme would represent additional impacts at a UK level.
16. SERC found evidence that highway improvements resulted in a net gain in employment up to 30km from the site of the improvement⁶. The study finds no strong evidence for effects being driven predominantly through displacement from outer wards to inner wards. This suggests that highway improvements can have a positive impact on employment at least at the level of a city or city-region. In the context of the M4CaN, a 30km radius stretches beyond the Severn Crossings.
17. As I make clear in my evidence, whilst the Scheme is expected to attract new investment to employment sites in the south of Newport, not all of these new jobs will be fully additional to the South Wales economy.
18. However, given the importance of the M4 Corridor, the proximity of the Scheme to the Severn Crossings, and the significance of the improvement in journey times and accessibility, it is reasonable to conclude that the Scheme will deliver a net overall increase in investment

⁴ Ibid

⁵ Cambridge Economic Consultants (1987): Case studies of the role of infrastructure projects in local and regional economic development. Unpublished report to the Department of Transport. Cited in David Simmonds Consultancy. Case Study: The Severn Bridge.

⁶ No attempt was made to assess employment impacts beyond 30km.

in the study area, rather than simply a redistribution of employment from one part of the study area to another.

19. In overview, my interpretation of the literature differs from Professor Whitelegg. In my opinion there is substantial evidence which suggests that transport can lead to positive local economic outcomes. However, such impacts are not assured and will not occur in all circumstances. In other words, transport is a necessary but not sufficient condition for stimulating economic activity.
20. It is important, therefore, to consider the specific economic context to the transport improvement. In respect of the Scheme, there are a number of reasons to suggest that the economic impacts would be significant. In summary:
 - a. The M4 is strategically important as the most heavily used transport infrastructure in Wales which acts as the primary route in and out of South Wales for the movement of goods.
 - b. The existing M4 is highly congested which indicates that transport demand exceeds supply and that capacity constraints are imposing costs on economic activity. In this respect it is notable that the Eddington Review concludes that *'a transport link is unlikely to improve an unproductive urban area unless there is underlying demand for this connection, and that productivity returns are likely to be greatest where there is demand for transport, as manifest, for example, through congestion'*.
 - c. The Scheme will improve access both within and between urban areas which is the primary mechanism through which transport affects productivity.
 - d. The improvement in journey times and accessibility resulting from the proposed Scheme is substantial.
 - e. The land use context – with a number of strategically important employment sites in close proximity of the Scheme – suggests that impacts on investment and employment are likely to be significant.

2.2.3. Response to **Point 3** (Considers that new road building is just as likely to drain jobs away from a local economy as it is to attract them):

1. The two-way road argument says that improving access to a region could harm its economy by exposing local firms to competition from outside and enabling firms outside the region to serve local markets from further afield. The logic of the two-way road argument is as follows. Transport costs act as a barrier to trade. When trade barriers are reduced, firms will face greater competition.
2. There will be winners and losers from any increase in competition. However, there is little empirical evidence that transport improvements have 'drained away' jobs from large, already interconnected economies. The evidence given in SACTRA of circumstances in which transport improvements have had a negative impact on local economies relates to small towns (Okehampton and Liskeard) and rural areas. The region whose accessibility would be enhanced by the Scheme, namely South Wales, is already a large and connected economic entity.
3. In practice, the effects of competition will vary across different sectors of activity and will depend on local circumstances. The TIEP review (page 44) considers the case of an improvement in access between two cities, one large and central, and one small and peripheral. It states:

'Simple reasoning suggests that, if transport and communication costs are very high, the firm has to operate one office in each city to reach customers. If they are moderate, it serves both cities from one office, and this will tend to be the larger city where most of its customers are. But if transport/ communication costs become extremely low, then the cost of reaching customers becomes irrelevant compared to other elements of costs: it will run its single office from whichever city is cheaper. If the small/ peripheral city is the cheaper place to do business, with lower costs of land and perhaps also labour, then this suggests a process of regional divergence followed by convergence. Reducing transport/ communication costs from very high levels to intermediate ones is associated with regional divergence (as the branch office is closed and activity concentrated in the centre). Reducing them from intermediate to

low brings convergence, as activity moves to the periphery where land and labour is cheapest.'

4. In other words, the outcomes of increased competition will, within each sector, depend on a range of variables including the level of transport costs and the relative costs of production in different areas (linked to land costs, wages and levels of productivity).
5. Venables and Rosewell (2009)⁷ also consider the two way road argument in the context of High Speed rail between London and Manchester. They conclude that improving connectivity is most likely to be a force for convergence (the smaller, lower income city benefiting to a greater extent than the larger, higher income city):

'There are opposing forces at work. Initially, firms with headquarters in one city might have served the other through branch offices. These may now close as better connectivity enables each firm to supply from a single office or plant. Closures will tend to reduce employment in the smaller location (Manchester) which was deriving proportionately more of its employment from these branch offices. But pulling in the other direction, Manchester now becomes a more attractive location for headquarters; it starts off with lower wages and rents, and improved connectivity means that it will get better access to London's large market and large base of suppliers. It is therefore likely to attract headquarters and other business activity, creating new sources of employment in the city. Combining these forces, theory suggests that better connectivity is a force for convergence.'

6. In summary, whilst I would acknowledge that the effects of competition are complex and difficult to predict, there is no reason to conclude that South Wales would lose out as a result of any increase in competition, or that increased competition would act to offset the economic benefits of the Scheme.
7. Improving access, both within South Wales and between South Wales and other areas of the UK, is one of the ways in which the Scheme will deliver improved productivity. It is important not to characterise the

⁷ High Speed Rail, Transport Investment and Economic Impact. Bridget Rosewell (Volterra Partners) and Tony Venables (University of Oxford).

economy as a 'zero-sum game' in which different cities or regions are competing to secure a fixed amount of jobs or GDP. It seems to me that transport (and roads in particular) is one of the few areas of policy in which it is suggested that imposing higher costs on economic activity may have positive economic outcomes.

8. Taken to its logical extent, if we are to believe that improving transport results in economic activity draining away from Wales, then the best strategy for the Welsh Government would be to encourage more congestion on transport links between England and Wales and to lobby for higher tolls on the Severn Crossings. In my view, such an approach would not reflect the views of the majority of economists or of the business community in Wales. It is also contrary to Welsh Government policy.

2.2.4. Response to **Point 4** (Considers that spatial factors (peripherality and access to economic mass) are not linked to economic performance):

1. Professor Whitelegg concludes that access to economic mass and peripherality are not linked to economic performance. This appears to be at odds with much of the transport economic literature.
2. The linkages between accessibility and productivity are well established. 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).
3. The TIEP review provides an overview of this evidence. Whilst the scale of this effect varies, academic studies consistently find a positive and statistically significant relationship between accessibility and productivity. Such relationships have been derived by controlling for other factors that influence productivity levels (such as skills levels, occupational structure, and the presence of particular industrial sectors). The TIEP review states: *'This is an area where the research literature provides quite robust results, indicating that increases in city size (or other measures of economic density) have significant positive effects on productivity'*.

4. 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.
5. 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 0.1128. A methodology for the quantification of agglomeration effects is provided in the Department for Transport’s (DfT) WebTAG 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.
6. The assessment of agglomeration effects captures the effect of improving transport links within city-regions. The productivity benefits associated with reducing peripherality deals with the benefits of improving inter-city or inter-regional accessibility.
7. The benefits of improving connectivity between cities and regions are related to but distinct from the benefits of increased economic density. Improving transport links between regions acts to reduce barriers to trade, enabling firms to expand and take advantage of economies of scale. A further benefit arises from the process of trade and specialisation. Increased trade enables city or regional economies to specialise in the activities for which they have a comparative advantage⁸ (in other words, those activities in which they are more productive). This is analogous to the benefits of international trade.

⁸ Comparative advantage occurs when one country can produce a good or service at a lower opportunity cost than another. The theory of comparative advantage states that if countries specialise in producing goods where they have a lower opportunity cost – then there will be an increase in economic welfare.

8. The benefits of connecting cities is also explored by Rosewell and Venables in relation to high speed rail⁹. They make a distinction between the benefits of 'expanding places' and 'connecting places'. They state:
'Increased connectivity increases the potential for trade, whether by improving freight connections or by improving the ease with which meetings can take place, with firms, plants and offices moving to new – and now more efficient – locations'
9. Importantly, Rosewell and Venables make the point that the assessment of agglomeration effects does not capture the benefits of improving connectivity between cities and regions. They conclude:
'The key point for present purposes is that the benefit of this 'connecting places' productivity gain is not included in standard CBA [cost benefit analysis]. It arises from an external economy of scale, like the agglomeration arguments (sic), and is a further source of 'wider benefit' from transport improvement.'
10. In other words, there are further productivity benefits of improving transport connections between cities which are not captured in the assessment of agglomeration effects.
11. This conclusion supports the findings of the research undertaken in Wales to explain why levels of productivity in the economy are less than the UK average. These studies have consistently found that connectivity between Wales and other UK cities is a material factor in explaining levels of productivity, alongside (and in addition to) agglomeration effects.

⁹ High Speed Rail, Transport Investment and Economic Impact (Bridget Rosewell and Tony Venables)

12. To summarise, the findings of the productivity research for Wales are as follows:

- a. *Understanding productivity variations between Wales and England. University of the West of England and the University of Bath (2006).* This study research estimated that the productivity of the average firm fell by 0.7% for every 10% increase in travel time to London.
- b. *Extending the research on understanding the productivity variations between Wales and the UK. Professor John Hudson, Department of Economics & International Development, University of Bath (2009).* A 10% increase in travel time (by road) to London is associated with a 0.45% reduction in productivity.
- c. *Productivity in Wales: the impacts of peripherality on spatial patterns of productivity. University of the West of England (2010).* This study found a statistically significant relationship between an 'index of peripherality' and productivity.
- d. *Understanding productivity variations between Wales and England. University of the West of England (2016).* A 10% increase in the minimum travel time to London or (depending on which is nearest) the next four largest conurbations, leads to a 0.6% reduction in productivity for single plant firms and a 0.2% reduction if multi-plant firms are included.

13. I would acknowledge that there is a significant degree of uncertainty over the precise relationship between peripherality and productivity. Nevertheless, there is sufficient evidence to conclude that the productivity benefits of reducing peripherality are significant and additional to both user benefits and agglomeration effects.

2.2.5. Response to **Point 5** (Considers that there is no evidence that perceptions of the quality of transport influences the decisions of businesses and visitors):

1. As Professor Whitelegg points out, business investment decisions are complex and rely on a range of factors, of which transport is just one. As noted above, there is evidence that – where businesses are looking for new premises – the quality of the transport network will be a determining factor. In practice, it cannot be expected that such decisions are based on a purely rational assessment of journey times and costs. It is reasonable to expect that people’s perceptions of the ease of access and the quality of the highway network will play a role in shaping these decisions. Professor Whitelegg identifies that businesses will consider factors such as the quality of schools and the attractiveness of the countryside which are also not strictly measurable. Whilst I do not doubt that this is the case, I fail to see how perceptions of the quality of the countryside would matter but perceptions of the quality of the highway network would not.
2. In relation to visitors, Professor Whitelegg suggests that it is not credible that visitors would be influenced by their experience of the M4. Professor Whitelegg states that many millions of tourists visit the Lake District and Cornwall each year in spite of difficult journeys by car.
3. In my opinion, journey times and accessibility must have an influence on where people choose to spend their leisure time. The link between transport and tourism is identified in SACTRA (1999)¹⁰ which states (Section 3.64), *‘many other categories of trips, while not in themselves productive, nevertheless can have substantial impacts on the economy, by changing patterns of demand for leisure activities, for example, which then stimulate the development of services. The case of tourism, where the trip itself may be part of the product, can also have powerful economic implications: in some areas, tourism may be the main industry.’* SACTRA (1999) also identifies secondary evidence of the influence of transport on tourism. A study of transport and development changes around Inverness concluded that *‘the expansion of tourism in the area*

¹⁰ Transport and the Economy: Full Report (SACTRA)

would not have been possible without the major transport improvements in the area’.

4. Travel times will be of particular significance for day trips and short breaks, or for those attending events. It is reasonable to expect that, when considering whether to make a trip to Wales, potential visitors will factor journey times and ease of access into their decision. If a visitor spends time stuck in a queue on the M4, it is also reasonable to expect that this will influence how much they enjoyed their visit.

2.2.6. Response to **Point 11** (Stated that the Scheme is a very expensive and deeply flawed project and has been justified on inaccurate VFM and BCA calculations).

1. Mr Bryan Whittaker has described the approach to traffic modelling in his evidence (WG1.2.1). As he points out, the M4CaN Transport Model does take into account the effects of induced traffic. Therefore, the economic appraisal results also take into account the effects of induced traffic. The benefit-cost ratio (BCR) has been calculated based on outputs from the Transport Model in accordance with WebTAG guidance.

2.2.7. I confirm that the statement of truth and professional obligations to the inquiry from my main proof still applies.

2.3. Bryan Whittaker (Traffic)

2.3.1. Response to **Point 6** (Concerned that building new roads generates new traffic defeating the rationale for new roads):

1. It is recognised that transport schemes that impact on journey times and cost will, in principle, influence the level of demand for travel. The SACTRA (Standing Advisory Committee on Trunk Road Appraisal) assessment in their 1994 report concluded that induced traffic can and does occur, probably quite extensively, through its size and significance is likely to vary widely in different circumstances. In particular the opening of a new road scheme can elicit a number of changes in trip making behaviour including trip reassignment, re-timing redistribution and modal shift. These responses can result in additional trips and additional vehicle mileage on the road network, which is commonly referred to as ‘induced traffic’.

2. Conversely, in a 'Do-Minimum' scenario i.e. in the absence of a proposed scheme that provides additional capacity, the effects of forecast growth traffic growth and the subsequent increase in traffic congestion can lead to 'trip suppression' which could manifest itself as modal switching to public transport and or as a reduction in the number, length or frequency of journeys. These responses, as well as redistribution, can lead to reduced vehicle mileage on the road network.
 3. The Department for Transport (DfT) WebTAG Unit M2 states that 'the purpose of variable demand modelling is to predict and quantify these changes', and goes on to say that 'there should be a presumption that the effects of variable demand on scheme benefits will be estimated quantitatively unless there is a compelling reason for not doing so.
 4. New road capacity relieves congestion which, in turn, reduces travel costs which can result in more traffic. Some of the additional traffic has reassigned from other roads so relieving them, but it is accepted that there may be some induced traffic. However, this does not simply fill up the additional capacity, but rather a new balance between supply and demand is formed in which there is more traffic than before, but less congestion and thereby making journeys quicker, safer and more reliable. Therefore, induced traffic should not necessarily be interpreted as a negative effect, as users will still benefit from easier access and journeys. The M4CaN model predicts the extent of induced traffic and traffic suppression quantitatively. The results show that average journey times experience a sustained improvement which persist even with higher volumes of traffic in 2037 and 2051 under the Do-Something scenario that is shown in Table 11.1 of my main proof WG 1.2.1.
- 2.3.2. Response to **Point 13** (Stated that "Beyond Transport infrastructure" published in 2006 reported many of the schemes reviewed have demonstrated significant increases in traffic volumes (in the range of 10-35%, within a period of one to two years after opening)):
1. The recent update to the report stated was published earlier this week and titled 'The Impact of Road Projects in England'. That report notes that 'traffic growth was typically in excess of background growth by about 5-10% points over time periods of about 3-8 years'. In other words, traffic

growth on improved roads was above background levels by around 1.3% per year.

2. However, 'background growth' was assessed by looking at estimated growth over the county or region in which the scheme was located. This assessment has inevitable weaknesses. If roads are improved in those counties or regions where land-use development is expected to be concentrated, the faster traffic growth gets counted by CPRE which is incurred. As a general rule, traffic is known to grow faster on high quality roads than on local roads. Transport Statistics Great Britain shows traffic growth on motorways exceeding traffic growth on all roads (1993 – 2007) by coincidentally by 1.3% per year. That higher faster traffic growth as previously stated is counted by CPRE as induced traffic.
 3. Whilst induced traffic is a real effect, it doesn't necessarily mean it is a significant effect, and is very unlikely to be of the scale as suggested by CPRE. When individuals move house or change jobs, they do so partly through changes in accessibility to the journeys they believe that they are going to make. The combination of land-use change (which is subject planning policy) and trip distribution within existing land uses (which is not) leads to both faster traffic growth rates on the high speed network in the absence of any road improvement, and faster traffic growth rates in response to improvements (i.e. induced traffic). Disentangling the two in modelling can be achieved, but doing the same in terms of observations is far more difficult, if not impossible and certainly cannot through the means of simplistic comparisons.
- 2.3.3. Response to **Point 14** (Concerned that a large amount of induced traffic will usually have the effect of cancelling out or minimising the travel time savings that have been predicted for a road scheme):
1. The SACTRA Report, concluded that the economic value of a scheme can be overestimated by the omission of even a small amount of induced traffic. However, the economic appraisal carried out of the proposed M4 which does account for induced traffic still provides value for money and gives a Benefit to Cost Ratio of 1.62. It recognised that there are benefits to the induced traffic (if there were not induced then traffic would not occur)

and that there are dis-benefits of the induced traffic to existing users which is accounted for in the economic appraisal.

2.3.4. Response to **Point 15** (Concerned that the Welsh Government report on traffic forecasting issued in December 2016 makes no reference to the SACTRA report):

1. Both the Revised Forecasting Report December 2016 (Document 2.4.13) and Bryan Whittaker's Proof of Evidence (WG1.2.1) clearly makes a number of references to induced traffic and the M4CaN Variable Demand Model (VDM). It is possible of course that Professor Whitelegg has not associated references to Variable Demand Modelling which accounts for the effects of trip suppression and of course induced traffic.
2. The relevant references in the Revised Forecasting Report December 2016 (Document 2.4.13) are Sections 3.4, 3.6, 4.1, 9.1, 9.2 and 9.3. The relevant references in Mr Bryan Whittaker's Proof of Evidence (WG1.2.1) are 4.1.5, 4.1.6, 4.1.7, 9.2.1, 9.2.2, 9.6.5, 9.6.6, 9.6.7, 9.6.8.
3. The responses in the VDM are such that, if the generalised costs for a trip are greater in a future year than they were for the base year, then there will be some degree of suppression. Similarly a decrease in generalised cost in the future year with a proposed scheme in place compared to without the proposed scheme in place will lead to some degree of induction.
4. The M4CaN VDM modelling process also reflects the traffic response that would arise from changes in toll charges on the Severn Crossing that reflect in generalised cost in the future years without the M4 proposal in place (Do-Minimum) and in the future years with the scheme in place (Do-Something). Therefore both the induction effect of the change in toll charges as well as that direct from the M4 proposal are both fully accounted for.

2.3.5. Response to **Point 16** (Concerned that the Welsh Government report on traffic forecasting ignores the reality of exaggerated and inaccurate forecasts made in the past):

1. The traffic forecasts that are used in the M4CaN model are derived from the DfT National Trip End Model 7.2 forecasts through TEMPRO 7.2. As such, it is not the function of the inquiry to examine the merits of the forecasts, as the Inspectors made clear at the Preliminary Inquiry Meeting

2. Transport Statistics Great Britain shows that between 1985 and 1990, traffic in Britain grew by 33%, greatly exceeding the forecasts. Between 2007 and 2012, traffic in Britain fell by around 3½%, falling short of the forecasts. In both cases, I believe that the most significant factor was economic – the credit boom in the first instance and the credit crunch in the second instance.
3. These periods can be seen to be exceptions to the general case in which traffic grows steadily, paralleling long-term growth in the economy.
4. The DfT traffic forecasts are long-term forecasts, used for the appraisal of road schemes over a long period. However the DfT do revise their forecasts when the needs arises. The DfT use a broad range of evidence and data on travel behaviour and the factors that influence it, based on;
 - an understanding of how people make travel choices
 - the expected path of key drivers of travel demand
 - an assumption of no change in government policy beyond that already announced.
5. National Road Traffic Forecasts 2015 is an update to the earlier version of 2013 recognising a general concern around how the forecasts of significant traffic growth fit with recent data showing a largely flat trend over the last decade. The 2015 forecasts recognise that the factors that are highlighted as being key drivers of road demand – incomes, costs and population - have been important drivers in recent trends, but that other factors such as increasing concentrations of people living in urban areas, increased costs such as company car taxation and insurance, capacity constraints, technological developments which allow for homeworking and online shopping, have contributed. Related to this, the number and nature of the journeys that people make, may also be playing a role. It has been further recognised that established relationships, such as the one between income and car travel may not be as strong.
6. The National Travel Survey (NTS) data has shown that the average numbers of trips have been falling and that there has been a general downward trend in trip rates. The two most common journey purposes (shopping and commuting), exhibit statistically significant downward trends

with reductions of 6% and 10% respectively between 2003 and 2010. The trends in this data are not uniform and vary according to purpose and segmentation (e.g. gender, area and household type). For example, the personal and employers' business purposes are stable while the holiday trip rate is increasing, and the trips that are reducing tend to be shorter trips.

7. The recent decline is considered to be in the main due to economic conditions, and as these are forecast to improve in the future, the DfT take the view that there is reason to believe the decline will not continue at its current rate in the long term and this view is reflected in the latest NTEM central growth forecast. The NTEM central growth scenario therefore is based on the latest trip rate data collected in the trip rate review assumes a declining trend in trip rates between its base year of 2011 and 2016 and then constant trip rates thereafter.
8. The NTEM forecasts are designed to provide a national view of possible future trends in road traffic. They provide a tool to understand the case for, and impact of, investment in the road network across the country as a whole, and other road transport policies. Analysis of specific schemes use bespoke models fitted to local conditions to inform decisions.

2.3.6. Response to **Point 17** (Stated that in the Inspector report into the proposed M74 motorway in Glasgow, The Inspector came down firmly against the M74 and accepted the case made by the objectors (Table 4). "it cannot be concluded that the public benefits of the proposal would be sufficient to outweigh the considerable disadvantages". Considers that an objective assessment would reject the assertion that such investments could maintain accessibility improvements over time):

1. I have no direct knowledge of the scheme referred to, but my understanding of it is that the principal reason for the Inspector's refusal was that 'the combined and cumulative effect of various adverse impacts on these communities would be likely to be very severe, particularly; community severance, traffic noise, visual intrusion and air pollution and not directly related to the issue of induced traffic. However, I note that the Secretary of State did not accept the decision of the Inspector.

2.3.7. I confirm that the statement of truth and professional obligations to the inquiry from my main proof still applies.

2.4. Tim Chapman (Carbon)

2.4.1. Response to **Point 12** (Stated that the Scheme will add 980,000 tonnes of Carbon Dioxide, referring to the Paris agreement on Co2 and WG policy 'Reducing Welsh emissions', Environment Wales Act 2016):

1. The paper by Scott et al (2015) entitled “Embodied greenhouse gas emissions of the UK National Infrastructure Pipeline” referenced by Professor Whitelegg specifically states: “Bottom-up estimates of embodied emissions are often preferred owing to their greater specificity and reduced dependence on monetary proxies”. For the Scheme, we have specific detailed calculations of the carbon emissions, which are significantly more accurate than any top-down approximation such as that used in his method can ever be.
2. The single carbon intensity per £ spent is a general simplification that is helpful in the absence of more specific data, but needs to be applied carefully as different sorts of infrastructure projects are very different in construction nature from one another: The construction intensity of a road project is very different to that of aviation and even rail and significantly different to Energy or Communications. The objector is extrapolating the top-down calculation methodology of the authors beyond its intended, meaningful range.
3. As an indication, a new road consists of many earthworks which are comparatively carbon efficient and most of the carbon is in the major structures and road surfacing layers, which are a very small proportion of the overall project volume. This is not reflected in the price/ carbon normalisation that the paper concludes from the wide variety of infrastructure projects to date.
4. Therefore I believe the current Capital Carbon content for the project shown in the Carbon Report is a more accurate assessment than the methodology used by Professor Whitelegg.

2.4.2. I confirm that the statement of truth and professional obligations to the inquiry from my main proof still applies.