
PROOF OF EVIDENCE OF
DR STEVE MELIA

ON BEHALF OF

CYCLING UK

In the matter of:

Public Local Inquiry into the M4 Corridor around Newport Project

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1 INTRODUCTION

This proof of evidence can be navigated more easily on screen by selecting the 'Navigation Pane' option (from the 'view' menu in Word). This will show all the headings and sub-headings within the document in a vertical toolbar to the left of the screen, enabling navigation to any heading by a single click.

I was invited to assist Cycling UK as an expert witness at a fairly late stage. What is written here is necessarily limited by that short timescale.

1.1 Summary of Case

The main arguments outlined below are that M4CaN is incompatible with the Welsh Government's sustainability policies and that it offers poor value for public money, which could be better spent on other transport projects, which on average, offer higher Benefit to Cost ratios (BCRs).

Section 2 assesses M4CaN against the sustainability principle contained in the The Wellbeing of Future Communities Act.

Section 3 assesses the revised traffic forecasts. It argues that the Core Scenario forecasts have been overestimated because they are based on:

- overestimates of future car ownership, inconsistent with the trends of recent decades
- overestimates of future GDP growth, inconsistent with the trends of recent decades
- overestimates of population growth, which were prepared before the referendum and parliamentary vote to leave the European Union

Subsection 3.5 argues that the Forecasts have underestimated the magnitude of 'induced traffic' from M4CaN because it makes no allowance for:

- Land use changes
- Impacts on future decision-making

Section 4 argues that road building may cause economic activity to relocate but no research evidence has ever proven that transport infrastructure investment *causes* higher *national* GDP. In which case, the wider impact assessment should not be included in the cost benefit analysis.

Section 5 concludes that M4CaN offers poor value for public money because:

- The BCRs are low, particularly when taking account of the analysis in Section 3 about the overestimated Traffic Forecasts.
- The appraisal (and WebTAG) makes no allowance for the 'deadweight loss' of finance through taxation; this means that BCRs need to be considerably higher than 1:1 in order to justify a decision to proceed.
- Whatever assumptions are made, the BCR of M4CaN is lower than the averages typically obtained for trunk roads and other types of transport scheme.

1.2 Witness Introduction

I am a Senior Lecturer in Transport and Planning at the University of the West of England (UWE), and have been since 2010. I have a BA (Hons) in Economics from the University of Liverpool, an MA in Applied Social Research and a PhD in Transport and Planning from UWE. I lead postgraduate modules on Transport Economics and Appraisal and Changing Travel Behaviour.

My research has focussed on the relationship between transport and spatial planning and the potential for more sustainable forms of personal transport. My recent research projects have included an evaluation of road closures in Brighton, for Brighton and Hove Council, a study of car clubs in new developments for Carplus and a joint study with the University of Oxford for the Department for Transport into the changing travel patterns of young adults. A list of my academic publications can be viewed on the UWE website¹ and professional publications on www.stevemelia.co.uk.

I advised the DfT and the Town and Country Planning Association working for the Department of Communities and Local Government on the Ecotowns programme in 2008/9; the transport guidance produced by both of those bodies reflects my input in respect of carfree developments and filtered permeability. More recently I was invited to give evidence to the London Assembly inquiry into traffic congestion and a similar exercise conducted by the Greater Cambridge City Deal.

2 SUSTAINABLE DEVELOPMENT

The Wellbeing of Future Communities Act (WFG) 2015 enshrines into Welsh law the principle of sustainable development, defined, following Brundtland (1987) as: ensuring “that the needs of the present are met without compromising the ability of future generations to meet their own needs”. The full implications of that principle are not widely understood. Development practices that depend on continual expansion of human impacts on the natural environment reduce the ability of future generations to meet their own needs and are therefore unsustainable. A transport policy that depends on continual increase in road capacity in order to satisfy increasing demand for travel is unsustainable. The Welsh Government’s case for the M4 relies on rising demand from road users as a justification for expanding the capacity of the road network around Newport by building an additional stretch of motorway as a supplement to the existing M4. None of the supporting evidence explains what would or should be done if demand continues to expand in the future, as the Government appears to expect. Their implication is that road capacity can, and should, continue expanding indefinitely. The case for the road is based purely on a short-term perspective. The Welsh Government is no different from most governments in simultaneously holding two contradictory beliefs, in long-term sustainability and in short-term expediency. They will only confront that contradiction when the option of ‘a bit more damage in the short-term’ becomes unavailable.

3 TRAFFIC FORECASTS

We have not had the time or resources, as yet, to scrutinise the details of modelling process. The feasibility of such an exercise is currently being investigated. The following analysis respond to the Revised Traffic Forecasting Report and some of the underlying assumptions used, or overlooked, at various stages of that process. It will demonstrate that the Forecasts have overestimated the likely

¹ <http://people.uwe.ac.uk/Pages/person.aspx?accountname=campus%5Csj-melia>

growth of traffic under the Do Minimum scenario and underestimated the additional traffic would be induced by M4CaN.

3.1 National Traffic and Car Ownership Forecasts

Forecasts of travel demand and traffic volumes rising continuously until 2051 lie at the heart of the Government's case for M4CaN. These forecasts rely in turn on national forecasts from TEMPRO and NTEM. Figure 1 from Goodwin (2012a) illustrates how the DfT has persistently over-estimated traffic growth since 1989.

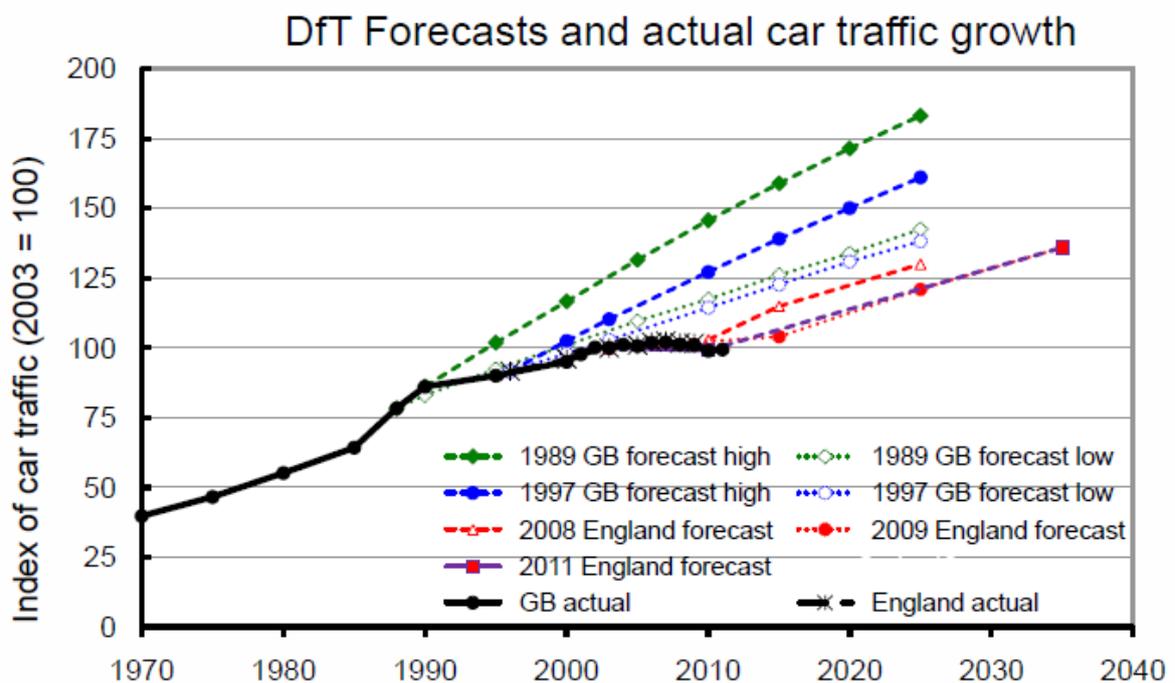


Figure 1 Historical overestimates of DfT National Traffic Forecasts, from Goodwin (2012)

The latest outputs from NTEM 7.0 forecast lower rates of growth than version 6.2 but the central forecast is still forecasting substantial growth nonetheless. One of the inputs to NTEM comes from the National Car Ownership Model.

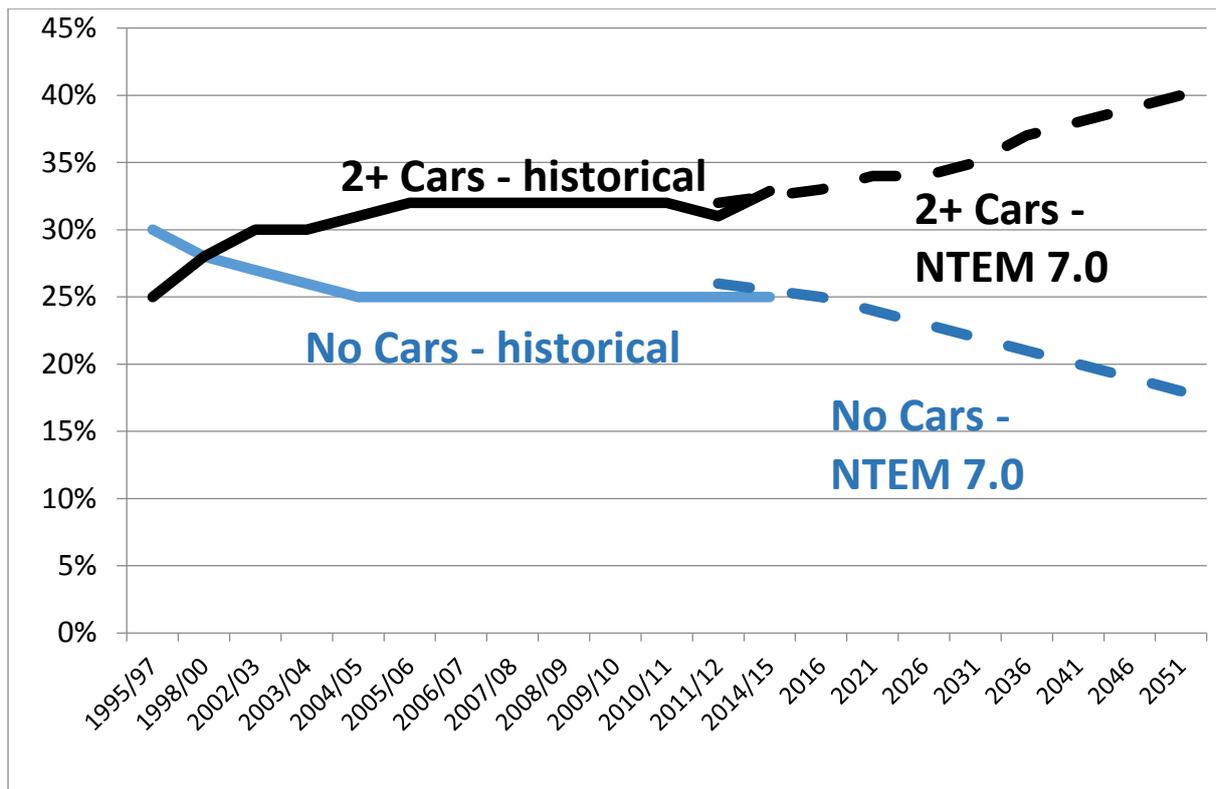


Figure 2 Household Car Ownership, Historical² and Projections from NTEM 7.0 – Great Britain

Figure 2 shows the household car ownership assumptions derived from NTEM 7.0 compared to trends in the recent past for Great Britain. It shows a clear plateau in car ownership which began in 2004/5, some three years before the recession, which has lasted until the most recent NTS statistics. The projections in NTEM 7.0 assume continual growth in car ownership and falls in the proportions of households without cars with no slowing of the rate of change until 2051.

Figure 3 shows a similar analysis for Wales, with more volatility in the past (possibly reflecting smaller sample sizes) but a broadly similar relationship between past trends and the NTEM projections. It seems, therefore, that the long tradition of governments forecasting growth in traffic, driven by growth in car ownership, regardless of recent trends, continues to influence decision-making on major infrastructure projects. Further reasons for doubting those projections will be discussed below.

² Source: National Travel Survey Table NTS 9902. Note the figures for 2014/15 were for England only (GB unavailable). Note that the time intervals on the horizontal axis vary according to the available data points.

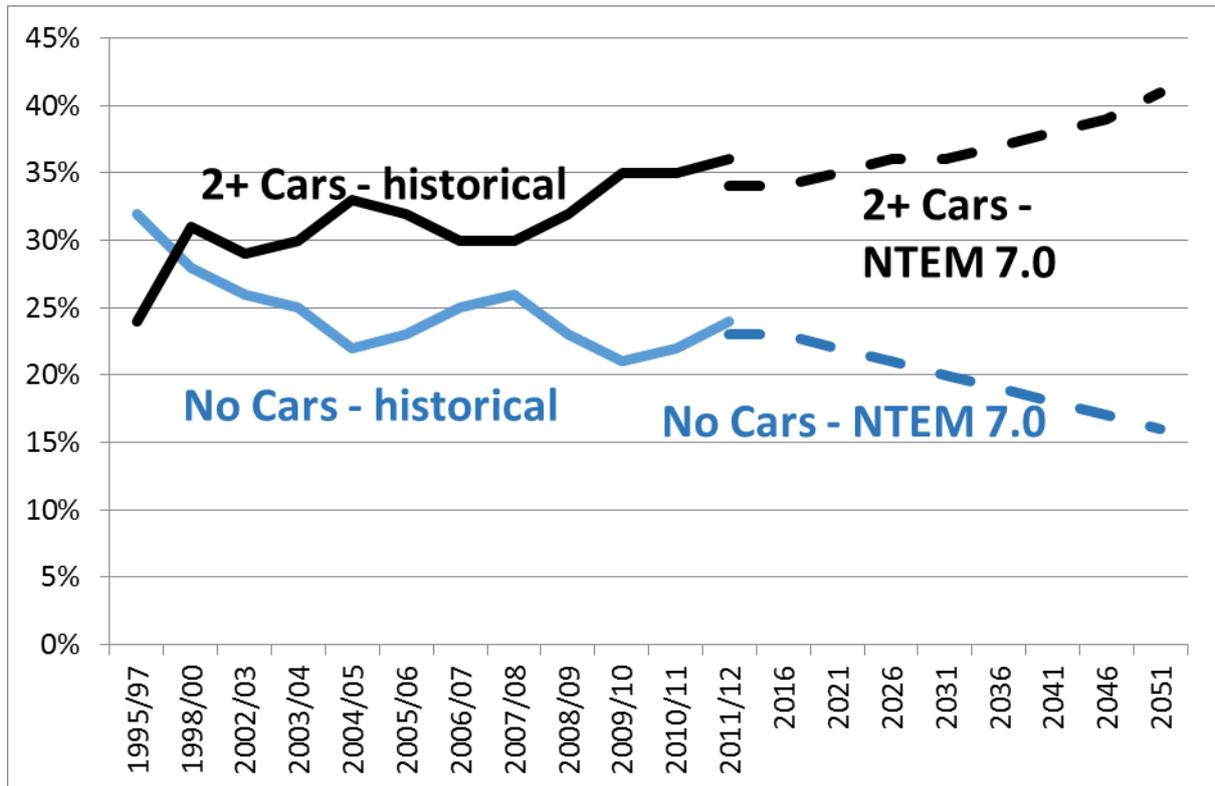


Figure 3 Household Car Ownership, Historical and Projections from NTEM 7.0 – Wales3

Despite repeated calls from the academic transport community, the DfT has refused to make the coding behind the national traffic forecast model publicly available, which makes it difficult to identify the specific reasons for the persistent overestimation of traffic volumes. Those reasons may relate to the construction of the model and they may relate to its inputs. One of the most important inputs to the national model is projected GDP growth; this influences the M5CaN traffic forecasts directly, and indirectly via the National Car Ownership Model. A footnote to page 13 of the Revised Traffic Forecasting Report identifies the table in WebTAG which provided the GDP forecasts for that report (they influence future traffic growth via changes in generalised costs).⁴ The following analysis compares those forecasts with past trends in GDP.

3.2 GDP Growth Assumptions

The forecasting of future GDP growth is surrounded by political ideologies, which influence economists as well as politicians. The policy of UK governments has for many years favoured “high and stable rates of economic growth” (DEFRA, 1999). This has influenced forecasts conducted by and for governments, if not the actual outcomes. The Office of Budget Responsibility was established to provide more objective forecasts (or to protect ministers from blame for those forecasts). They are not immune from the ideological influences which promote over-optimism in that respect, however. The WebTAG forecasts shown below are derived from an OBR report.

³ Note, the most recent car ownership statistics available from the NTS or the Welsh Government are for 2011/12

⁴ WebTAG Databook (Annual Parameters) as at November 2014.

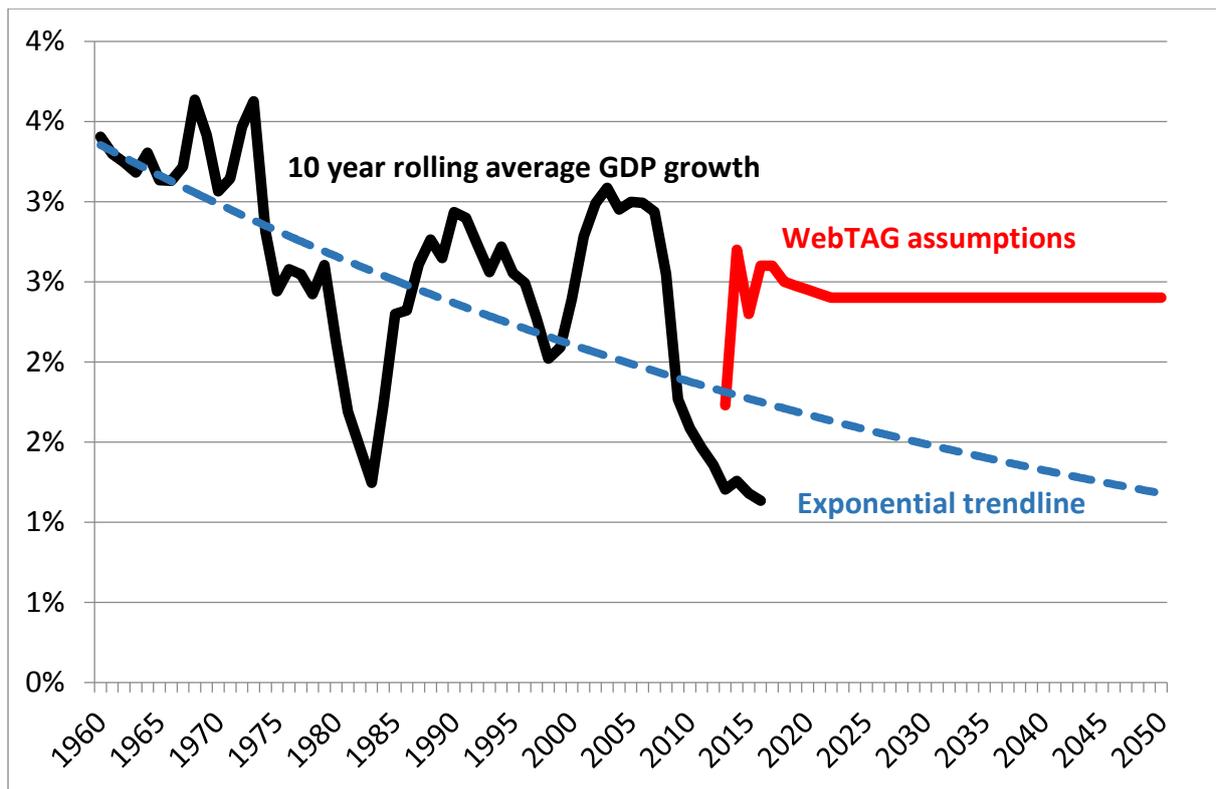


Figure 4 Rolling Average UK GDP Growth⁵ Compared to WebTAG Forecasts Used in M4CaN

Figure 4 shows actual GDP growth for the UK between 1960 and 2016 using a 10 year rolling average to smooth out the short-term effects of booms and recessions (so the dataset begins in 1950). The exponential trendline fitted to that data clearly shows the long-term downward trend in GDP growth since the postwar recovery years, a trend which is not unusual for mature developed economies. The OBR assumptions used in WebTAG clearly imply that this downward trend will be rapidly reversed and that the UK growth rates will settle at an average of 2.4% from 2021 onwards. This implies that the UK economy would double in size between 2016 and 2045. These assumptions, which are an important element of the projected traffic growth for M4CaN, are clearly optimistic.

3.3 Changing Travel Behaviour of Young Adults: the Cohort Effect

Another factor behind the repeated overestimation of traffic growth, and car ownership rates, relates to the changing travel patterns, licence-holding and car ownership of young adults. A growing body of literature has demonstrated how young adults across the developed world have, since the 1990s, been reducing their licence-holding, car ownership and travel by car (Delbosc and Currie, 2013, Le Vine and Polak, 2014, Kuhnimhof *et al.*, 2012). Goodwin (2012b) has demonstrated how changing behaviour in early adulthood exerts a ‘cohort effect’ across the life cycle; car ownership and use tends to rise in the transition from young adulthood to middle age but cohorts with lower car ownership when they are young are likely to own fewer cars compared to earlier cohorts as they grow older (the opposite effect to the one that influenced earlier generations in the

⁵ Past figures from: ONS (2017) Quarterly National Accounts Time Series Data. Gross Domestic Product: chained volume measures: Seasonally adjusted.

20th Century). I have been part of a team researching these effects for the DfT. The results of that study have not yet been released and have not yet influenced the national traffic forecasting model.

3.4 Population Forecasts

The ONS 2012-based population projections were used in NTEM 7.0 and have also informed the various scenarios in the M4CaN forecasts.⁶ These were conducted before the EU referendum and take no account of the decision to leave the EU nor its aftermath.

The most important element in the population projections is net migration because of both its direct impact and its indirect impact on the birth rate in the UK. Conventional wisdom in the planning world has argued that no change is necessary in the projections because they were already based on “conservative” long-term assumptions of net migration.⁷ Those statements have been made in the context of planning for housing; as there has been persistent undersupply in the past, there is an understandable resistance to any change in assumptions that would cause local authorities to reduce their planned housing allocations.

When considering the implications of the referendum for other purposes, including traffic forecasts, the changing political climate is at least as important as the decision itself. The recent analysis by the Social Market Foundation(2016) demonstrates how political opinion is pushing governments towards policies of lower immigration both from Europe and the rest of the world. The actions of the UK government since the referendum decision have made that direction of change very clear. Although these impacts may be difficult to quantify, they suggest, like the GDP trends, a tendency towards lower traffic growth, which has not been reflected in the M4CaN forecasts.

3.5 Induced Traffic and Spatial Impact

As a detailed analysis of the traffic modelling has not been possible at this stage, the following comments focus on some more general issues affecting the key issue of induced traffic. Since the publication of SACTRA (1994) the existence and importance of induced traffic has never been seriously challenged. However, its mechanisms and quantitative impacts are still poorly understood. The Traffic Forecasting Report acknowledges the issue of induced traffic, which it claims to address through the use of a Variable Demand Model. The total amount of induced traffic is not stated in that report and cannot be directly deduced from any of the outputs. However, there are several reasons for believing that its long-term impacts have been underestimated.

1. The modelling has not allowed for land-use changes.
2. It has not allowed for any impacts or constraints on future transport policies and decisions in the area.

Each of those factors will be considered in turn below.

3.5.1 Land Use Impacts

The land use impacts of building new roads has long been recognised (Litman, 2012 provides a summary). New roads and additional road capacity influence the location of both employment and

⁶ See page

⁷ See for example: <http://nlplanning.com/blog/the-implications-of-brexit-on-population-projections-and-housing-need/>

residential development. These impacts tend to strengthen in the longer-term. New motorways have a particularly strong dispersing effect on new development, promoting growth in locations accessible to the motorway network and reducing pressure for development closer to the centres of towns and cities.

As discussed below, influencing the location decisions of employers is a key economic objective of M4CaN. The Traffic Forecast makes no allowance for additional traffic generated by land use changes resulting from such relations, however, nor does it make any allowance for the impact of M4CaN on residential sprawl. The only justification for this apparent inconsistency is provided in 4.4.5, which states that “there are no dependant developments...that would only go ahead if [M4CaN] was built.” If that were true in the long-term, it would fatally undermine the scheme’s economic case.

Some scheme appraisals have used Land Use Transport Interaction (LUTI) models to capture some of these impacts; WebTAG provides Supplementary Guidance on the use of LUTI models.⁸ LUTI models are complex, difficult to calibrate, and difficult to use. This may have influenced the decision to ignore land-use impacts in the traffic modelling. Whatever the reason, and whatever the quantification difficulties, this decision means that the Forecasts will underestimate the additional traffic induced by M4CaN.

3.5.2 Impacts on Future Decision-Making

A new motorway will change the physical, political and cost-benefit context for future decision-making. The additional traffic generated will increase congestion at junctions elsewhere in the area; that will increase pressure for further schemes to increase the capacity of those junctions and the flow through them. In the recent consultation on Severn Bridge tolls, the UK Government cites capacity constraints on the M4 as one reason for retaining tolls whilst “monitoring the impact” of increased traffic from halving them.⁹ Without M4CaN, future governments would find it more difficult to reduce or scrap tolls altogether; indeed that is one reason why most AMs support the scheme. Whether they are right or wrong, bridge tolls are clearly another unrecognised mechanism by which M4CaN will induce further traffic growth.

The high cost of M4CaN will also have impacts on transport spending in the Newport area and across the rest of Wales. Schemes that could have increased public transport use or active travel will be cancelled, delayed, or never considered in the first place, all of which will cause higher traffic volumes than the Do Minimum case.

3.6 Conclusions

The Revised Traffic Forecasts (Table 9.3) show an increase of between 40% and 45% in Vehicle Kilometres by 2051 under the Do Minimum Scenario. The Do Something Scenario would add just 1% to those volumes in the AM peak, and would actually reduce them in the inter-peak period. The evidence outlined in this section suggests that the Do Minimum forecasts have been over-estimated and the additional traffic impact of M4CaN underestimated.

⁸ WebTAG: Supplementary Guidance – Land Use Transport Interaction Models, on: www.gov.uk

⁹ The Severn Crossings – Reducing Toll Prices and Other Matters. Page 12. On www.gov.uk

This conclusion will have important implications for the Economic Appraisal, discussed in Section 5. It also casts doubt on the claim made in that Appraisal that M4CaN will produce a net reduction in carbon emissions; other witnesses will scrutinise that claim in more detail.

4 Wider Economic Benefits

Section 5 will consider the Economic Appraisal and assess the value for money offered by M4CaN. That Appraisal has been divided into two sections covered by separate reports. This Section will address the Wider Economic Benefits, which feed into the Economic Appraisal. The Economic Appraisal Report acknowledges that these 'wider impacts' "can be quantified with less certainty" than the other benefits, which is why the BCRs are shown both with and without them. This section will cast further doubt on the reliability of such attempts to quantify wider economic impacts, and will argue that they should be disregarded when assessing the value for money of the scheme.

4.1 The Relationship Between Transport Infrastructure and Economic Activity

There is a vast literature on the relationship between transport infrastructure and economic activity/growth. Most of those studies start from theoretical perspectives postulating a positive relationship between the two, and given the strong vested interests involved (from which academics are not immune) it is not surprising that most of them find what are looking for. Several studies have concluded that the links are very weak, or non-existent; the evidence of Prof. Whitelegg summarises several of these studies, which I will not repeat here.

Meta-studies such as Melo (2013) have found wide variations in the reported elasticities of relationships between transport infrastructure and measures such as GDP or GVA. Some studies have reported negative elasticities i.e. more roads are associated with lower GDP, once other factors are controlled for. The results depend very much on the methods and the data chosen. There is very little solid evidence on which to base a model that claims to quantify these benefits.

4.2 What Causes What? The Problem of Establishing Causality

As explained in Melia (2015) there is no doubt that building or expanding roads (or railways) can cause economic activity to shift from one place to another, although as Goodwin (2003) has shown, employment may shift towards, or away from a new or improved road. None of the many studies that I have ever read has ever *proven* a *causal* link between road improvements and *national* GDP, however.

The conditions for establishing causality from quantitative are (following Handy *et al.*, 2005):

1. A statistical association exists between the two variables
2. Cause precedes effect
3. No third factor causes an accidental or spurious association, and:
4. The causal mechanism is understood (this factor is necessary if the findings of a study are to be applied to any different context)

To address all of those criteria would be very difficult and no study that I have ever read has addressed all of them in a way that could prove whether road building does or does not influence national GDP. It is easy to satisfy the first of those criteria, but what causes what? Roads are often built in response to, or anticipation of, economic growth in a local area.

A further problem relates to how the money was raised to pay for the road in the first place. If taxes are raised nationally, or public money is borrowed, and the money is spent in one location, that may well produce an increase in economic activity in the area where the money was spent; but that does not prove whether building the road had any impact on national GDP.

These reservations apply to the principal evidence such as Hudson (2009) and Bryan (1997). They are useful studies, carefully conducted, but neither of them prove whether road improvements have, or could, increase national GDP.

In conclusion, it may be reasonable to argue that building M4CaN could enable some additional development to occur alongside the motorway (which would also increase traffic and congestion) it would not be valid to assume that a new motorway would increase national GDP. Attempts to inflate the BCRs of road schemes (or any other transport schemes) by estimating 'wider impacts' are therefore based on little more than guesswork.

5 The Economic Appraisal and Conclusions

The Revised Economic Appraisal Report shows the following Benefit to Cost Ratios (BCRs) under the various scenarios:

	Excluding Wider Impacts	Including Wider Impacts
Core Scenario	1.62	2.23
Low-growth Scenario	0.94	1.38

Table 1 Benefit to Cost Ratios Estimated for M4CaN from the Economic Appraisal Report

Section 4 explained why the 'wider Impacts' are not well-founded and should not therefore be included when assessing the value for money of M4CaN. Section 3 explained why the Traffic Forecasts, on which the Core Scenario is based, have overestimated the likely growth in background traffic under the Do Minimum scenario. Although there can be no certainty in traffic forecasting, this suggests that the Low-growth scenario is more plausible than the Core Scenario. Under either of these scenarios M4CaN represents poor value for public money, for the reasons argued below.

5.1 Deadweight Loss of Finance via Taxation

WebTAG follows the principles of welfare economics in assessing 'consumer surplus' as one important element of the monetised benefits. There is a corresponding principle on the cost side, known as 'deadweight loss', which has been recognised by the DfT in the context of wider economic impacts¹⁰ but has not been incorporated within the monetised costs in WebTAG. Deadweight loss is the additional burden imposed by taxation on an economy. If £1bn is raised by taxation, the net cost to the economy (ignoring the benefits from spending the money, which are assessed separately) will be greater than £1bn. Deadweight loss occurs because companies and individuals change their activities, in ways which reduce the efficiency of resource use, in order to minimise the tax burden. This may involve some active tax avoidance but more importantly, it causes agents to reduce their use of taxed resources – including labour.

¹⁰ DfT (2016) [Understanding and valuing the impact of transport investment](#). On: www.gov.uk

Deadweight loss is difficult to estimate, particularly where governments are borrowing money, which will be repaid at some future date by taxation of an unknown type. This is probably the main reason why no allowance has been made for it in WebTAG. Nonetheless, there it has one very important implication for the assessment of value for money: a BCR of 1:1 does not represent a 'break even point'. In order to make a project worthwhile, the monetised benefits should be considerably higher than the monetised costs.

5.2 Higher BCRs Available from Alternative Projects

This point is further reinforced when we consider the value for money that could be obtained from other projects, which will be prevented or delayed by a decision to allocate such a large proportion of the national transport budget to M4CaN. The Eddington Report (Eddington, 2006) presented some convincing evidence, accepted by the UK government at the time, that smaller transport projects tended to offer better value for money than mega-projects and that more public investment should be directed towards the former. The RAC Foundation published some further analysis of the transport schemes that informed the Eddington review (Dodgson, 2009). This revealed the following average BCRs for different categories of transport scheme:

Transport scheme BCR	Average BCR scores
Highways agency roads	4.66
Local roads	4.23
Heavy rail schemes	2.83
Light rail schemes	2.14
Local public transport schemes	1.71

Table 2 Average Benefit to Cost Ratios of Transport Schemes (Dodgson 2009, Table 1)

A more recent analysis by the DfT of **cycling schemes**¹¹ showed that these tended to generate the highest value for money of all. The average BCR for schemes funded under the Cycling Ambition Fund and Cycling in National Park Grant were assessed at **1:5.5**.

When compared against these averages, the poor value for money offered by M4CaN becomes very clear. Indeed, this analysis begs the question: what is the point of conducting a cost benefit analysis, when the largest sums of public money are allocated to schemes such as M4CaN, which offer such poor value for money. If the argument relies on the non-monetised benefits, then similar consideration should be given to the non-monetised costs, particularly the environmental damage this scheme would cause. Other witnesses acting for the Gwent Wildlife Trust will provide ample evidence of that.

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¹¹ DfT (2014) Value for Money Assessment for Cycling Grants. On: www.gov.uk

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