



Department  
for Transport

# Understanding and Valuing the Impacts of Transport Investment

## Progress Report 2014

December 2014

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# Contents

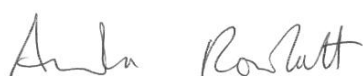
Foreword .....	4
Executive summary .....	5
1. Introduction.....	9
2. Analytical Strategy.....	10
3. Economic Growth .....	12
Continuous Development of Best Practice Guidance .....	12
Informing Our Next Phase of Development.....	13
TIEP Report Findings .....	13
Painting a Richer Picture .....	14
User Benefits.....	15
Investment and Employment Effects .....	15
Productivity and Agglomeration.....	17
Forecasting Number of Jobs and Homes .....	18
Summary of the Evidence and Next Steps .....	19
4. Valuing Environmental and Health Impacts.....	22
Working Together on the Methods and Values .....	22
Recent Developments in Valuing Environmental and Health Impacts.....	23
Continuing our Collaborative Work.....	23
5. Valuing Journey Improvements- Values of Time Travel Savings and Reliability .....	24
Getting Ready To Survey .....	25
Scope of the Research .....	26
Timescales for the Research Project and Updated Appraisal Guidance .....	30
6. Forecasting the Future Demand for Travel.....	31
Understanding Behaviour Change .....	33
Capturing Demographic and Spatial Changes and Impacts.....	36
GDP and Economic Growth .....	37
Capturing Policy Levers .....	37
Joint Working and Research .....	38
7. The Treatment of Uncertainty .....	39
Background .....	39
Uncertainty and the Building Blocks of our Analysis.....	40
Improving the Links between Appraisal and Evaluation .....	40
Forecasting Demand and Benefits in the Long Term .....	41
Communication of Uncertainty .....	43
Next Steps.....	45
8. Next Steps.....	46

# Foreword

The Department for Transport's appraisal framework and methods have been built up over many years to be a world-class basis for informing decisions about transport investment options. In October 2013, we published 'Understanding and Valuing the Impacts of Transport Investment'. This reviewed why and how we appraise transport investment options. It also confirmed our commitment to keeping our approach world class, by maintaining and developing our methods to keep pace with an ever-changing world. We set out our ambitious plans for this development, and our commitment to placing experts and stakeholders at the heart of these plans.

In the last year, we have made great progress in delivering this agenda, notably through important work to advance the understanding of the link between transport and the economy and new research into values of travel time savings. This has benefitted greatly from the input we have had from experts and stakeholders who have responded to our calls for evidence, contributed to our workshops and input to our research. We have also added a new element - an investigation of the impact of changing behaviour on our travel choices and demand forecasts, to ensure that our plans keep pace with latest evidence.

I am therefore pleased to present this progress report, which summarises the progress we have made and our plans for further development. We look forward to continuing to work closely with experts and stakeholders, to ensure the information used to inform transport investment decisions remains relevant and robust.



Amanda Rowlatt, Chief Analyst and Strategy Director

December 2014

# Executive summary

## Introduction

1. The Department's long term programme of research to improve how we understand and value the impacts of transport investment has produced an analytical evidence base, set out in WebTAG<sup>1</sup>, that is internationally respected as best practice. In October 2013, we published the Understanding and Valuing the Impacts of Transport Investment (UVITI) suite of documents<sup>2</sup> that set out why and how we value these impacts and the latest Departmental research. Over the past year we have worked collaboratively with academics and stakeholders to design our analytical strategy and a programme for maintaining and enhancing our evidence base. This report sets out our strategy and the significant progress we have made in delivering this programme.

## Analytical Strategy

2. Our analytical strategy aims to build confidence in our evidence base through an open and transparent approach, working closely with experts and stakeholders to provide high quality and robust evidence to inform transport investment decisions. We have identified five key development themes: Economic Growth; Valuing Environment and Health; Valuing Journey Improvements; Forecasting the Future Demand for Travel; and; the Treatment of Uncertainty. The following describes the challenges and progress on developing the evidence base in each of these areas.

## Economic Growth

3. The impact of transport investment on economic performance plays an important role in the debate about transport scheme options. Over the last year we have made significant progress in updating our understanding of the potential impacts. Through continued engagement, including academic and wider stakeholder workshops focussed on economy impacts (December 2013, April 2014) and an open call for evidence, we identified the latest thinking on transport investment and economic performance and commissioned the Transport Investment and Economic Performance report<sup>3</sup> (TIEP) from Professor Tony Venables<sup>4</sup>,

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<sup>1</sup> <https://www.gov.uk/transport-analysis-guidance-webtag>

<sup>2</sup> DfT (2013); "Transport appraisal in investment decisions: understanding and valuing the impacts of transport investment" <https://www.gov.uk/government/publications/transport-appraisal-in-investment-decisions-understanding-and-valuing-the-impacts-of-transport-investment>

<sup>3</sup> Venables, A., Overman, H., Laird, J. (2014); "Transport investment and economic performance: Implications for project appraisal" <https://www.gov.uk/government/collections/transport-appraisal-and-strategic-modelling-tasm-research-reports>

<sup>4</sup> BP Professor of Economics, Director, Oxford Centre for the Analysis of Resource Rich Economies (OxCarre).

Professor Henry Overman<sup>5</sup> and Dr James Laird<sup>6</sup>. The authors had the specific remit to provide recommendations on the scope for enhancing our current appraisal approach, while ensuring the evidence base remains robust.

4. The key messages from the report are that transport is essential for economic growth and, as a result of many years of development, the Department's "appraisal guidelines provide a rigorous framework for appraising projects" and "[the Department] has been a world-leader in incorporating some of the wider impacts of transport improvements."<sup>7</sup> We are confident that our approach to transport appraisal remains sound.
5. The authors of the TIEP report also set out the scope for improving our approach to valuing economy impacts as well as the key technical challenges in doing so. For some projects it is possible there could be some relevant additional economy impacts. However, there is no current consensus on how these can be robustly estimated.
6. We propose to develop standards for the application of different approaches to modelling economic impacts and develop our approach to the valuation of productivity effects and investment and employment effects. We recognise that the required methods are still in development and whilst we will investigate the potential to include these in guidance, it is important that we ensure our evidence base remains of high quality.
7. The TIEP report also focusses on the communication of economy impacts, recommending that right from the outset of a project, a context specific narrative should be developed that describes how the transport scheme could impact the economy. As part of our guidance development we will be looking at ways to improve how we communicate these impacts with a view to releasing guidance for consultation towards the end of 2015.

## Environment and Health

8. Many of the key developments to our appraisal framework over the last decade have focused on broadening the scope of the environmental and health impacts that can be monetised within our appraisal framework. In this progress report we update readers on close joint-working with others, inside and outside government, to continue to ensure we understand and reflect latest developments in the evidence base.

## Valuing Journey Improvements

9. Values of travel time savings play a central role in transport appraisal – they are used to calculate the benefits of improved connectivity and underpin valuation of a wide set of journey improvements, like reduced

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<sup>5</sup> Professor Henry G. Overman, Director What Works Centre for Local Economic Growth, London School of Economics

<sup>6</sup> Dr James Laird, Senior Research Fellow, Institute for Transport Studies, University of Leeds

<sup>7</sup> Venables, A., Overman, H., Laird, J. (2014); "Transport investment and economic performance: Implications for project appraisal"; page 4 <https://www.gov.uk/government/collections/transport-appraisal-and-strategic-modelling-tasm-research-reports>

crowding on trains and improved reliability on our roads, as well as reductions in journey times. Last year we updated our values and validated them against existing evidence. Now we're going further and a large scale research project is currently underway to measure values of time through directly surveying both people and business to understand how they value travel time savings. This project will build on our already established methods for valuing travel to deliver fully updated values, with greater understanding of the diversity of the values, to ensure they remain reasonable for use into the future. The scope of the project is broad, covering: business and personal travel; a wide set of transport modes; and investigating how factors like increased use and capability of mobile technologies affect people's willingness-to-pay for quicker journey times.

10. The value of travel time savings project is scheduled to report in Spring 2015. It will pull together an analysis of all the survey data and will make recommendations on how the findings can be incorporated in to refreshed WebTAG guidance. Our intention is to consult widely on the findings of the research and on the appropriate changes to WebTAG with a view to incorporating changes in updates to WebTAG in 2016.

### **Forecasting the Future Demand for Travel**

11. Understanding the future demand for travel is key to assessing the impacts of transport investments. We describe our recent research analysing National Travel Survey data which suggests a decline in the number of trips for certain journey purposes (such as shopping and commuting), against a background of academic research which found evidence for a levelling off of car use per capita and a decrease in licence holding for some demographic groups in the context of other evidence. The factors which influence these trends are diverse and include economic, behavioural, demographic and spatial factors and we report on our progress in understanding the extent to which these factors influence travel trends and how we will account for these changing factors in our forecasting models and methodologies.
12. This work is part of a wider programme of work to update our National Trip End Model (NTEM), the Department's primary dataset used for forecasting demand in scheme business cases. Our approach will be to update the model with the latest 2011 census data, as well as with other demographic and employment data and undertake model development through close working with the expert community.

### **The Treatment of Uncertainty**

13. There is unavoidably uncertainty in future forecasts. This makes demand and scheme benefits harder to predict the further in the future we go. Since much of our transport investment is for the longer term, it has a long-lasting impact on the economy, the environment and society, how to handle inherent forecast uncertainty is a key theme in our analytical strategy.
14. Within our appraisal framework, we describe the size of the uncertainty in both the calculation of scheme benefits, through the development of

alternative forecast scenarios and sensitivity tests, and on the scheme costs side, through the application of optimism bias and quantitative risk assessment. These methods are established in WebTAG to allow analysts to identify the key sources of uncertainty and account for them when presenting their business cases to decision-makers. We reflect on our understanding of the levels of uncertainty around the building blocks of our modelling and appraisal approach and the continued work to develop this understanding with reference to the investigation into the variability in individual travel choices as part of our trip rates research and the ranges around the values of time work.

15. Taking the long term perspective raises the question of how best to forecast transport demand and the impacts of options into the long term. We aim enhance our current methods by investigating how benefit profiles of schemes may be extrapolated into the long-term future to minimise levels of uncertainty. This investigation will be based on developing our current approach which is based on model predictions in the medium-term and key drivers affecting travel demand and benefits in the longer term.
16. At the heart of understanding uncertainty is developing our portfolio of ex-post evaluation evidence and using this to identify areas of uncertainty and using this to inform our model development. We are therefore looking to enhance the ways in which ex-post evaluations can generate and feedback evidence to validate and improve the quality of our modelling and appraisal.
17. Beyond the analytical issues we discuss the importance of developing an approach to communicating the uncertainty in our analysis to decision makers and our approach to support business case developers to provide a fuller range of information regarding the uncertainties in their modelling and appraisal.

### **Continued Joint Working**

18. We are pleased that we are able to report good progress so far on the work we committed to in October 2013, and that we have extended our ambitious agenda. We have benefitted greatly from the input of many experts and stakeholders, to whom we are grateful. Following the publication of this progress report, we would like to continue to build on the success over the past year with an engagement event in early 2015 to discuss our next phase of development.



# 1. Introduction

- 1.1** Our transport system is vital to the way we lead our lives, the success of our economy, our wellbeing and our environment. As a nation we benefit from a substantial transport network and services. As further improvements are sought, it is essential that decision-makers have the fullest information about all the impacts each option could have on our society, economy, and environment; and how these align with decision-makers' objectives.
- 1.2** The Department's long term programme of research, to improve how we understand and value the impacts of transport investment on the economy, has produced an analytical evidence base, set out in WebTAG<sup>8</sup>, that is internationally respected as best practice.
- 1.3** In October 2013, the Department published the Understanding and Valuing the Impacts of Transport Investment (UVITI) suite of documents<sup>9</sup> that set out why and how we value these impacts and the latest Departmental research. We followed publication with a pivotal engagement event with academics and stakeholders in December 2013. This allowed us to identify key challenges and opportunities for developing our evidence base, and to define our analytical strategy.
- 1.4** At its heart is the need to draw on the expert community both inside and outside the Department underpinned by a joint working approach to ensure that our analysis remains world class. Setting out five key analytical development themes around: economic growth; environment and health; valuing journey improvements; forecasting future demand for travel; and, the treatment of uncertainty, we put in place a challenging work programme to deliver the analytical strategy.
- 1.5** One year on, this document describes the significant progress we have made in delivering this strategy and sets out the latest developments on the key themes of our analytical programme.

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<sup>8</sup> <https://www.gov.uk/transport-analysis-guidance-webtag>

<sup>9</sup> DfT (2013); "Transport appraisal in investment decisions: understanding and valuing the impacts of transport investment" <https://www.gov.uk/government/publications/transport-appraisal-in-investment-decisions-understanding-and-valuing-the-impacts-of-transport-investment>

## 2. Analytical Strategy

**2.1** Our analytical strategy has been designed to ensure that our evidence base remains world class, continuing to provide high quality, robust evidence to inform transport investment decisions. It also aims to build confidence in our evidence base through an open and transparent approach working closely with experts and stakeholders.

**2.2** This strategy has been developed to remain relevant to the appraisal questions raised by the Department's investment programme. It is overseen by our Transport Appraisal Guidance strategy board, ultimately reporting to our Chief Analyst.



**2.3** Over the past year we have shaped our high level work programme, prioritising analytical developments through a process of internal and external engagement to identify key decision points and evidence needs. This process began with the publication of the "Understanding and Valuing the Impacts of Transport Investment" suite of documents<sup>10</sup> and an external stakeholder workshop in 2013.

**2.4** The process identified five key analytical development themes that aim to meet the needs of our stakeholders. Detailed work programmes have been developed for each of the themes. This is summarised at a high level in **Figure 2.1** below.

**2.5** In addition to the key development themes, the strategy also covers routine 'incremental' improvements, such as updates to GDP or Carbon Values in the 'Databook'<sup>11</sup>. These types of updates are announced on the Transport Appraisal Guidance website<sup>12</sup> as 'Forthcoming Changes'<sup>13</sup> and are introduced at regular six month intervals.

**2.6** The following document describes the five key analytical themes in more detail and sets out the progress so far in building a transparent and high quality evidence base.

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<sup>10</sup> DfT (2013); "Transport appraisal in investment decisions: understanding and valuing the impacts of transport investment" <https://www.gov.uk/government/publications/transport-appraisal-in-investment-decisions-understanding-and-valuing-the-impacts-of-transport-investment>

<sup>11</sup> <https://www.gov.uk/government/publications/webtag-tag-data-book-november-2014>

<sup>12</sup> <https://www.gov.uk/transport-analysis-guidance-webtag>

<sup>13</sup> <https://www.gov.uk/government/publications/webtag-forthcoming-changes>

**Figure 2.1 Key Milestones of the UVITI Analytical Strategy**

Themes	Aims for Development	Key Milestones					
		2014		2015		2016	
Economic Growth	Developing a picture of the economic impacts of transport investments		 TIEP Report Published	Economy Engagement Event		Consultation: Communicating + Modelling Impacts	
Valuing Environmental and Health Impacts	Ensuring consistency with latest evidence from inside and outside Government	 Guidance on Marginal Abatement Costs	 Updated GHG Guidance	 Updated Noise Guidance			
Valuing Journey Improvements	Update our data with new, direct survey evidence of values of travel time savings	 Start of VTTS Research	 VTTS Pilot Study Complete	 Completion of VTTS Research	 Updated Guidance for VTTS		
Forecasting the Future Demand for Travel	Updating and enhancing our forecasting approach	 Updated Trip Rates	 Trip Rates Research Contract Awarded	 Trip Rates and NTEM Engagement Event	 NTEM 7 Data Set Release		
Treatment of Uncertainty	Building the evidence base to support improved communication of model uncertainty			 Report on Long-Term Benefits Estimation	 Guidance on Uncertainty Around Core Model and Appraisal Inputs		
Overall Programme	Guidance updates	 Restructured WebTAG Released	 Autumn WebTAG Release	 UVITI Engagement Event	 Autumn WebTAG Release	 Spring WebTAG Release	 Autumn WebTAG Release

## 3. Economic Growth

- 3.1** Good transport infrastructure is recognised as an essential part of ensuring the economic success of the UK. Transport supports the economy in many ways depending on the type of scheme, the context in which it sits and the surrounding infrastructure.
- 3.2** Improved connectivity, particularly in urban areas, can increase the effectiveness of business clusters and result in increased productivity and growth. It can also affect labour markets as reduced commuting costs can encourage more people to enter the labour market and/or travel further to find jobs more suited to their skills. There is also a spatial component to the economic impact of transport schemes as improved connectivity can affect where businesses choose to locate and where workers choose to live, potentially generating significant impacts at a sub-national or regional level.
- 3.3** The Department is investing in transport with a wide range of schemes designed to meet a wide range of outcomes from solutions to immediate network problems to those focussed on enabling economic development. It is vital that we can continue to inform decision makers about the impacts and trade-offs between different and diverse options, as comprehensively as possible.
- 3.4** The Department's long term programme of research, to improve how we understand and value the impacts of transport investment, has produced an analytical evidence base, set out in WebTAG, that is internationally respected as best practice. This section sets out the progress we have made in enhancing our understanding of economy impacts to allow us to support the delivery of a wide range of outcomes, and our plans to develop further the analytical guidance.

### Continuous Development of Best Practice Guidance

- 3.5** Over many years we have developed our approach to the appraisal of economy impacts. The pivotal Standing Advisory Committee on Trunk Road Assessment (SACTRA) report on 'Transport and the Economy'<sup>14</sup>, which was published in 1999, provided the foundations for our detailed understanding of economic impacts. This was followed by: the 'Transport, Wider Economic Benefits, and Impacts on GDP'<sup>15</sup> discussion paper in 2005, which set out methods to appraise economy impacts; the

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<sup>14</sup> SACTRA (1999); "Transport and the economy: full report"

<http://webarchive.nationalarchives.gov.uk/20090325061432/http://www.dft.gov.uk/pgr/economics/sactra/>

<sup>15</sup> DfT (2005); "Transport, wider economic benefits and impacts on GDP"

[http://webarchive.nationalarchives.gov.uk/20061011120000/http://www.dft.gov.uk/stellent/groups/dft\\_econ\\_appr/documents/divisionhomepage/038896.html](http://webarchive.nationalarchives.gov.uk/20061011120000/http://www.dft.gov.uk/stellent/groups/dft_econ_appr/documents/divisionhomepage/038896.html)

Eddington Report in 2006<sup>16</sup>; and the release of new WebTAG guidance. As a result of these previous developments, the Department's "appraisal guidelines provide a rigorous framework for appraising projects" and "[the Department] has been a world-leader in incorporating some of the wider impacts of transport improvements."<sup>17</sup>

- 3.6** Whilst the Department's analytical techniques are currently world class we recognise that the evidence environment is continuously evolving and that this brings opportunities to develop further our understanding. However, these opportunities are at the leading edge of analysis. For this reason we look to our academic experts and stakeholders to inform our development programme ensuring the analytical techniques support investment decisions and remain world class.

## Informing Our Next Phase of Development

- 3.7** In Spring 2014 we commissioned the Transport Investment and Economic Performance (TIEP) report from Professor Tony Venables<sup>18</sup>, Professor Henry Overman<sup>19</sup> and Dr James Laird<sup>20</sup>. The authors had the specific remit to provide recommendations on the scope for enhancing our current appraisal approach, while ensuring the evidence base remains robust.
- 3.8** To ensure the authors had access to the latest thinking and empirical evidence, we had an open call for evidence, in which academics and stakeholders could submit their latest research. In addition, we held a workshop in April 2014, in which stakeholders scrutinised and provided feedback on the emerging findings in the report.

## TIEP Report Findings

- 3.9** The report groups the impacts of transport investment into three broad types: user benefits, investment and employment effects, and productivity effects. It sets out the latest evidence and methods for valuing these impacts together with recommendations for enhancing our approach. The overarching message of the report is that economic impacts are context specific and for some projects, a wider, context specific picture should be presented of how people and businesses are affected by, and respond to, transport investment.
- 3.10** In the following sections we describe our understanding of the report and how the recommendations will inform our development programme,

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<sup>16</sup> Eddington, R. (2006); "The Eddington Transport Study" <http://webarchive.nationalarchives.gov.uk/+http://www.dft.gov.uk/about/strategy/transportstrategy/eddingtonstudy/>

<sup>17</sup> Venables, A., Overman, H., Laird, J. (2014); "Transport investment and economic performance: Implications for project appraisal"; page 4 <https://www.gov.uk/government/collections/transport-appraisal-and-strategic-modelling-tasm-research-reports>

<sup>18</sup> BP Professor of Economics, Director, Oxford Centre for the Analysis of Resource Rich Economies (OxCarre).

<sup>19</sup> Professor Henry G. Overman, Director What Works Centre for Local Economic Growth, London School of Economics

<sup>20</sup> Dr James Laird, Senior Research Fellow, Institute for Transport Studies, University of Leeds

beginning with encouraging the presentation of a fuller, context specific and richer picture of economy impacts.

## Painting a Richer Picture

- 3.11** Transport investments can impact the economy in many different ways, such as revitalising a local area or developing a specialist and highly productive cluster of businesses that complement each other. In addition, the economic impacts of transport are not mutually exclusive, a transport investment may have more than one economic impact, and their occurrence will be context specific. For example, one transport scheme may have few economic effects beyond a reduction in transport costs, whereas another scheme may affect both transport costs and the levels of employment and Gross Value Added (GVA). As the mechanism through which the transport investment impacts the economy will be specific to the place and the type of intervention, the programme of analysis must be designed to ensure it covers the range of mechanisms and captures the full range of economic impacts.
- 3.12** The TIEP authors recommend that, right from the outset of a project, a context specific narrative should be developed that describes how the transport scheme could impact the economy. The authors propose that the narrative could then be used to help define the analysis, which will test this assertion. We recognise the value of this narrative based approach and plan to develop guidance which will help scheme promoters articulate the narrative and outline how it could be used to inform the analytical programme design. In addition, we would like to encourage the narrative to be presented alongside contextual and analytical information, such as: scene setting information on the types of local industries and employment levels; the local impacts on jobs and Gross Value Added (GVA); and national economic impacts. Altogether presenting a fuller, richer picture that can be more easily understood and scrutinised by decision makers.
- 3.13** In the next sections, we describe the three broad mechanisms through which transport investment impacts the economy that are identified in the TIEP report. These comprise: user-benefits which are a measure of the direct effects of transport investments, such as reductions in vehicle operating costs and journey time savings; investment and employment effects, which refer to changes in the level of economic activity in a particular location that result from a transport investment; and productivity effects which are a result of change in the density of economic activity.



## User Benefits

- 3.14** User-benefits measure the direct effects of transport investments, such as reductions in vehicle operating costs and journey time savings. Reducing these costs is directly related to improvements in productivity, for example through goods and services being delivered faster and/or at lower costs. This approach is used in calculating the economic impacts of the majority of the Department's investment portfolio, from congestion relief schemes to bus priority lanes. The TIEP report cites the ex-post evaluation of the Jubilee Line Extension that demonstrates the strength of the approach<sup>22</sup> and confirms that the Department's "assessment of user-benefits is well grounded."<sup>23</sup>



- 3.15** Where there is significant change in the spatial distribution of employment and residential locations, direct user benefits may not capture all the impacts for schemes. We consider these other impacts in the next section.

## Investment and Employment Effects

- 3.16** Investment and employment effects refer to changes in the level of economic activity in a particular location, as a result of transport investment inducing a change in the number of jobs.
- 3.17** The TIEP report recommends further work to better understand and value these effects, because they often form an important focus of both the debate and decision-making process. Our current approach to investment and employment impacts covers the impact of a scheme on residential land use change, the 'move to more productive jobs' guidance, and regeneration areas. These approaches are tightly defined because of the complexity in identifying whether benefits are 'additional', rather than just being redistributed from elsewhere, and the extent to which any of these changes are already accounted for as part of the direct user-benefit calculation. As a result of our approach and evidence base, we are confident in the robustness of current business cases which include these impacts based on existing WebTAG guidance.

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<sup>21</sup> We acknowledge the following source for the image on this page: <https://www.flickr.com>: Ian Britton

<sup>22</sup> Gibbons, S., and Machin, S. (2005); "Valuing rail access using transport innovations"; Journal of Urban Economics, 57(1): 148-169

<sup>23</sup> Venables, A., Overman, H., Laird, J. (2014); "Transport investment and economic performance: Implications for project appraisal"; page 4 <https://www.gov.uk/government/collections/transport-appraisal-and-strategic-modelling-tasm-research-reports>

**3.18** In line with the recommendations in TIEP, we intend to develop further our guidance on investment and employment effects, so as to present a fuller picture of these impacts on business cases. However, as acknowledged by the report authors, identifying and valuing the impacts of a scheme is challenging, particularly when they arise due to a change in the spatial distribution of economic activity. Investment and employment effects, in addition to those already in WebTAG, will only be included in guidance when there is a sufficiently robust methodology to quantify and value these impacts.

**3.19** In developing our approach to capture a broader range of potential investment and employment impacts we need to ensure that new methods are sufficiently well developed so as to support robust analytical advice. To begin this process we plan to consider a range of



approaches to valuing the scale of the impact alongside developing a method to determine the extent to which the impact is additional.

### **Valuing the impacts (jobs and GVA)**

**3.20** There are at least two approaches that we are aware of to value the investment and employment effects: the uplift in land value as a result of a change in land-use; and the change in output (Gross Value Added) which results from new and/or expanded economic activity.

**3.21** The land value uplift approach underpins what is currently set out, for the narrow circumstance, in the current dependent development guidance. The alternative GVA approach involves forecasting the number of jobs, which could be created as a result of a transport scheme, and valuing these on the basis of their expected productivity. However forecasting the impact of transport improvements on the locations of jobs and homes and linking this to economy is subject to a great deal of uncertainty, but does offer the potential to capture these effects. It is for this reason that we intend to investigate the feasibility of utilising these approaches and any relevant alternatives to capture a fuller range of investment and employment effects.

### **Additionality and Displacement**

**3.22** As set out in the TIEP report, understanding and quantifying the extent to which investment and employment is additional at the national level or whether it is merely displaced from other locations or activities is complex. Thus, while transport investment may have important employment and GVA impacts at the local level, these may not be additional when considered at the national scale.

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<sup>24</sup> We acknowledge the following source for the image on this page: <https://www.flickr.com>: Elliott Brown



- 3.23** The question of additionality is not limited to transport investment and to develop our understanding we plan to consider existing methodologies, such as those used by other Government Departments, and develop a method appropriate for transport investments.
- 3.24** Better transport connectivity and/or the redistribution of employment centres, as a result of improved transport links, can lead to the development of highly productive clusters and specialist centres. In the next section we explore the TIEP recommendations and our current thoughts with respect to these potential productivity effects.

## Productivity and Agglomeration

- 3.25** Productivity effects are derived from changes to agglomeration economies; the concentration of economic activity is positively related with productivity. The benefits of being closely located is one of the principle reasons for the clustering of economic activity. The TIEP report sets out two ways transport can impact the concentration of economic activity, and hence productivity. We have termed these static and dynamic clustering.
- 3.26** Static clustering occurs when the effective density of a cluster changes as a result of changes to generalised transport costs but the location of economic activity is unchanged. In this instance people become effectively closer together because their transport links are improved, but there is no land use change. Dynamic clustering is where a transport scheme induces a change in the location of jobs and companies, and as a result increases the effective density of a cluster.
- 3.27** The TIEP report notes that our approach estimating the economic benefits associated with static clustering effects is “fundamentally sound”<sup>26</sup>, such that we are confident in existing business cases, which include this effect. However, the TIEP report identifies that it is not clear that the approach fully captures dynamic clustering effects.
- 3.28** Despite the potential relevance of dynamic clustering to some types of transport interventions,



<sup>25</sup> "MediaCity at night" by University of Salford Press Office - NIGHTSHOT 3. Licensed under Creative Commons Attribution 2.0 via Wikimedia Commons -

[http://commons.wikimedia.org/wiki/File:MediaCity\\_at\\_night.jpg#mediaviewer/File:MediaCity\\_at\\_night.jpg](http://commons.wikimedia.org/wiki/File:MediaCity_at_night.jpg#mediaviewer/File:MediaCity_at_night.jpg)

<sup>26</sup> Venables, A., Overman, H., Laird, J. (2014); "Transport investment and economic performance: Implications for project appraisal"; page 41 <https://www.gov.uk/government/collections/transport-appraisal-and-strategic-modelling-tasm-research-reports>

there is not currently a consensus on how to robustly estimate these effects.

- 3.29** Dynamic cluster effects are subject to a great deal of uncertainty, such as forecasting future land use, employment and industrial composition. We plan to investigate these effects, initially focussing on the extent to which our existing methods capture the impact of improved inter-city connectivity and/or where there is significant land use change as a result of a transport investment.
- 3.30** Underlying the quantification of user benefits, investment and employment effects, and productivity effects is forecasting the location of jobs and households in response to a transport investment. This 'quantity effect' is discussed below.

## Forecasting Number of Jobs and Homes

- 3.31** Forecasting where people will live, work and visit is fundamental to the Department's analytical work. The Department uses the land-use model which is part of the NTEM modelling suite to forecast the location of jobs and employment growth based on local authority plans and demographic forecasts (See chapter 6 on Forecasting the Future Demand for Travel). These forecasts form the baseline assumptions for transport usage in scheme appraisal. However, it is possible that a transport scheme will induce a change in where people live, work and visit, thereby deviating from the underlying assumptions about travel patterns.
- 3.32** The TIEP report recommends that the Department models transport induced land-use change in a broader range of business cases. However, forecasting land-use change and the spatial distribution of economic activity is complex: land-use models are highly data intensive and mathematically demanding.
- 3.33** The TIEP report outlines four different approaches to model the location and level of economic activity: Survey Based Approaches (Bottom-up), Econometric Models, Land-use Transport Interaction (LUTI) models, and Spatial Computable General Equilibrium (SCGE) and General Equilibrium (GE) models.
- 3.34** We plan to build on the research published last year into methods for modelling the impact of transport investment on the location and level of economic activity,<sup>27</sup> by setting standards to assess the quality of different approaches. Setting standards should encourage scheme promoters to provide information which is relevant, robust and proportionate to the particular scheme, thereby ensuring a context specific appraisal that meets the requirements of decision-makers.

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<sup>27</sup> McCartney, P., Lowe, S., Worsley, T., Hall, K., Mackie, P., (2013); "Assessment of Methods for Modelling and Appraisal of the Sub-National, Regional and Local Economy Impacts of Transport" <https://www.gov.uk/government/publications/modelling-and-appraisal-of-the-sub-national-regional-and-local-economy-impacts-of-transport>

## Summary of the Evidence and Next Steps

- 3.35** Transport is essential for economic growth and, as a result of many years of development, the Department's "appraisal guidelines provide a rigorous framework for appraising projects" and "[the Department] has been a world-leader in incorporating some of the wider impacts of transport improvements."<sup>28</sup> The Department's existing appraisal techniques allow for a broad range of economic impacts to be appraised, such as labour market impacts, productivity (agglomeration) effects, investment effects and user-benefits. As a result of the breadth of impacts captured and the robust evidence base, WebTAG "provide[s] a rigorous framework for appraising projects,"<sup>29</sup> and we are confident that our approach to transport appraisal remains sound.
- 3.36** The economic impacts of transport investment are wide ranging, particularly for large projects, and context specific. For this reason there is no 'one size fits all'. We need scheme promoters and sponsors to understand and identify which impacts are relevant to their specific scheme and not mechanically apply appraisal techniques.
- 3.37** For some projects it is possible there could be some relevant additional economy impacts that are not fully captured in the guidance, such as dynamic clustering, and investment and employment effects. This is because no sufficiently robust methods currently exist to model and value these impacts, which achieve a broad consensus within the analytical community: the required methods are at the edge of the analytical envelope and still in development. As outlined in the TIEP report, the Department's existing methodologies to appraise transport schemes are robust and rigorous. However, we recognise that it is increasingly important to understand and, where possible, value these additional impacts. Therefore we intend to investigate these effects and develop guidance for their inclusion in transport appraisal.
- 3.38** Below we summarise our next steps in developing our guidance on economic impacts. A key theme running throughout our approach is stakeholder engagement. This will allow us to seek the broadest consensus for the development of guidance and ensure it is based on a robust evidence base.

### Short term developments

- 3.39** In the short term we will undertake a number of actions to address how we quantify, value and communicate economic impacts.
- 3.40** We plan to improve the way the economic impacts of transport are communicated to decision makers through requiring scheme promoters to: outline the economic context of the investment location; develop a narrative which describes how the scheme will impact the economy; and present analysis which tests the narrative. This should improve

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<sup>28</sup> Venables, A., Overman, H., Laird, J. (2014); "Transport investment and economic performance: Implications for project appraisal"; page 4 <https://www.gov.uk/government/collections/transport-appraisal-and-strategic-modelling-tasm-research-reports>

<sup>29</sup> Venables, A., Overman, H., Laird, J. (2014); "Transport investment and economic performance: Implications for project appraisal"; page 5 <https://www.gov.uk/government/collections/transport-appraisal-and-strategic-modelling-tasm-research-reports>

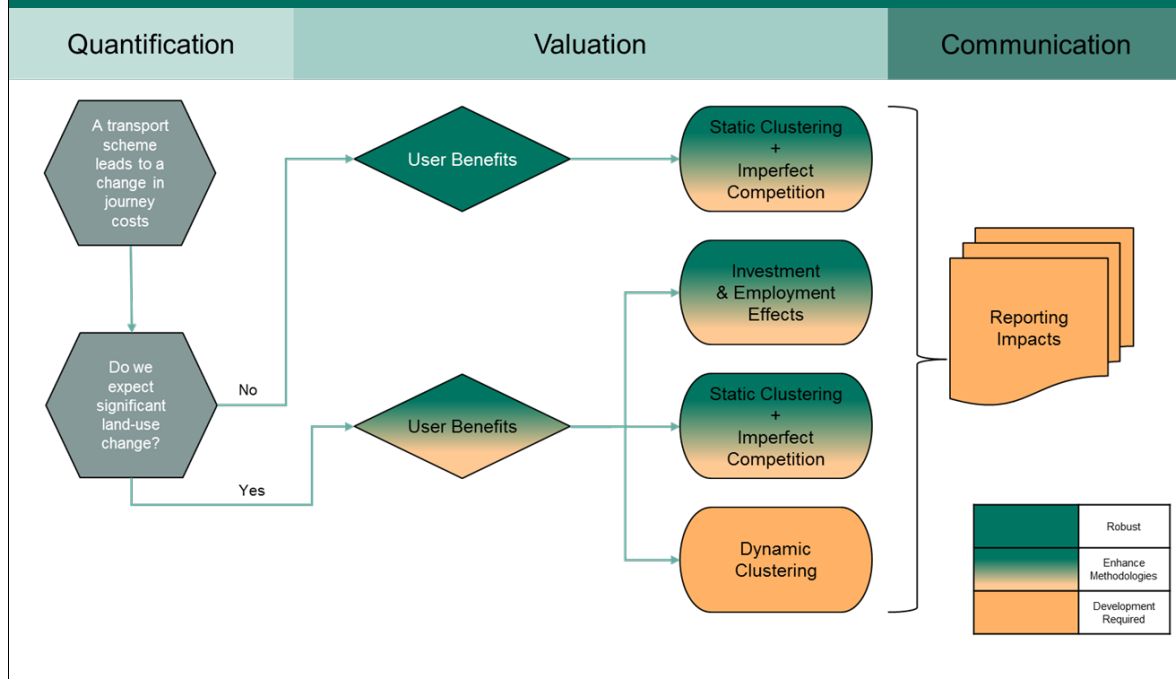
understanding of the economic impacts and the scrutiny to which they are subjected by decision makers. A core part of developing this guidance will be to engage with our stakeholders, developing our approach in tandem with scheme specific business cases, finally releasing guidance for consultation in autumn 2015.

- 3.41** With respect to the valuation of impacts we intend to broaden our approach to investment and employment effects and set out guidance on additionality and displacement. In addition we will investigate the opportunities to enhance our approach to 'dynamic clustering effects', beginning with understanding the extent to which our current approach captures intercity and other effects, such as specialisation. We plan to commission external advice to develop our technical understanding in this area and will hold an external engagement event on the outputs of this work in autumn 2015.
- 3.42** To support the valuation of the economic impacts, we will continue to develop our understanding of how people and businesses respond to transport investment, helping to forecast the location and numbers of jobs (the quantity effects). In conjunction with this we plan to set standards for the application of different approaches to model economic impacts releasing guidance for consultation in autumn 2015.

#### **Longer term**

- 3.43** **Figure 3.1** describes an impression of the potential future shape of economic impacts appraisal process, aligning guidance along the three key mechanisms identified by TIEP and encouraging scheme promoters to present their narrative, economic analysis and context as a coherent picture. At the heart of this approach would be robust methods that could be applied in a way that reflects the context specific nature of economy impacts.

**Figure 3.1 Potential Future Shape of the Economic Impacts Appraisal Process**



## 4. Valuing Environmental and Health Impacts

- 4.1** Transport has far-reaching impacts on our economy, the environment and how we live our lives every day. To ensure decision makers have the fullest possible information, transport appraisal aims to provide a comprehensive picture of the social, environmental and economic impacts of different options.
- 4.2** A recent comparison of practice in several countries with well-developed transport appraisal frameworks<sup>30</sup> noted that many of the key developments in WebTAG over the last decade have focussed on environmental and health impacts – like monetisation of greenhouse gas and air pollutant emissions, and the physical activity benefits of walking and cycling – have ensured that our methods continue to be in line with international best practice.
- 4.3** Given the wide range of environmental and health impacts, there are a wide range of different methods used to value these impacts in transport appraisal. For example, noise values draw on evidence of the impact of noise on house prices; greenhouse gas emission values use prices from the EU Emissions Trading System and estimates of the costs of meeting Government carbon targets; and values of health are derived from people's willingness-to-pay to reduce the risk of accidents, injuries and death.
- 4.4** As far as possible, we aim to place an evidence-based value on impacts, where this is not possible, we take an 'environmental capital' approach to qualitatively assess impacts on biodiversity, the water environment, heritage and other factors. This involves an assessment of the current environmental resources, features and characteristics – to establish a baseline level of environmental capital – and how this will be affected by the option being considered. This approach ensures that, although they can't be monetised, factors like impacts on protected species or the water environment are considered and reflected in our value for money advice.

### Working Together on the Methods and Values

- 4.5** Transport isn't the only source of environmental impacts; we work closely with other Departments on how these impacts should be treated in appraisal and to ensure our methods are up-to-date and reflect the latest evidence.

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<sup>30</sup> DfT (2013); "International comparisons of transport appraisal practice"  
<https://www.gov.uk/government/publications/international-comparisons-of-transport-appraisal-practice>



- 4.6** Some of the environmental consequences of transport schemes, e.g. on air quality and noise, ultimately result in impacts on people's health. There are many other areas where valuation of health impacts is important; in a transport context alone we look at changes in the number and severity of accidents and changes in physical activity from walking and cycling. Therefore we also work closely with Defra, the Department for Health and others across Government to develop our approach to valuing health impacts.



## Recent Developments in Valuing Environmental and Health Impacts

- 4.7** In November 2014 we updated our guidance to include the latest Supplementary Green Book guidance, issued by DECC<sup>32</sup>, on valuing greenhouse gas emissions. And in January 2014 we introduced the 'marginal abatement cost' method for valuing air quality pollutants where EU limits are exceeded, in line with the method developed by Defra<sup>33</sup>.

## Continuing our Collaborative Work

- 4.8** Much of the development of our guidance in recent years has focussed on broadening the scope of appraisal to monetise more environmental and health impacts. These effects can be either positive or negative but our comprehensive framework, which ensures that impacts that can't be monetised are considered in Value for Money advice, means that decision makers are presented with a full set of information.
- 4.9** Our Analytical Strategy in this area is based on close joint working with others, both inside and outside of Government, to ensure that we understand developments in the evidence base and are able to reflect them in our appraisal methods and values. We will continue to work in this collaborative fashion. For example, we are working with colleagues from across Government on the latest research on the impacts of noise and to ensure approaches used across Government to value health impacts are consistent, make use of the latest methodological developments and use up-to-date evidence.

<sup>31</sup> We acknowledge the following source for the image on this page: <https://www.flickr.com/photos/mariordo59/>

<sup>32</sup> <https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal>

<sup>33</sup> <https://www.gov.uk/government/publications/green-book-supplementary-guidance-air-quality>

## 5. Valuing Journey Improvements- Values of Time Travel Savings and Reliability

- 5.1** Values of travel time savings (or 'values of time') play a major role in Transport Business Cases. They are used to value the benefits of improved connectivity and underpin the valuation of other journey improvements, like reduced crowding on trains and improved reliability, as well as the direct benefits of quicker journeys.
- 5.2** Last year we updated our values and validated them against evidence from a wide range of studies. This included a comparison of our values for business travel against existing evidence of businesses' 'willingness-to-pay' for quicker journeys, which demonstrated our values are an effective proxy and confirmed they are reasonable for use in informing decision making. Now we're going further and a large scale research project is currently underway to measure values of time through directly surveying both people and business to understand how they value travel time savings. This will ensure our values continue to reflect; people's willingness-to-pay for quicker journeys, behavioural changes, the growth in the availability and capability of mobile technology, and developments in data and analytical techniques. This project will build on our already established methods for valuing travel to deliver fully updated values, with greater understanding of the diversity of the values and ensure it remains reasonable for use in to the future.
- 5.3** At the 2013 UVITI stakeholder workshop, some of the key issues and challenges around values of time were discussed. This helped set the direction for the Department's next stage of research, which is focussed on new, direct survey evidence. The broad objectives of this research are to:
- Produce new, robust and reliable values from new survey evidence covering a range of transport modes;
  - Extend the use of direct survey methods, previously used for non-work travel, to business travel time savings;
  - Explore the characteristics of people and the trips they make; and
  - Generate consistent estimates for the values for other journey improvements, like improved reliability and crowding relief.
- 5.4** We commissioned this research in May 2014 and this section describes progress with the project so far and our next steps.



### Box 5.1: More than just time savings – the importance of valuing time

A transport scheme will have direct impacts on the people who are travelling, by improving their travel experiences, often speeding up journey times and thus allowing more time to pursue leisure or business activities. Improving access to employment, business, and leisure opportunities also offers people the chance to work in different places, with different businesses, and to switch to more enjoyable activities - all of which would be indicated by a change in the volume and pattern of travel. These economic impacts could transform further, as they lead to changes in people's and business locations, and property prices. For example, imagine:

- A transport scheme, which makes a cross town journey easier by removing interchanges. Someone who has been put off visiting friends across town and instead has been staying home and watching TV, can now make that journey, switching to what is for them a more enjoyable activity; or
- A business person who doesn't travel to meet an important potential client because the journey requires two train journeys and a long interchange. The provision of a seamless service means that they make their vital meeting, sealing the big deal and opening up the markets their business can serve.

We use values of time to estimate these different ways that people can benefit from transport improvements in transport appraisal; emphasising the vital role that the values play and that they're not simply about time savings.

## Getting Ready To Survey

- 5.5** Our research is survey-based - the values of time will be derived from responses to questionnaires completed by members of the travelling public and businesses. As with any large-scale survey, it is important that these questionnaires, and the survey methods that will deliver them, are tested before rolling them out.

### Focus groups

- 5.6** As a first stage, before any surveying, we held focus groups with members of the travelling public and businesses, to explore some of the more novel areas of our research, in particular how businesses make travel decisions and view the benefits of quicker journeys. The groups also looked at the



<sup>34</sup> Photo courtesy of Accent

concept of trading between time and cost, in transport and other contexts. These discussions confirmed that people and businesses are comfortable with the idea of trading-off the two and recognise the broader benefits of saving travel time.

### **Out in the field- developing and piloting questionnaires**

**5.7** It is important to test and pilot surveys before rolling them out. This has two primary purposes: to ensure the survey delivery methods work, e.g. can enough people be recruited to complete the survey; and to make sure the questionnaires are ‘working’ – that people can understand and complete them and that the resulting data can be used to estimate values. The latter is particularly important given the complex nature of the questionnaires and the issues we’re covering in the research project.

**5.8** Hence our questionnaires, developed with input from the focus groups, were subject to cognitive testing – in-depth interviews that test whether respondents fully understand the questions and what they’re thinking about when answering them – and two waves of piloting. This allowed any problems identified in the first wave to be rectified in wave two.

**5.9** In both waves of piloting we were able to recruit enough people to complete the surveys and, although the questionnaires and the issues they’re dealing with are complex, respondents generally understood what was being asked of them and found the choices they were being asked to make realistic. Taking these two factors together, the piloting and cognitive testing were successful and indicate we will be able to estimate reliable and robust results from the surveys. Following this success, the second stage of the project – the main data collection and calculation of the values – is now underway.



## **Scope of the Research**

### **History of measuring values of time travel savings**

**5.10** For many years, both in the UK and abroad, surveys have been used to estimate values of time to calculate the benefits of improved journey times and connectivity. Cost-benefit analysis requires benefits to be expressed in monetary terms and these survey techniques – which estimate people’s ‘willingness-to-pay’ – are necessary because there is

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<sup>35</sup> Photo courtesy of Accent

no widespread market where quicker journeys can be 'bought', and therefore no readily available monetary values.

**5.11** Traditionally the focus of these survey-based methods has been on non-work travel. 'Discrete choice stated preference' techniques – where survey respondents choose between journey options for a hypothetical trip with different travel times and costs – are used to estimate people's willingness-to-pay for quicker journeys.

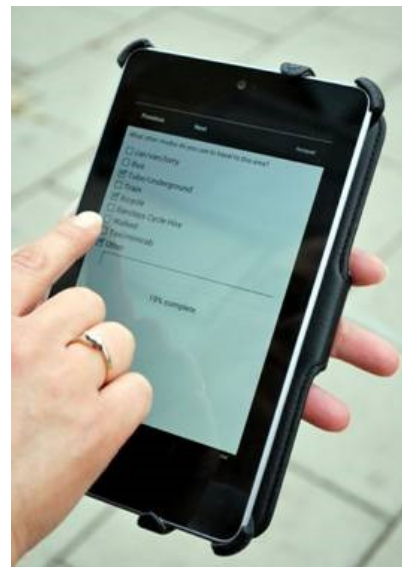
**5.12** For business travel, the benefits of improved journey times and connectivity are most likely to be realised as reduced costs and increased productivity. Businesses should theoretically be willing to pay up to the value of these productivity benefits for quicker journeys. How much a business would be willing to pay depends on a wide range of factors, such as the value of more time an individual or team might spend at the destination (i.e. extra meetings, more time to seal the deal), what work can be done while travelling, the impact of crowding on productivity and the value of not having to plan and pay for an overnight stay. However, rather than willingness-to-pay techniques, a more economic-theory based approach, which simplifies these complexities, has traditionally been used to estimate business values that effectively operate as a proxy for willingness-to-pay.

### Why focus on 'willingness-to-pay'?

**5.13** Last year we set out our intention to go beyond this theory-based proxy and collect evidence of businesses' willingness-to-pay. In this project we are doing just that by extending the use of willingness-to-pay techniques to business travel and undertaking stated preference surveys with 'employees' (people in the course of business trips) and 'employers' (representatives of an organisation, responding from the business' perspective). This approach has significant challenges, such as identifying the right people in an organisation to represent that business' view and ensuring that both employees and employers are reflecting what the business would want in their responses.

**5.14** However, the approach also has significant benefits; it will allow detailed analysis and greater understanding of the factors that affect how a business would benefit from improved journey times and connectivity, including characteristics of the business, the employees making business trips and the trip itself (such as its length, timing and the ability to work while travelling).

Therefore, taking a willingness-to-pay approach will allow us to explore and better understand the uncertainty and variation in the values.



<sup>36</sup> Photo courtesy of Accent

## Taking a multi-modal approach

**5.15** In this study we are taking a multi-modal approach, surveying bus, rail, light rail, tram and London Underground users, pedestrians and cyclists, as well as car users. Other recent European national values of time studies, such as those in Sweden<sup>38</sup> and the Netherlands<sup>39</sup> have also taken a multi-modal approach but this is a significant development from previous UK national studies, which focussed predominantly on car users.

**5.16** This will not necessarily mean that our values will be split by mode in the future, but will allow for more direct comparisons between modes and investigation of whether differences are attributable to trip (e.g. journey distance) or personal (e.g. income) characteristics, or more intrinsic features of the different modes of transport.



## Walking and cycling- specific challenges

**5.17** Including walking and cycling brings its own specific challenges, especially as there has been significantly less research, relative to the mechanised modes, on how pedestrians and cyclists perceive the benefits of quicker journeys. These challenges include how to introduce a 'cost' for walking and cycling trips, which is needed to calculate a monetary value; how to disentangle the potential benefit of quicker journeys from the greater effort of walking or cycling quicker; and, fundamentally, how important journey times really are for these trips, alongside other factors like safety and physical fitness.

## Validating the data

**5.18** While there is no widespread market where people can 'buy' travel time savings, real-world situations where people are faced with time-cost trade-offs can provide insights on values of time. In some respects so-called 'revealed preference' data from actual behaviour are preferable to stated preference data as they are based on real-world choices. However, the realities of dealing with data from such 'natural experiments' mean they are often not of sufficient quality, or available in sufficient quantity, to estimate values robustly.

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<sup>37</sup> We acknowledge the following source for the image on this page:

<http://www.geograph.org.uk/photo/1128399>; Author: Nigel Chadwick

<sup>38</sup> Börjesson, M., Eliasson, J. (2012); "Experiences from the Swedish Value of Time study"

<http://www.transportportal.se/SWoPEc/CTS2012-8.pdf>

<sup>39</sup> Significance, VU University Amsterdam, Bates, J. (2012); "Values of time and reliability in passenger and freight transport in The Netherlands"

[http://www.kimnet.nl/sites/kimnet.nl/files/filemanager/bijlagen/Bijlage\\_Values\\_of\\_time\\_and\\_reliability\\_in\\_passenger\\_and\\_freight\\_transport\\_in\\_The\\_Netherlands.pdf](http://www.kimnet.nl/sites/kimnet.nl/files/filemanager/bijlagen/Bijlage_Values_of_time_and_reliability_in_passenger_and_freight_transport_in_The_Netherlands.pdf)



- 5.19** We drew on existing 'revealed preference' evidence when validating our values last year. In this study, we will be adding to that evidence base by collecting new survey evidence of real-world travel choices and using this data to validate results from the stated preference surveys. This means we will have both the greater depth and insight that can come from well-constructed stated preference surveys and the real-world evidence from revealed preferences.
- 5.20** It's vital when dealing with revealed preferences that people are faced with genuine time-cost trade-offs. We are focusing on rail travel and significant effort has gone in to selecting routes where competition between train operators means that passengers face a real trade-off and there's sufficient variation in the times and costs for values to be estimated. There are two further benefits to this approach: looking at choices between competing train operators avoids the additional complexity of choices between different modes (where it is hard to separate how people value travel time from their inherent preferences for different modes); and it allows us to make a direct comparison between results from the different methods by carrying out stated preference surveys with passengers on the same routes.

### **Not all time is the same- valuing changes in other journey improvements**

- 5.21** As set out above, values of time are not just used to calculate the benefits of quicker journeys, but also to value other journey improvements, including improved reliability, crowding relief and reduced time spent accessing, and waiting for, public transport.
- 5.22** While other national studies have included some of these factors (for example, the recent Dutch study included reliability), in this project we are including reliability, crowding, service frequency, driving in different traffic conditions and different time elements for bus travel. This represents a significant development from previous UK national studies. The evidence behind the current multipliers has been built up from different sources – we are not aiming to replace all of this existing evidence but to ensure the multipliers are consistent with the values of time to which they are applied.

### **Getting the most out of the data**

- 5.23** Including all of these different journey improvements posed a significant question for the questionnaire design. Presenting all respondents with 'choice games' covering all the factors relevant to their mode of transport would maximise the quality of the data but potentially make the questionnaire too complex and affect response rates.
- 5.24** For the piloting, we opted for a '3-game' approach. In general, respondents faced a series of experiments including: time and cost; time, cost and reliability; and time, cost and another 'quality' factor, like crowding. There was no evidence from the pilot of excessive 'drop-out' rates. Therefore this approach is being continued for the main data collection and will bring significant benefits in terms of the consistency and depth of the data from the surveys.

### **Box 5.2: More than just time savings- values of time and crowding**

Crowding, in appraisal, is represented through multipliers on the values of time – which reflect the additional discomfort of travelling in crowded conditions and evidence that people would be willing to pay more to reduce journey times in crowded conditions – meaning that the more a train is crowded, the higher the ‘time cost’ of a journey.

Where a transport improvement reduces crowding, for example by increasing capacity, this will reduce the multiplier, and therefore value of time, for that journey. The resulting reduction in the ‘time cost’ of the journey is how the benefits, in terms of a more pleasant travelling experience, would be calculated in transport appraisal.

The values of time underpin the valuation of crowding improvements and, in a similar fashion, are also used in the valuation of a whole range of other journey improvements, in addition to valuing the benefits of quicker journeys and improved connectivity.

### **Why might the values vary for different people or trips?**

- 5.25** People will view travel time differently, depending on their personal preferences and the specific details of the trips they make. There is a lot of evidence on how factors like journey purpose, income and trip duration affect values of time. Recent developments in the availability and capability of mobile technologies also have the potential to affect the values, by broadening the set of activities people can undertake while travelling.
- 5.26** Our study will look at the traditional factors, like income and distance, but the questionnaires also cover how people use their travel time. This will provide evidence on how the range of values are affected by the use of mobile technologies while travelling – one of the key advantages of extending survey-based techniques to business travel.

## **Timescales for the Research Project and Updated Appraisal Guidance**

- 5.27** The analysis and research we published last year demonstrated that our current values are reasonable for use in informing decision making and that our theory-based values for business travel are an effective proxy for businesses' willingness-to-pay. This research project will help us better understand the diversity of the values, and to ensure they continue to remain reasonable for use into the future.
- 5.28** The research project is scheduled to report in spring 2015. The report will pull together an analysis of all the survey data and will make recommendations on how the findings can be incorporated in to refreshed WebTAG guidance. Our intention is to consult widely on the findings of the research and on the appropriate changes to WebTAG over the rest of 2015 - with the aim of incorporating changes in updates to WebTAG in 2016.

## 6. Forecasting the Future Demand for Travel

- 6.1** Understanding demand for travel is core to understanding the impact of transport investments. Forecasting demand is challenging. We can learn from the recent past, with established travel trends providing a good basis for future behaviour, but we must understand why these trends are developing. This chapter sets out our current approach and our development plans for forecasting demand for travel.
- 6.2** Our current understanding is embedded in the established National Trip End (NTEM) suite of models, which is the basis for forecasting multimodal demand for travel. These are based on decades of research and past evidence to understand the demand for future travel – how many trips there will be, which modes people will be taking and when and why they travel.
- 6.3** The NTEM data set is an important source used in transport modelling and planning applications. It provides an initial forecast of travel demand (not specific to any mode) to be applied in bespoke transport models and is the standard dataset used by the Department, Local Authorities and other organisations when modelling demand for use in business cases. Transport models then allow this demand to be adjusted by supply and cost considerations (e.g. local congestion) in order to give more locally accurate trips by mode, purpose, destination, and any other segmentation to which the model is calibrated. Indeed, the NTEM data set provides the initial demand for the National Transport Model (NTM), which then forecasts traffic based on generalised costs seen on the network and changes in macro-economic factors. In addition to NTEM, our modelling and appraisal guidance also describes uni-modal demand forecasting models, such as those specific to modelling rail or aviation. [PDFH<sup>40</sup> and aviation forecasts<sup>41</sup>]. These mode specific applications are not extensively discussed here.
- 6.4** Demographic changes are a key driver of travel demand changes. Within the NTEM suite, the Department utilises a land-use model (called the Scenario Generator) that rationalises various local and national data sources for population, employment and housing supply to give future estimates of where people live and where they work. The spatial detail of the current model is demonstrated in **Figure 6.1** below. The demographic projections are disaggregated further to identify whether households own a car, based on factors such as income growth and

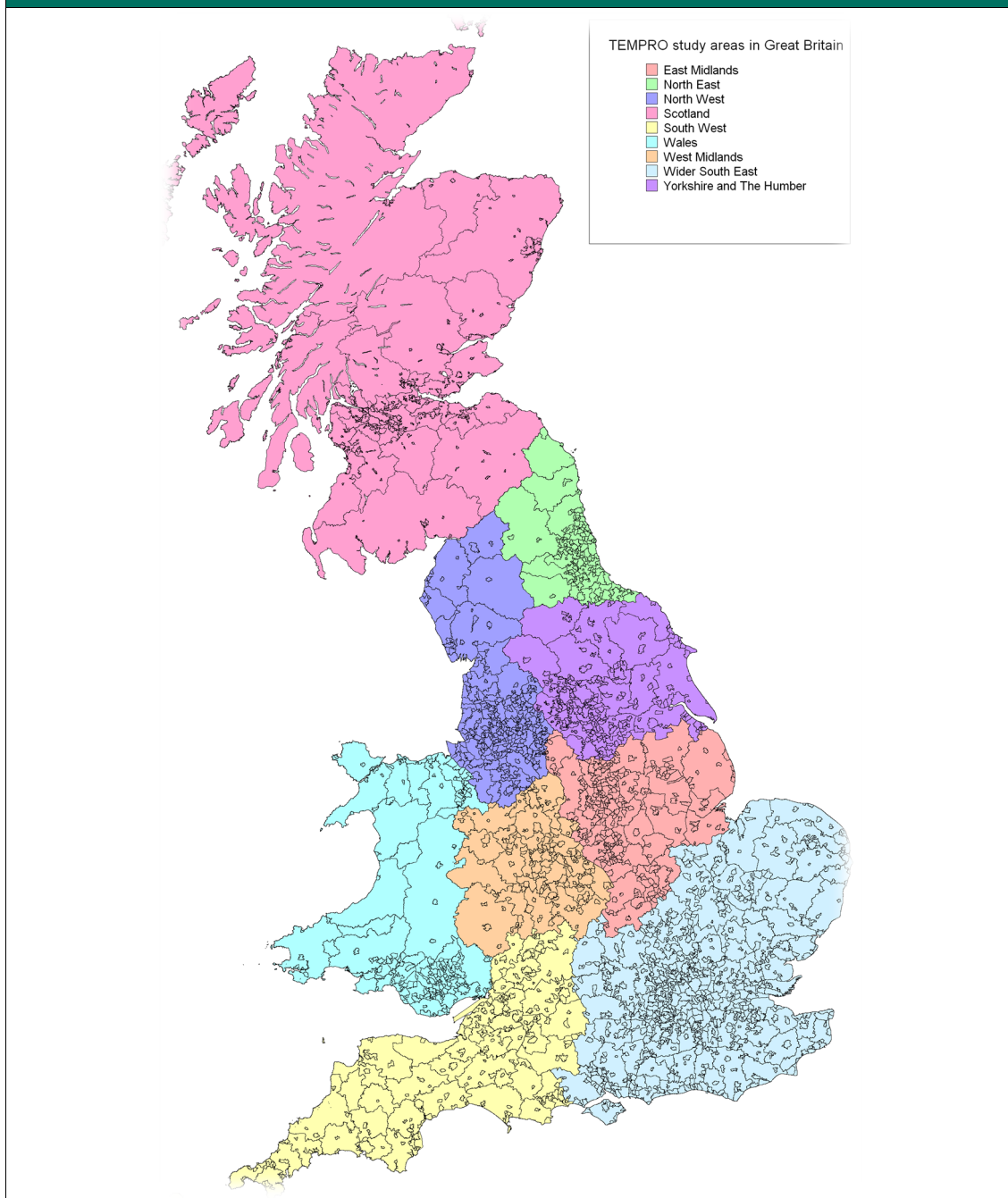
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<sup>40</sup> Passenger Demand Forecasting Handbook: for more information see [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/381943/TAG\\_Unit\\_A5.3\\_-\\_Rail\\_Appraisal\\_November\\_2014.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/381943/TAG_Unit_A5.3_-_Rail_Appraisal_November_2014.pdf)

<sup>41</sup> <https://www.gov.uk/government/publications/uk-aviation-forecasts-2013>

saturation levels. This has been shown to be an important indicator in determining the number and type of trips which people will make.

**Figure 6.1 Zoning System of the National Trip End Model Data Sets**



- 6.5** This is finally combined with census data, employment data and with trip rates from the National Travel Survey to forecast future trip ends to, and from, areas in Great Britain. This creates very detailed and sophisticated forecast datasets comprising the number of trips, the purpose of the trip and the household types they are generated from for approximately 2,500 zones in Great Britain.
- 6.6** Our forecasting approach uses the latest available planning data projections to identify where people live and work, largely taken from other Government Department sources and Local Authorities. The average trip rates, for different cohorts and journey purposes, such as



shopping or commuting, are derived from the National Travel Survey, which is a Department commissioned travel survey collected yearly since 1988. This is all combined as described above in order to forecast total travel demand.

- 6.7** With the publication of the 2011 Census data and updated demographic and planning projections we have the opportunity to update our models. We have also re-estimated people's trip-making patterns to the most recent data from the National Travel Survey, which will implicitly incorporate the latest information we have on people's travel choices into the model, capturing many elements of behavioural change that have occurred in the previous decade. This work is described in more detail in the next section.
- 6.8** Building on this work we aim to investigate the trends emerging from the latest evidence, looking at how our modelling suite can reflect more recent evidence in travel demand trends. To better anticipate future behaviour we also must understand why behaviour is changing and the influence of this, and other factors such as demographic and spatial change, economic factors such as GDP and fuel prices as well as specific policy levers on demand for travel. This chapter describes our progress and plans for develop NTEM and enhancing our forecasting capability.

## Understanding Behaviour Change

- 6.9** Recent research by the Department<sup>42</sup> and other organisations has indicated that people's travel behaviour might be changing. This has been highlighted by other organisations in such research papers as TfL's "Drivers of Demand for Travel in London"<sup>43</sup>, OECD's roundtable report "Long-run Trends in Car Use"<sup>44</sup> and the Independent Transport Commission's "On the Move"<sup>45</sup> report.
- 6.10** The On the Move report highlighted several trends which includes young men being less prevalent than before in holding driving licences, an increase in female driving fuelled by increased participation in the labour market, and increases in rail patronage driven, at least in part, by a sharp decline in company cars. Other observations in the UK and developed countries have also indicated that car use has been levelling off in denser urban areas, whilst people continue to increase their car use outside of these areas. The Department is developing research to capture and quantify these trends while also understanding what is driving them.

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<sup>42</sup> Including; DfT (2009); "Research into changing trip rates over time" [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/193908/trip-rates-report.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/193908/trip-rates-report.pdf) and forthcoming DfT publication exploring factors and trends of roads use.

<sup>43</sup> TfL (2014); "Drivers of Demand for Travel in London"

<https://www.tfl.gov.uk/cdn/static/cms/documents/drivers-of-demand-for-travel-in-london.pdf>

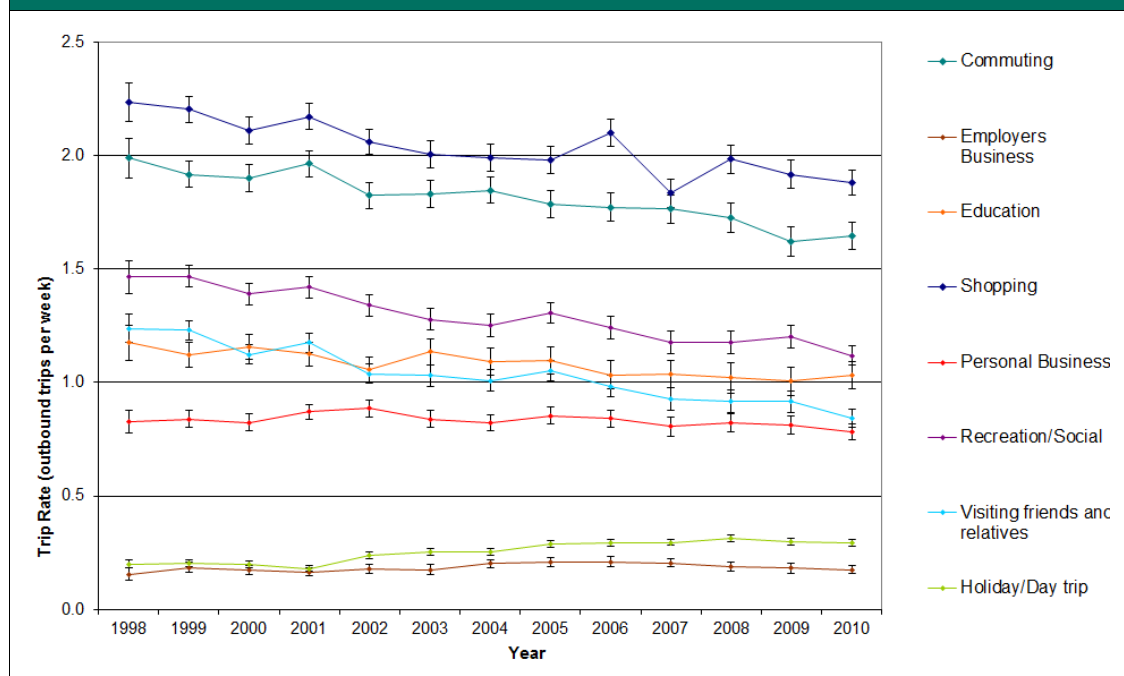
<sup>44</sup> OECD (2013); "Long-run Trends in Car Use" [http://www.oecd-ilibrary.org/transport/long-run-trends-in-car-use\\_9789282105931-en](http://www.oecd-ilibrary.org/transport/long-run-trends-in-car-use_9789282105931-en)

<sup>45</sup> ITC (2012); "On the Move: Making sense of Car and Rail travel trends in Britain" <http://www.theitc.org.uk/our-research/research-reports/transport-reports/>

## Investigating trip rates

- 6.11** Within NTEM, input parameters called “trip rates” represent one of the primary input parameters into the model which capture travel demand. The trip rates are a measurement of people’s propensity to travel<sup>46</sup>. Recent Departmental research analysed the latest National Travel Survey (NTS) data available at the outset of the study, a time-series of NTS data from 1998 to 2010, to re-estimate the trip rate values and capture the latest travel trends observed from the NTS data.
- 6.12** The project has conducted further robust statistical analysis, and begun to investigate whether there are trends over time, or changes in other aspects of travel such as trip distance, or the number of trips by various different purposes made. **Figure 6.2** below shows a graph of the trends by purpose for the period 1998 to 2010 for home based outbound trips, so does not yet cover onward and return trips.

**Figure 6.2 Graph of Trip Rate Trends Between 1998 and 2010**



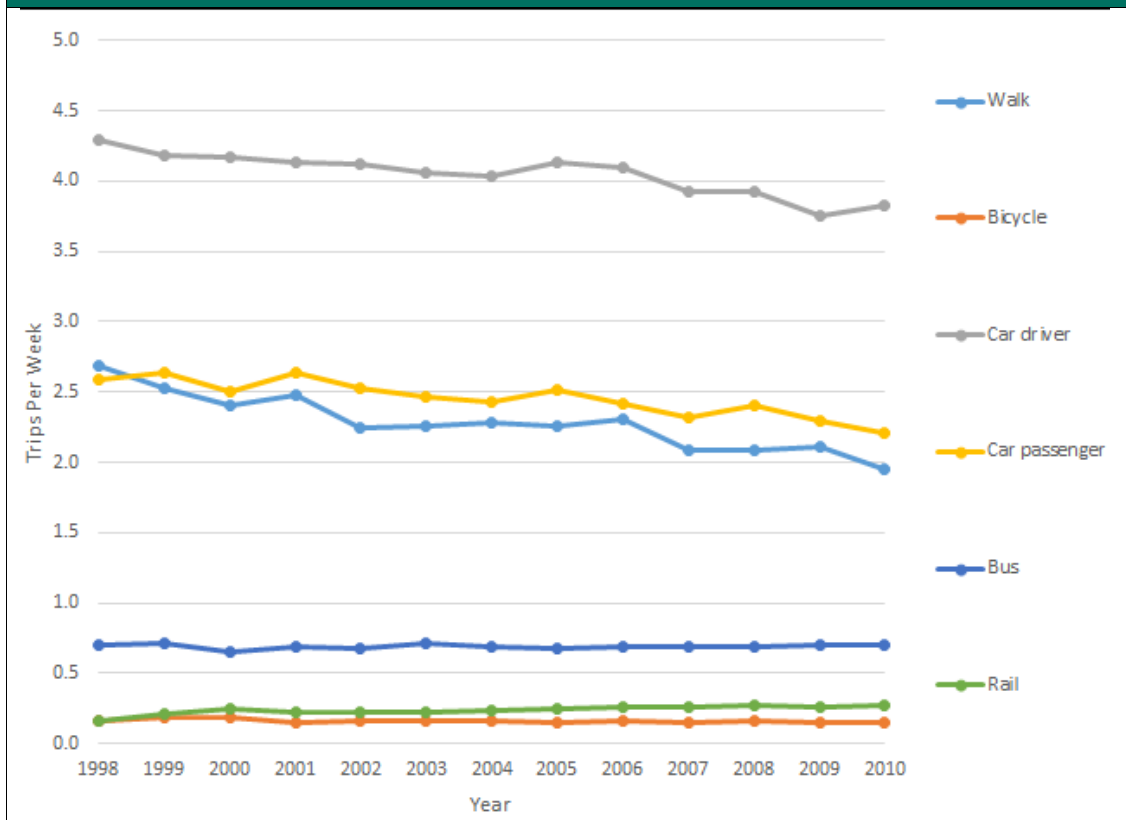
- 6.13** Initial investigation of the trends revealed a general downward trend in trip rates which has also been similarly described in headline statistics reported by NTS publications. The two largest journey purposes (shopping and commuting), exhibit a statistically significant downward trend with reductions in the range of 15% to 17% respectively between 1998 and 2010. The trends in the data are not uniform across all purposes though and vary according to purpose and segmentation. For example, the personal and employer's business purposes are stable but the holiday trips are increasing.
- 6.14** To enhance our forecasting capability, we need to understand the factors that are driving these trends. This is difficult, with multiple factors

<sup>46</sup>Trip rates in this study were defined as the number of home-based outbound trips a person makes per week for a variety of purposes, such as commuting, shopping, education, etc.

appearing to influence demand. We carried out some exploratory analysis to identify what is driving the trends. This included examining the trends by mode, with **Figure 6.3** below demonstrating the trip rates by mode instead of by purpose.

- 6.15** Observed from **Figure 6.3**, and also measured through the regression analysis, it can be seen that the walk mode has been the mode with the steepest decline over the period of analysis. This was also in line with an analysis conducted on trips by distance which indicate that trips in the shortest distance band (in this case < 1 mile) have been most in decline compared to other "distance-segments".

**Figure 6.3 Trip Rates by Mode Between 1998 and 2010**



- 6.16** It is worth noting that the trend for rail trips shown in **Figure 6.3** is consistent with the large trip rate increases recorded in other rail specific data sets. This is not immediately apparent because the NTS dataset has a small overall sample size for rail and this is one of the reasons that rail forecasting is generally implemented using uni-modal guidance based on PDFH and reflected in WebTAG.
- 6.17** The ongoing trip rates research will aim to more fully understand the reasons behind these trends. Key to this is understanding people's attitudes to travel and what is driving their travel choices. We are working with the Independent Transport Commission (ITC), who are undertaking complementary attitudinal research that will help inform the types of behavioural datasets which could be used to enhance our trip rate forecasts.

## Car ownership trends

- 6.18** As part of the research into understanding recent travel behaviour, we must also understand the constraints and conditions which travellers face when making travel choices. A key priority is to better understand apparent constraints on car ownership - an important driver of travel demand - and enhance how we model car ownership. This is particularly relevant in denser urban areas. Whereas on aggregate, car ownership forecasts across Great Britain have validated well, the car ownership forecasts have performed less well in those denser urban areas and in particular London. This is likely due to a need to enhance the representation of constraints in these areas, such as congestion and parking availability, as well as potential opportunities, such as good public transport provision. Of course, broader social trends such as lower license holding of young males will also need to be reflected by using updated sources of evidence and data.
- 6.19** During the course of the update to the NTEM demand forecasts, we intend to assess the performance of the National Car Ownership Model within NTEM and seek to improve this where necessary. This will be an assessment of the potential to add more explanatory power to the model or make other refinements to better reflect more recent car ownership trends, and the value added to the forecasts in doing so. This will be in addition to the collection of more recent data sets and a critical evaluation of potential new data sets to use in updating and fully re-calibrating the model.

## Capturing Demographic and Spatial Changes and Impacts

- 6.20** The NTEM is used to forecast future travel demand in the form of trip ends (trips beginning or ending in NTEM zones). This is achieved by taking trip rates from the NTS (people's propensity to travel) and applying them to detailed segments of the population (e.g. split by household size, car ownership and so on). This gives users a growth rate in travel demand, which is derived from the land-use forecasts from the Scenario Generator model based on population, employment and housing projections to 2041.
- 6.21** During the course of the NTEM update project we intend to identify potential enhancements to the NTEM's land use model, the Scenario Generator, which forecasts the numbers of people and jobs in the 2500 NTEM zones<sup>47</sup>. This will include updating the technical elements of the model, such as the areas in which to balance the workforce with jobs, and re-estimating the parameters that control how the model responds.
- 6.22** Travel statistics have shown that travel patterns differ significantly depending on the area type being examined, with urban areas showing journey distances, times and mode use which are significantly different from those in rural areas. Alongside the update of the NTEM dataset with

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<sup>47</sup> DfT (2011); "NTEM 6.2 Guidance, Version 6.2" <https://www.gov.uk/government/publications/tempro-downloads/tempro>

the latest census data the project will examine how changing demographics in urban and rural areas are affecting observed trends and the extent to which these spatial variations will affect trip rates and demand for travel.

## GDP and Economic Growth

- 6.23** Economic growth and its impact is a key factor in demand for travel and the types of trips people make; for example, GDP affects employment forecasts. The majority of external factors, such as oil prices and costs of motoring, are traditionally modelled in transport models which can explicitly capture the costs of different modes. But GDP and personal income growth are important factors in influencing travel demand and the mode of travel, for example through the relationship between income and car ownership. These are currently captured in NTEM within the National Car Ownership Model and these relationships will be explored as part of the work described above. GDP forecasts also play a role in calculating the growth of jobs in the Scenario Generator.
- 6.24** The total demand for travel from NTEM implicitly includes macro-economic factors in the trip rates estimated from NTS data. For example, the recent economic downturn is possibly a factor in changing trip rates, particularly in the commuting journey purpose. The ongoing trip rates analysis will look to determine what portion of the decline is due to economic factors and what is due to other factors (for example, technological or continuing attitudinal and behavioural changes) as measured by a range of indicators including GDP, personal income, household income, etc. In particular, it will look to examine how economic effects act on discrete segments of the population, for example young people, and how this affects peoples' propensity to travel.

## Capturing Policy Levers

- 6.25** The observed travel behaviour of individuals is a result of how people exercise their personal preferences with respect to transport supply conditions and personal circumstances (financial or accessibility needs, etc.) which is, in part, influenced by wider policy interventions. Changes in behaviour as a result from more recent policy interventions will, in aggregate, be implicitly included in the trip rates calculated as part of NTEM. The only explicit assumption that is policy-based are the dwellings data input into the Scenario Generator, which guides where houses are likely to be built, subject to other constraints and considerations. Increasing the scope to include more policy based inputs will be considered as part of the model updates.
- 6.26** The National Transport Model is a key policy-testing tool and used for producing the Department's Road Transport Forecasts. We are reflecting the evidence on changing trip rates in considering a broader range of scenarios for the next iteration of the Department's forecasts. The re-estimated trip rates have been used to generate a new scenario for declining trip rates. Extrapolations have been made from past trends to

estimate trip rate changes for forecast years. Results of this have been published in the Road Investment Strategy: Strategic Vision document<sup>48</sup>.

## Joint Working and Research

- 6.27** To ensure our NTEM forecasting approach continues to support the production of high quality demand forecasts, we will continue to place joint working with academics and stakeholders at the heart of our approach. Early in 2015 we will be holding an engagement event which will address our travel trend and trip rate research and the development of our NTEM suite and national travel demand forecasts. This will be followed by a detailed evidence and literature review that will form the basis for a robust model development plan which will enable us to deliver a new NTEM7 data set in early 2016.

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<sup>48</sup> <https://www.gov.uk/government/publications/road-investment-strategy-strategic-vision>

# 7. The Treatment of Uncertainty

## Background

- 7.1** There is, unavoidably, uncertainty in future forecasts. This makes demand and scheme benefits harder to predict the further in the future we go. Within our appraisal framework, we describe the size of the uncertainty in both the calculation of scheme benefits, through the development of alternative forecast scenarios, and on the scheme costs side, through the application of optimism bias and quantitative risk assessment.
- 7.2** The Department has established guidance on how analysts may treat uncertainty in their modelling and appraisal work in WebTAG. This provides good practice advice on how national and local uncertainty may be captured. The use of transport models as tools to assess not just core scheme benefits, but how a scheme or strategy may perform in a variety of different circumstances in a proportionate manner, is established as a core principle of the guidance. Testing robustness to uncertain outcomes is achieved through sensitivity tests of more detailed scheme assumptions, wider scenario tests and the provision of ranges around key values. All of this treatment of uncertainty provides the decision-maker a more informed view of the performance of a potential investment in a range of different circumstances.

### **The importance of long-term forecasting and evaluation**

- 7.3** The 2013 UVITI technical report<sup>49</sup> identified the increasing importance of understanding and valuing the impacts of larger and longer term transport schemes. Since much of our transport investment is for the longer term, it has a long-lasting impact on the economy, the environment and society. We previously identified two key analytical issues that arise from taking the long term perspective:
- How best to forecast transport demand and the impacts of options into the long term; and
  - How to handle the inherent forecast uncertainty.
- 7.4** At the heart of understanding uncertainty is developing our portfolio of ex-post evaluation evidence and using this to identify areas of uncertainty and using this to inform our model development.
- 7.5** Beyond the analytical issues is the importance of developing an approach to communicating the uncertainty in our analysis to decision

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<sup>49</sup> DfT (2013); “Understanding and valuing the impacts of transport investment: latest DfT technical research and next steps in transport appraisal” <https://www.gov.uk/government/publications/transport-appraisal-in-investment-decisions-understanding-and-valuing-the-impacts-of-transport-investment>



makers that provides a richer understanding of the impacts of a proposed investment.

- 7.6** This section discusses how we are taking forward these questions, and developing the link between evaluation and appraisal in order to enhance our forecasting capability. We begin our approach to capturing the size of uncertainty around the basic inputs to modelling and appraisal, 'the building blocks of our analysis'.

## Uncertainty and the Building Blocks of our Analysis

- 7.7** WebTAG guidance covers the importance of understanding the uncertainty around transport model inputs and describes the principles in accounting for these as best as possible, and in a proportionate manner. Key model inputs are prone, say, to day-to-day variation in traffic flows, sample sizes in surveys and so on.
- 7.8** As part of our wider analysis development program we continuously reflect upon and take account of elements of uncertainty. For example, the re-estimation of values of travel time will provide ranges around core values that will be reflected by analysts in appraisal work (see Chapter 5). The trip rates study has also looked at uncertainty around the propensity for people in different households to travel for different purposes. This key input into modelling and appraisal framework can be used to test uncertainty in travel demand forecasting (see Chapter 6). As a final example, the National Transport Model made use of several scenarios to test the impacts of the Roads Investment Strategy, including projecting forward declining trip rates over time, and decoupling the link between GDP growth and changing car use.
- 7.9** As part of developing our understanding of the building blocks of our analysis we will look to undertaking additional research into uncertainty around key model inputs and how these may be accounted for in forecasting and development of a business case.
- 7.10** Continuing to build on this essential understanding of key planning data and economic inputs, as well as the parameters that govern the performance of transport models, will help to give analysts a better appreciation of how this may affect model outcomes. This provides the basis for understanding how uncertainties in these key inputs propagate through transport models and the range of potential outcomes of the analysis. It will also allow us to develop improved advice to potentially smaller-scale investments where it is disproportionate to run many sensitivity tests.

## Improving the Links between Appraisal and Evaluation

- 7.11** Assessing the effectiveness and impacts of transport investment ex-post is important for demonstrating value for money and learning lessons about how future investment can most effectively be targeted. It is also important to test how the assumptions in transport models and their



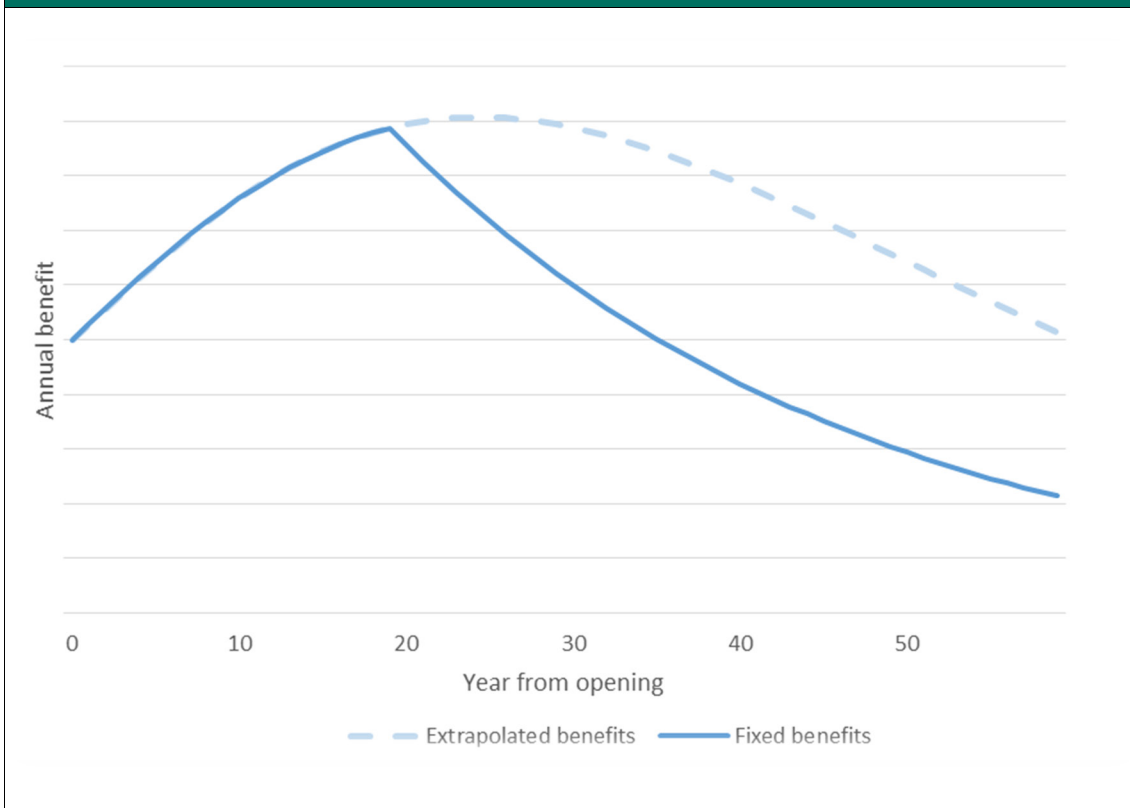
forecasts performed against outturn, and how to explain the potential variations and how this uncertainty was accounted for in appraisal.

- 7.12** To facilitate this, we are looking to enhance the ways in which ex-post evaluations can generate and feed back evidence to validate and improve the quality of our modelling and appraisal. Feedback from external experts at our UVITI workshop in December 2013 and our evaluation workshop in June 2014 identified this as an issue that merits more attention. In addition, the TIEP report by Venables et al. recommends undertaking more systematic ex-post evaluation which can then be compared with ex-ante predictions.
- 7.13** It is an opportune time to build our approach for using evaluation evidence, as we are working towards delivering our strategic vision for improving transport monitoring and evaluation (2013 Monitoring and Evaluation Strategy) and have established clear priorities for monitoring and evaluation within the annual Monitoring and Evaluation Programme. However, it will take time for these to feed through into an improved evidence base. In the meantime, we are scoping the option of a methodological study to improve how evaluation evidence can feed back into appraisal parameters and models.

## Forecasting Demand and Benefits in the Long Term

- 7.14** Transport models are exceptionally useful forecasting tools for assessing the potential impacts of a transport investment. The methods used within these models have been developed over many years. Broadly, they are tools for estimating travel demand and how this demand responds to changes in transport provision. However, the further into the future we try to predict, the larger the uncertainty regarding the demand for travel and the future provision of transport infrastructure and services.
- 7.15** For practical purposes, models are therefore not usually run in the distant future, particularly not in the final year of the appraisal period 60 years ahead. Our current guidance recognises this and gives guidance on the extrapolation of benefits after we finish formal modelling, dependent on the profile of benefits resulting from the scheme and how these might be expected to continue. A core sensitivity test is recommended of holding annual benefits constant past this point, and is often used to compare schemes on a consistent basis.
- 7.16** **Figure 7.1** below shows a comparison of the profiles of benefits of a hypothetical example where the analyst fixes benefits after the final modelled year (sometimes called demand capping) and uses an extrapolation technique to project the benefits profile forward, as recommended in WebTAG. Both trends decrease over time due to the compound discount rate over time. Even when fixing benefits after the final modelled year, commonly 20 years, a significant proportion of the total benefits of a scheme are often seen to occur in the latter half of the appraisal period.

**Figure 7.1 Example of potential profile of discounted user benefits with i) no change in benefits after the final modelled year (20 years) and ii) hypothetical example where benefits continue to increase**



**7.17** The underlying reason for extrapolating benefits is that, as WebTAG describes, growth in benefits are a function of transport use, i.e. demand. To develop our approach and enhance the way we provide advice on the extrapolation of scheme benefits in the longer term, we plan to undertake research that looks into potential methods so that we can better understand the potential benefits profile, how this relates to the specific scheme and what the key drivers of demand and benefits are over time.

**7.18** We shall also investigate the appropriateness of the development of a long-term trend model to better understand how background drivers in travel demand affect benefits profiles in the longer term. Chiefly this will look at the link between benefits and population growth and income<sup>50</sup>, and how this may be used in general transport appraisals. This is to build on the existing guidance and is aimed at potentially enhancing the evidence-based benefit extrapolation approach that we currently recommend. Current guidance advises analysts to use the best evidence available when extrapolating benefits in a practical manner; expanding knowledge in this area may allow us to produce guidance that allows analysts to do this more easily.

<sup>50</sup> This is based up recommendations from the findings of Bates, J. et al. (2013); "Specifying the demand cap for rail"  
[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/251609/specifying-the-demand-cap-for-rail.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/251609/specifying-the-demand-cap-for-rail.pdf)

- 7.19** Key of course to this investigation will be an assessment of the practicality of longer-term forecasts in the face of uncertainty. Local transport and land-use developments, national economic drivers and changes in policy and technology all affect actual outcomes that will be inevitably different in some way to a specific forecast. It is the intention to create enhanced practical guidance that will better inform decision-makers about the potential of schemes in the long-term future.

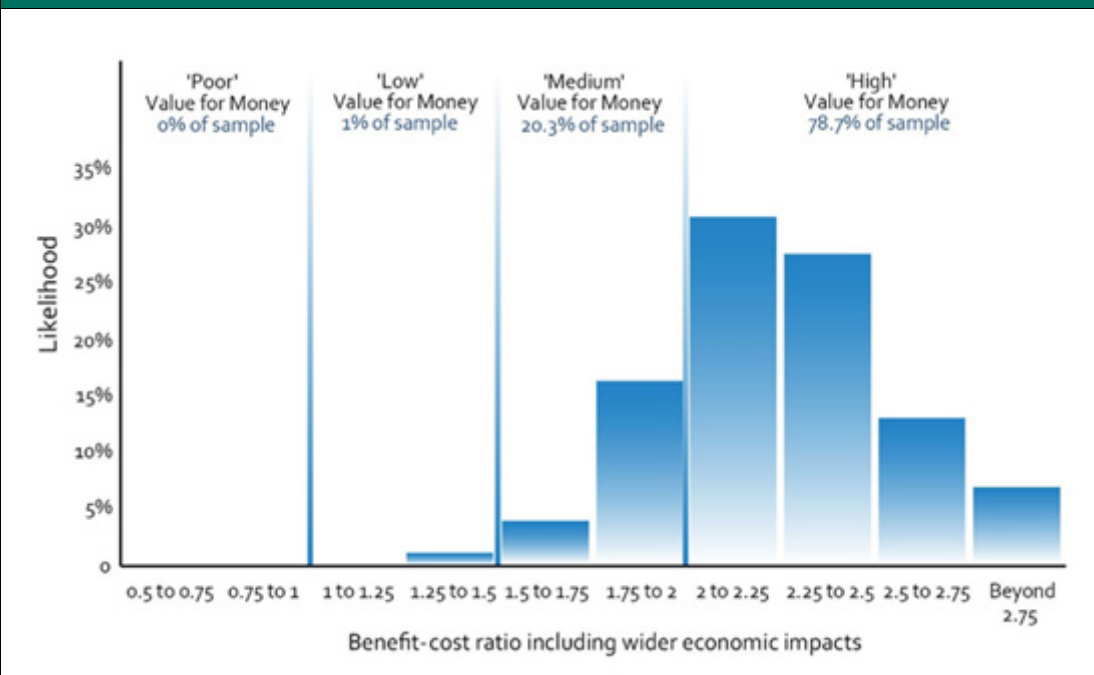
## Communication of Uncertainty

- 7.20** Uncertainty and the understanding of risk forms an important grounding for any potential decision around future investment, from local decisions to develop the right transport solutions, to investment boards and ultimately Ministers. Moving away from point estimates to presenting a richer picture is set out as good practice in the Treasury Green Book and has recently been echoed by the National Audit Office “Forecasting in Government to achieve value for money”<sup>51</sup>.
- 7.21** Several recent analytical studies within the Department have taken the opportunity to provide this richer picture by providing more probabilistic forecasting of the ranges of outcomes of schemes. Such an example is in the HS2 strategic case (as seen in **Figure 7.2**), which presents the range of possible benefit-cost ratios that arise from uncertainty in the inputs, allowing decision makers to see the likely impact on the value for money of the scheme. Another example has been in the aviation model forecasting, as shown in **Figure 7.3** below, which presents outputs such as terminal passengers with a median forecast and confidence ranges capturing the effects of outturn variations affecting the core model input assumptions.

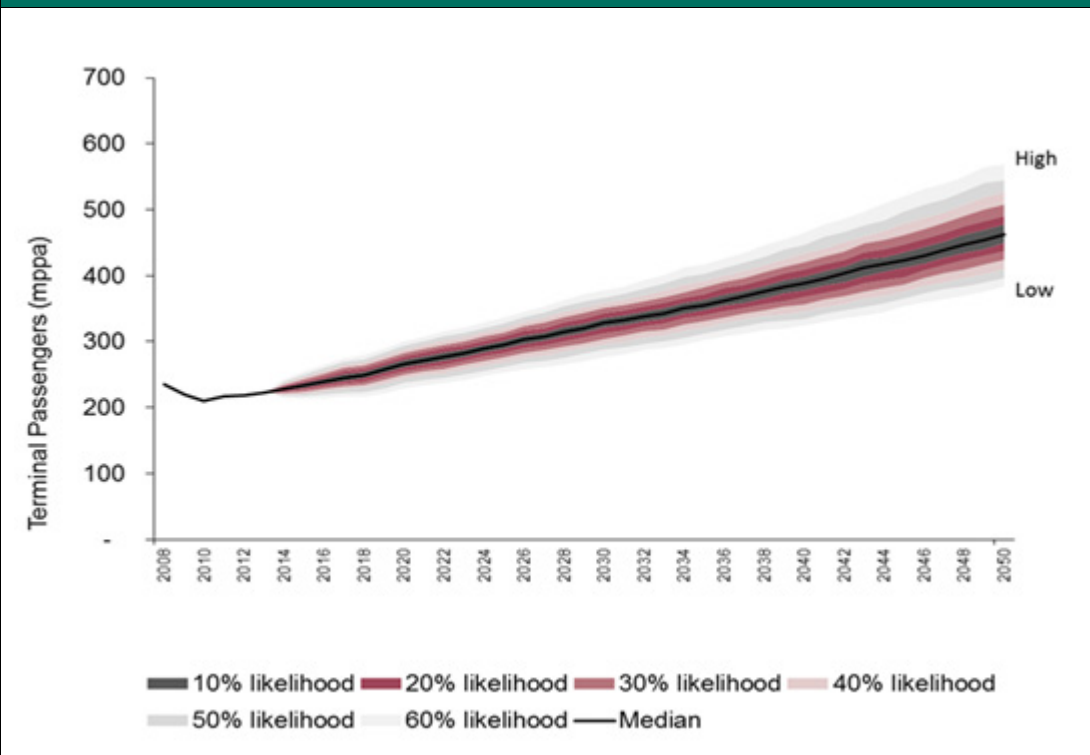
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<sup>51</sup> NAO (2014); “Forecasting in Government to achieve value for money”  
<http://www.nao.org.uk/report/forecasting-government-achieve-value-money-2/>

**Figure 7.2 Standard appraisal: distribution of benefit-cost ratios for the full network<sup>52</sup>**



**Figure 7.3 An aviation example of probabilistic forecasting around a median forecast of terminal passengers<sup>53</sup>**



<sup>52</sup> [http://assets.hs2.org.uk/sites/default/files/inserts/S%26A%201\\_Economic%20case\\_0.pdf](http://assets.hs2.org.uk/sites/default/files/inserts/S%26A%201_Economic%20case_0.pdf)

<sup>53</sup> [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/374660/AC05-forecasts.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/374660/AC05-forecasts.pdf)

- 7.22** Our development programme will enable our guidance to continue to support business case development to build this richer picture of uncertainty. This will allow analysts to provide a fuller range of information regarding the uncertainties in their modelling and appraisal to decision-makers. This will enable the provision of a better picture of how a scheme will perform in a variety of circumstances, provide more assurance that these have been considered, and more confidence in understanding the benefits of proposed investment.

## Next Steps

- 7.23** Understanding uncertainty is essential to developing and enhancing how we forecast demand and benefits in the long term. This chapter has set out our commitment to thoroughly developing our understanding of uncertainty, from capturing uncertainty in the key building blocks of modelling and appraisal, developing our understanding of our forecasting capability through ex-post evaluation, enhancing the approach to modelling benefits in the long term and communicating uncertainty to decision makers. We plan to continue to work closely with academics and stakeholders to ensure that our appraisal framework enables a high quality and proportionate approach to capturing uncertainty.

## 8. Next Steps

- 8.1** We are pleased that we are able to report good progress so far on the work we committed to in October 2013, and that we have extended our ambitious agenda. We have made great progress on the work to fully re-estimate the values of travel time savings, and to better understand the economy impacts of transport investments. We have kept our approach to valuing environmental and health impacts in line with latest evidence, and we have a clear direction for work on travel demand and uncertainty. This has benefitted greatly from the input of many experts and stakeholders, to whom we are grateful.
- 8.2** Our next steps will be to continue the ambitious agenda set out in earlier sections of this report, engaging with experts and stakeholders on individual projects at pivotal points, and holding an overarching event in early 2015. By doing so, we will ensure our approach to understanding and valuing the impacts of transport investment remains world class, and provides relevant, reliable, and trusted information to decision-makers and stakeholders.