Department for Transport

Appraisal and Modelling Strategy

Informing Future Investment Decisions

Moving Britain Ahead

June 2018

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Department for Transport
Great Minster House
33 Horseferry Road
London SW1P 4DR
Telephone 0300 330 3000
Website www.gov.uk/dft
General enquiries: https://forms.dft.gov.uk

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Foreword

It is vital that we have a robust understanding of the wide ranging impacts that transport investment has so that the best investment decisions can be made. Our appraisal framework aims to provide as full a view as possible about the wide range of impacts transport has on the economy, environment and society. Our guidance on how to conduct transport appraisals, WebTAG, draws on best practice in government, academia and industry and we aim to ensure that it reflects the latest evidence and appraisal methodologies.

The appraisal environment has changed considerably since the last major review of our evidence base five years ago and we are facing significant uncertainty over the future of travel. In order to keep pace with the changes and ensure our guidance remains relevant and robust in an ever changing world, I am delighted to present this consultation on priorities for our Appraisal and Modelling Strategy.

The aim of the strategy will be to equip us with robust, flexible and easy to use appraisal and modelling tools relevant to the policy and investment decisions which will be made over the next five years. Consulting on the strategy will allow us to better understand your evidence needs and draw out areas of best practice across the industry. An important element of the strategy will be exploring how we support the application of WebTAG and make it more user friendly, in addition to further research and analysis to fill evidence gaps.

We are committed to working closely with our stakeholders as we develop our Appraisal and Modelling Strategy and look forward to hearing your views.

Amanda Rowlatt, Chief Analyst

June 2018

Executive summary

Introduction

1 The appraisal environment has changed considerably since the last major review of our evidence base five years ago and the future of travel is perhaps more uncertain than ever. In order to keep pace with these changes and ensure our guidance on conducting transport appraisals, WebTAG, remains best practice, the Department for Transport (DfT) is launching a consultation on priorities for a new Appraisal and Modelling Strategy.

2 Since our last analytical strategy[1] we have made significant progress, with the help of our stakeholders, in developing the evidence base. However, the world has continued to evolve, presenting challenges and opportunities that we need to reflect. These include:

- The Government's Industrial Strategy and Transport Investment Strategy has shifted the policy focus towards rebalancing the economy, supporting the creation of housing and improving the experiences of the travelling public;
- We are facing significant uncertainty in the transport sector as a result of changes in travel behaviour that are not fully understood and the development of new technologies;
- Institutional changes, such as the emergence of sub-national bodies, an increase in combined authority mayors and the creation of the National Infrastructure Commission, is changing the way in which policy is being developed, with an emphasis on prioritisation across sectors and on meeting local aspirations;
- We recognise that continuous development of our appraisal framework can present challenges for those using and applying the guidance, particularly when it is being applied in new situations.

Themes for the strategy

3 This document sets out our initial views on five key themes and priorities for developing the evidence base and supporting users of our guidance (WebTAG). These have been formed through discussions with stakeholders, in particular the Joint Analysis Development Panel[2] which we established in 2015 to provide strategic level comment and advice on our modelling and appraisal priorities.

4 The themes are:

- **People and place: capturing the range of impacts relevant for transport policy** – cities and devolution are increasingly important dimensions of transport

[1] Understanding and Valuing the Impacts of Transport Investment - https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/253860/understanding-valuing-impacts-transport-investment.pdf

[2] https://www.gov.uk/government/groups/transport-appraisal-and-strategic-modelling-division#joint-analysis-development-panel

policy which require a fresh focus for certain aspects of our guidance. Physical infrastructure helps to define the built environment, with wide ranging implications for wellbeing. Well-connected communities are essential for a healthy society and transport has an integral role to play in this. Improvements to the urban realm, often considered alongside transport schemes, can also generate value for affected communities which we need to better capture in appraisal. There is a case for advancing analytical methods to value improved journey experiences including (but not limited to) journey time reliability, quantifying the value individuals place on a variety of aspects of 'customer experience' and understanding the impact of technology (for example autonomous vehicles) on values of time.

- **Reflecting uncertainty over the future of travel** – the future of travel is highly uncertain, largely due to a combination of technological and behavioural uncertainties. We need to develop our understanding of emerging and future technologies that could fundamentally change the transport market. These include the impact of autonomous vehicles, mobility as a service and electric vehicles. On the behavioural side, we need to better understand trends including young people's travel behaviour, the impact of an ageing population, flexible working and online shopping. We also need better tools to capture and communicate uncertainty to decision makers, including the development and use of scenarios.
- **Modelling and appraising transformational investments and housing** – a number of potentially transformational schemes and programmes are being assessed and/or delivered, including East-West Rail, Oxford to Cambridge Express Way, Northern Powerhouse Rail, Crossrail 2 and the Trans-Pennine Tunnel. Their strategic objectives extend well beyond 'traditional' transport outcomes. Recent guidance has taken big steps forward in capturing many of these impacts but we need to build on this to support the ambitions of DfT's Transport Investment Strategy, for example, understanding transport's impact on housing growth along a corridor and a consideration of productivity benefits beyond those generated by agglomeration effects.
- **Supporting the application of WebTAG and making it more user friendly** – we recognise that continually developing and improving our appraisal guidance can present challenges for those using and applying it. We would like to explore options for building capability including: developing case studies showing how the guidance can be applied in different situations; organising workshops to raise awareness of aspects of the guidance and share best practice and better signposting of the guidance. We would also like to investigate options to streamline and simplify the guidance to make it more user friendly while maintaining its robustness.
- **Developing and maintaining modelling and appraisal tools to meet user needs** – given the challenges we are facing, different sources of evidence and modelling approaches may be needed to represent the transport market and undertake policy analysis in the future. We need to investigate the use of 'big data' in transport models and get a better grasp of any inherent opportunities or shortcomings in its use. We also need to strengthen the link with evaluation so that appraisal learns from and helps build better evaluation evidence. And we need to ensure our national modelling capability is fit for purpose.

Identifying priorities

5 Our aim for the strategy is to provide robust, flexible and easy to use modelling and appraisal tools that can be used to inform the critical policy decisions that will be made over the next five years. We are seeking views on priorities both within and between the five themes outlined above so that we can develop and publish a more detailed programme of work early next year. In that programme we will present our priorities for developing the evidence base and supporting the application of WebTAG over a five year time horizon.

6 We will need to carefully prioritise the large number of options presented in this document and, as part of the consultation, would welcome views on the criteria for prioritisation. Crucially, options taken forward will need to demonstrate that they will help improve decision making at a proportionate cost.

7 Recognising that priorities may change within the lifetime of the strategy and that early research results may have implications for subsequent work, our intention is to review and update stakeholders on our progress every 12-18 months.

Working closely with stakeholders

8 We plan to actively engage with our stakeholders during the consultation to listen to your views on priorities and identify ways in which we can better support the application of WebTAG and make it more user friendly. Further, we cannot deliver the ambitions in this document alone and as part of the consultation we would like to explore how we can collaborate with our stakeholders to deliver a broad and balanced programme of work.

Seeking your views

9 We are seeking your feedback on the questions posed in the document which are listed in full at Annex A. You can get in touch by emailing TASM@dft.gov.uk, with the subject 'Appraisal and Modelling Strategy' by 15th October 2018.

How to respond

The consultation period began on 19th June 2018 and will run until 15th October 2018. Please ensure that your response reaches us before the closing date. If you would like further copies of this consultation document, it can be found at https://www.gov.uk/dft#consultations or you can contact TASM@dft.gov.uk if you need alternative formats (Braille, audio CD, etc.).

Please send consultation responses to TASM@dft.gov.uk with the subject 'Appraisal and Modelling Strategy'.

When responding, please state whether you are responding as an individual or representing the views of an organisation. If responding on behalf of a larger organisation, please make it clear who the organisation represents and, where applicable, how the views of members were assembled.

If you have any suggestions of others who may wish to be involved in this process please contact us.

Freedom of Information

Information provided in response to this consultation, including personal information, may be subject to publication or disclosure in accordance with the Freedom of Information Act 2000 (FOIA) or the Environmental Information Regulations 2004.

If you want information that you provide to be treated as confidential, please be aware that, under the FOIA, there is a statutory Code of Practice with which public authorities must comply and which deals, amongst other things, with obligations of confidence.

In view of this it would be helpful if you could explain to us why you regard the information you have provided as confidential. If we receive a request for disclosure of the information, we will take full account of your explanation, but we cannot give an assurance that confidentiality can be maintained in all circumstances. An automatic confidentiality disclaimer generated by your IT system will not, of itself, be regarded as binding on the Department.

The Department will process your personal data in accordance with the Data Protection Act (DPA) and in the majority of circumstances this will mean that your personal data will not be disclosed to third parties.

1. Introduction

Background

1.1 Through its Transport Investment Strategy, DfT has allocated over £61bn in capital investment between 2015/16 and 2020/21, with an additional £2.6bn from the National Productivity Fund to support transport infrastructure and future transport technology. This investment will have far reaching impacts on transport users, the economy, society and the environment.

1.2 Given our record funding commitments, it is vital that we ensure our analysis supports us in delivering value for taxpayers' money. Our aim is to enable the best investment decisions to be made by equipping those producing appraisals with the right tools, methods and data so that decision makers can be provided with a robust assessment of the wide ranging impacts that transport investment has.

1.3 All business cases seeking investment include an economic case which provides a comprehensive and systematic assessment of all the impacts of a scheme. To ensure that this assessment is robust and allows spending options to be compared, the Department for Transport publishes guidance on how to conduct transport appraisals (WebTAG).

1.4 Our appraisal guidance draws on best practice in government, academia and industry; and we aim to ensure that it reflects the latest evidence and methodologies. This provides transport analysts with a comprehensive, consistent and robust approach for assessing the costs and impacts of transport interventions.

Scope of the strategy and consultation

1.5 This strategy is primarily focused on the research and work undertaken by Transport Appraisal and Strategic Modelling (TASM), which is the team responsible for developing and maintaining the Department's appraisal guidance, WebTAG.

1.6 The Department and its agencies undertake a wide range of research to enhance the analysis of specific modes to best align that analysis to the detailed requirements for emerging policies and strategies. TASM's work focuses more on the general principles of economic appraisal and modelling that support multi-modal appraisal. This strategy therefore does not represent all research activities across the Department.

1.7 We are seeking consultation responses that focus on how we could improve the appraisal guidance to better support scheme promoters as they develop the economic case for their business case. Responses should focus on the general valuation and modelling needs to support the requirements of a changing world and how evidence may be provided on scheme proposals that aim to tackle existing and emerging challenges. We are also keen to hear how we may improve the user

experience of the guidance so that it is more accessible and used in a proportionate and flexible way.

Recent progress

1.8 WebTAG has been developed over many years and has been continually enhanced and refined to capture a wider range of impacts, increase the robustness of those impacts already captured and reflect the priorities and objectives of decision makers.

1.9 Our current strategy for developing our appraisal tools and methods, Understanding and Valuing the Impacts of Transport Investment[3], was launched in 2013 and has delivered significant advances in our evidence base, including:

- a major development of the evidence base on valuing journey improvements, updating our estimated values of travel time savings and exploring the impact on these values of being able to work while travelling.
- an update to our guidance on Wider Economic Impacts which significantly improves the understanding and communication of the economic benefits of transport investments. In particular, we have made changes to strengthen our ability to measure a scheme's local economic impacts, assess the benefits of resulting housing growth and capture the structural changes in the economy which result from step changes in capacity and connectivity. We have also developed a new 'rebalancing' assessment toolkit, for use as part of the strategic assessment of future investment programmes.
- updates to environmental values used in appraisal to capture real world emissions and the latest evidence on the health impacts of NOx emissions. We have also incorporated an Impact Pathway approach to noise, covering annoyance, sleep disturbance and health impacts, with refinements to reflect the different impacts from road, rail and aviation noise. And we have extended the health benefits of walking and cycling to capture the reduction in morbidity from an active lifestyle in addition to the reduction in mortality.
- undertaking research into the drivers behind travel demand and examining how changes in travel behaviour may be influencing the propensity to travel. The findings show that income and travel cost continue to drive changes in overall car traffic, however, research on the reasons for an observed decline in trip rates was not conclusive. To reflect the uncertainty around future travel demand, we have incorporated scenario analysis into our National Transport Model forecasts.

Ongoing work

1.10 We are also committed to delivering and making use of research which is underway. This includes:

- better understanding the interactions between schemes in a programme to support appraisal of road schemes and inform future research on cross-sector packages involving transport;
- understanding how congested values of time on roads could feasibly be included in modelling and appraisal to improve our understanding of journey experience.

[3] Details of this strategy and the work described below can be found here - https://www.gov.uk/government/publications/transport-appraisal-in-investment-decisions-understanding-and-valuing-the-impacts-of-transport-investment

Further work will be needed to incorporate these values into our appraisal framework;

- work to assess how we could incorporate valuations of transport-specific landscape impacts;
- reviewing the evidence base on the degree to which increases in road capacity lead to additional traffic (induced demand). This will allow us to assess whether our existing assumptions on impact need to be updated;
- updating evidence on optimism bias (the extent to which cost estimates systematically fall short of outturn costs);
- updating the evidence and guidance around agglomeration impacts to strengthen our appraisal of productivity impacts, a key Transport Investment Strategy priority;
- undertaking a cross-Whitehall scoping study to review the need to develop the empirical evidence base (which dates back to the mid-1990s) on the value of a life year used to appraise impacts on the quality and length of life.

1.11 The Department is also working to improve its evaluation evidence to inform future decision making, as shown through our Monitoring and Evaluation Programme[4]. Strengthening the links with the appraisal process is an important objective of this work. We published a report on 'Strengthening the links between appraisal and evaluation' in 2016[5] and are working to improve our practice in this area.

1.12 We have worked collaboratively with a wide range of stakeholders to deliver these important advances to the evidence base and look forward to continued close working and building new partnerships to deliver the ambitions of our new Appraisal and Modelling Strategy.

4 https://www.gov.uk/government/publications/dft-monitoring-and-evaluation-programme-2017
5 https://www.gov.uk/government/publications/strengthening-the-links-between-appraisal-and-evaluation

2. The role of WebTAG in decision making

Introduction

2.1 This section provides background on how WebTAG and the economic case fits into the Five Case Model for business cases. It describes the holistic nature of our appraisal guidance which aims to cover all the potential impacts of transport investment and how they may be valued and compared. It also describes how the relative importance of each impact is appraised in order to form a judgement on the value for money of proposals.

The Five Case Model for business cases

2.2 The Department for Transport uses the Five Case Model for transport business cases, as recommended by HM Treasury. This means that the decision to invest in a transport project is considered from five perspectives: strategic fit, value for money, financial affordability, commercial viability and management achievability. This allows comprehensive and comparable assessment which helps us to prioritise our resources. It also ensures a wide range of options are considered and assessed proportionately at different stages of project development.

2.3 The Five Case Model approach shows whether schemes:

- are supported by a robust case for change that fits with wider public policy objectives – the 'strategic case';
- demonstrate value for money – the 'economic case';
- are commercially viable – the 'commercial case';
- are financially affordable – the 'financial case'; and
- are achievable – the 'management case'.

2.4 Decision-makers take into account the evidence in all five cases when making a decision. The Department's appraisal guidance, WebTAG, provides advice on how to conduct a transport appraisal with a view to providing an assessment of the potential impacts of transport investment. WebTAG primarily focuses on providing information for the economic case, although other analytical information produced can feed into the other cases where appropriate.

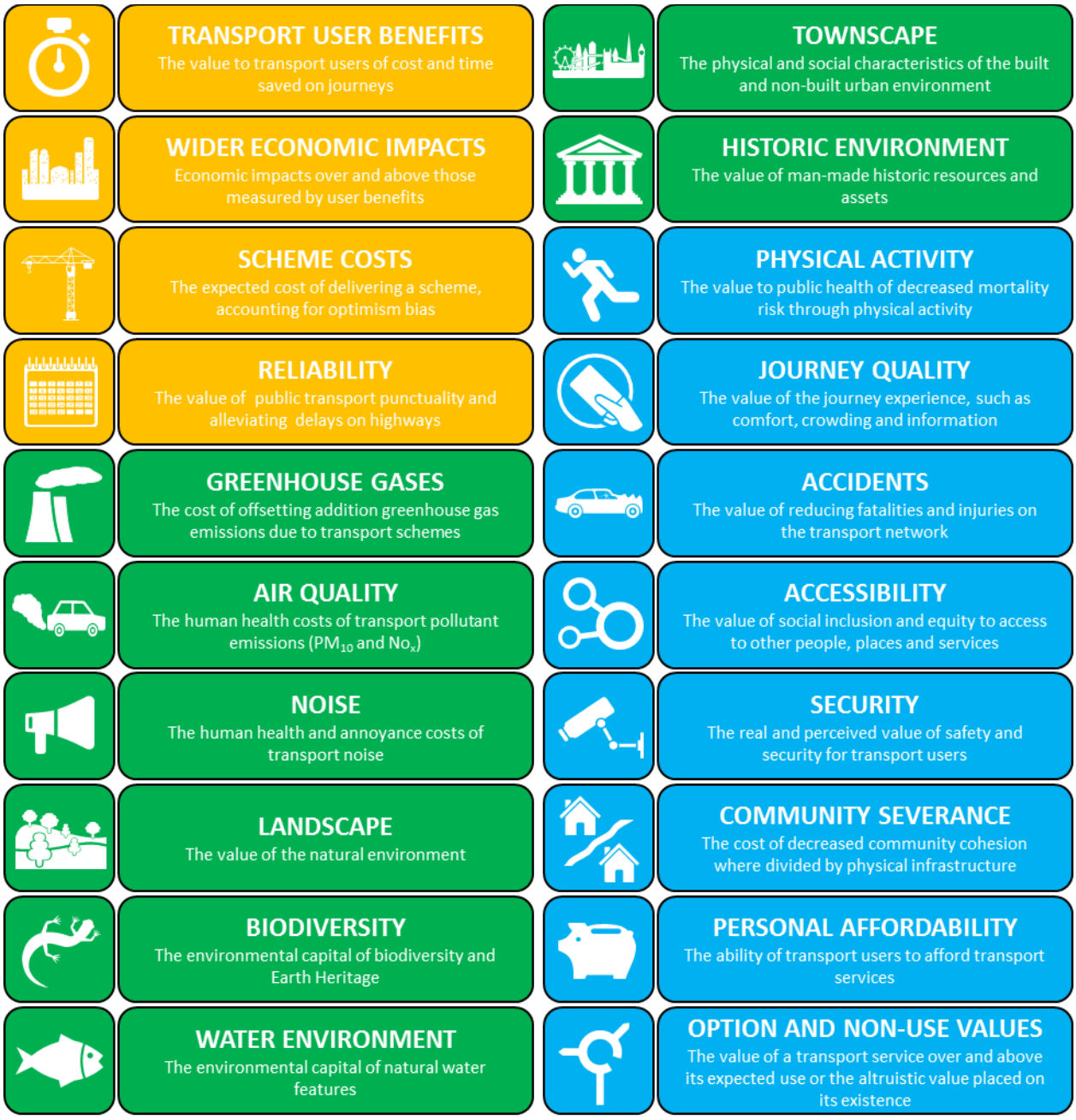
2.5 WebTAG is consistent with the appraisal and evaluation framework set out in HM Treasury's Green Book[6]. This recommends the cost benefit analysis approach to appraisal. Applying this to the transport context, transport appraisal draws together information on a wide range of impacts: it does not just consider the direct impacts on

[6] https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-governent

the transport users and service providers affected by the intervention, but also the impacts of the intervention on the environment, wider society and government.

Impacts considered in appraisal

2.6 WebTAG provides guidance to those producing and delivering analysis of the impacts of transport interventions. Primarily, it guides the user in summarising these impacts into an Appraisal Summary Table (AST), which describes the impacts across a holistic range of economic (yellow in the diagram below), environmental (green) and social indicators (blue).



2.7 Direct economic and social impacts are measured by calculating the change in real and perceived costs of a journey (e.g. time and money) as a result of an intervention across the population. If journey times are cut by ten minutes, we can value this. Also, where people change behaviour, such as shifting from the car to a train with comfortable seats, they have changed because it is of greater value to them and we

can measure these benefits too. We also value attributes of the journey experience, such as travelling in less crowded conditions or increasing safety through improved cycling infrastructure.

2.8 Transport primarily enables economic activity (rather than creating it itself). Improving transport connections can boost firms' productivity and can facilitate interactions between different firms and the labour market in a way that boosts economic output. We value these as wider impacts, including the effects of agglomeration, labour market participation and enabling the move to more productive jobs.

2.9 Environmental impacts are valued in different ways and the values used in transport appraisal are based on cross-government research. For example, air quality and noise impacts are monetised using information about how much people are willing to pay to avoid illnesses associated with poor air quality or annoyance from noise generated by transport. Carbon values are determined so they are consistent with the Government's carbon reduction targets. Landscape impacts are considered using a set of qualitative indicators to describe what contributes to landscape character. It may be difficult to assign precise values to such qualitative factors. They are, however, given equal prominence in the economic case and when scheme impacts are reported to decision-makers.

2.10 Social impacts of transport schemes can also be of fundamental importance and should be analysed in sufficient detail. For instance, the impact on public health through cycling promotion and infrastructure can accrue significant benefits through decreased mortality risk, which we can monetise. Similarly, schemes aimed at improving safety and reducing accidents provide value in saving lives and serious injury. We also value people's experience of the transport system through journey quality, such as reducing crowding on public transport or providing real time passenger information systems.

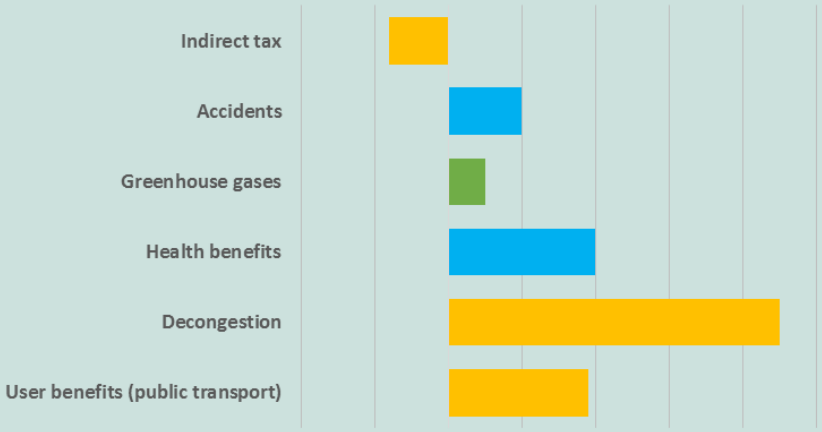
2.11 A further important aspect of social impacts is distributional analysis. This looks in detail at how transport schemes impact on different people in society - either spatially, by income group, by socio-economic class, or how vulnerable or minority groups are affected. This ensures that consideration is given to designing schemes in a way that benefits society evenly and that sufficient mitigation is put in place where this might not be achieved.

Examples of scheme impacts

2.12 The following examples illustrate how different impacts can be important for different types of scheme. Note that these provide an indication as to the spread of benefits that may accrue as calculated by forecasting tools and verified as far as possible with evaluation evidence: individual scheme impacts will vary. The colours yellow, blue and green in the bar charts indicate economic, social and environmental impacts respectively.

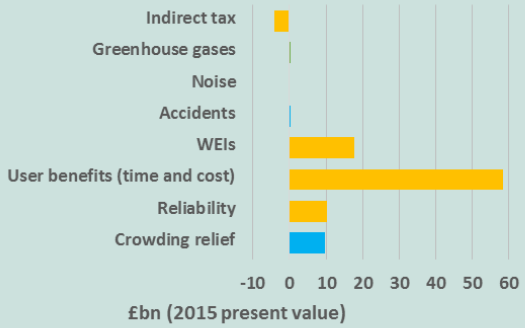
Example: Local Sustainable Travel Fund (LSTF)

- The LSTF was a funding stream available to Local Authorities to promote sustainable travel, reduce carbon emissions and drive economic growth.
- Such packages can include measures such as improved travel information, cycle training and cycle hire schemes.
- Packages of this nature can offer a wide range of benefits, including improved public health, quicker public transport journeys and environmental benefits from mode shift away from car.



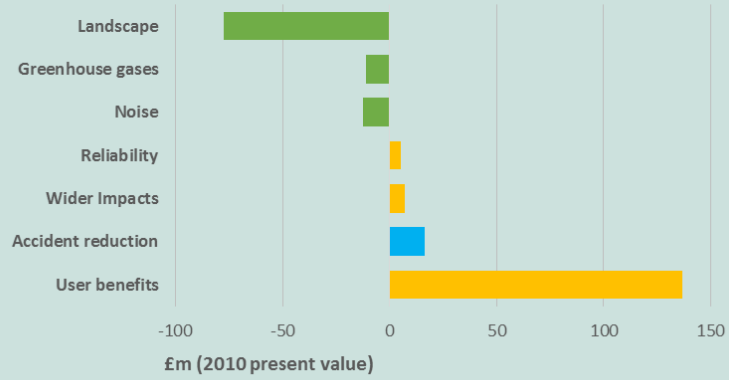
Example: Rail infrastructure scheme

- The main impact is quicker journeys, captured within user benefits
- The scheme is also expected to alleviate crowding, boost reliability and have wider economic impacts
- There are minor net social and environmental benefits from mode shift towards rail



Example: Bypass scheme

- This town bypass scheme was aimed at relieving congestion and potentially facilitating local developments.
- The route passes near to an Area of Outstanding Natural Beauty and was subject to local opposition including protests against the scheme's environmental impacts.
- Our analysis framework allows hard-to-measure impacts such as landscape to be considered in the overall appraisal of impacts.

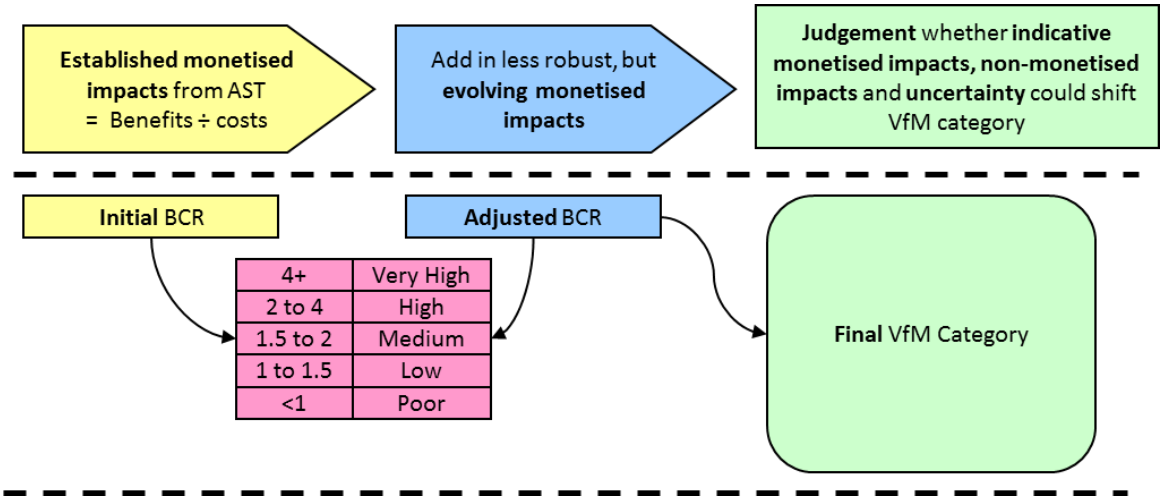


Assessing Value for Money (VfM)

2.13 In line with HM Treasury's Green Book, the cost benefit analysis approach attempts to attribute monetary values to the size of impact across each indicator so that a comparison can be made using a common metric. For elements such as scheme

costs and journey costs this can be simple, but for other aspects such as townscape and community severance this can be significantly more challenging. Nonetheless, the impacts are all shown together and quantified as far as possible, so that the decision maker can make an informed decision based on all aspects.

2.14 Scheme sponsors in DfT work with scheme promoters to best understand all of the relevant impacts in order to undertake a value for money assessment for the economic case. This compares the costs and benefits (both monetised and non-monetised) of the investment, taking into account the risk and uncertainty. All of these considerations are taken into account in the final value for money categorisation. This process is shown in the diagram below. For further information, please refer to the Department's Value for Money Guidance[7].



Making the case for investment across the country

2.15 The purpose of the economic case – which the transport appraisal informs – is to provide an assessment of the relative benefits and costs of a proposal. It does not apply any uplift or discount to benefits experienced in a particular location *nor is it* designed to achieve a particular distribution of spending.

2.16 There are a number of aspects of our appraisal system which work to avoid investment being concentrated in areas of high economic performance:

- our framework considers a broad range of impacts and local economic performance is just one element.
- social and environmental impacts are valued using standard, national rates. For example, in valuing the benefits of faster commutes we make no distinction between someone earning the minimum wage and someone earning £200k per annum.
- our assessment of schemes includes consideration of distributional impacts, including low income groups. Whilst these impacts are not factored into the VfM category, they should be appropriately considered when making decisions on schemes.

2.17 As illustrated by spending decisions, all regions have been able to put forward proposals which offer high returns to public spend[8]. The Department has recently

[7] Value for money guidance: http://assets.dft.gov.uk/publications/value-for-money-assessmentsguidance/vfmguidance.pdf
[8] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/626524/value-for-money-indicator-report-2016.pdf

published a rebalancing toolkit[9] which is designed to help authors of strategic cases assess how a programme or project fits with the objective of spreading growth across the country. The toolkit draws on evidence from the economic case and economic narrative, as well as wider evidence to more clearly articulate how schemes will contribute to rebalancing. It can be difficult to evidence how a scheme will drive regeneration and economic growth and we are looking at ways in which we can better support local areas to do this building on our Wider Economic Impacts guidance.

Flexible and proportionate guidance

2.18 Given the myriad of possible transport schemes that might need to be appraised, the guidance is designed to be flexible and its application proportionate to the level of investment and impact of the scheme. The degree of detail contained within the business case may vary depending on the level of investment or risk proposed to ensure that the appraisal process is proportionate.

2.19 A recent example of proportionality is our guidance on Wider Economic Impacts (WEIs) which clarified that wider economic impacts should only be assessed if they are relevant to the scheme and it is proportionate to do so. In most cases, supplementary economic modelling is not needed to build a robust Business Case and is only required for those schemes which have significant transformational impacts.

2.20 The modelling guidance recognises that it is not possible to address every eventuality and in some circumstances it might be more appropriate to deviate from the standards described or adopt an approach not addressed by the guidance. We are willing to consider alternative and new evidence, balancing this against the need to maintain consistency and rigour. Scheme promoters are encouraged to contact DfT at an early stage in the development process to discuss which techniques would be most appropriate in their particular circumstances.

2.21 One example of this is the forecasts produced by the National Trip End Model in TEMPRO. The data provided is prepared using local development plans and national forecasts of population and employment to provide forecasts of travel demand growth. The guidance describes that should more up-to-date or detailed local development information be available, this may be used in preparing travel demand inputs into the local transport model, whilst at an aggregate level travel demand needs to be controlled to address potential optimism bias and provide a level playing field for the reference case. The guidance also describes that other development scenarios, including those with higher aggregated levels of housing and employment, may also be prepared if it adds to the analysis.

[9] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/669043/supplementary-guidance-rebalancing-toolkit.pdf

3. Changing appraisal environment

Policy context

3.1 While our appraisal and modelling techniques have continued to evolve over the past five years, so too has the world around them, including the focus of Government policy. The objective of the Government's Industrial Strategy is to improve living standards by increasing productivity and driving growth across the whole country.

3.2 A core component of the Industrial Strategy is creating the economic infrastructure that will enable this, including by maintaining and upgrading our transport infrastructure. This will mean investing in our transport network in different ways, most fundamentally by addressing the network's core capability - its condition, capacity and connectivity - but also improving the user experience and adapting the network to safeguard our environment and health.

3.3 Transport investment will also seek to support the creation of new housing. As the Government's Housing White Paper[10] recognises, transport infrastructure is one of the keys to unlocking development and delivering places people want to live.

3.4 As the investment programmes to shape and deliver these goals are developed, the focus will be on prioritising value for money and rigorous business case appraisal.

Institutional changes

3.5 Institutional developments, including the emergence of sub-national bodies such as Transport for the North and Midland Connect, more combined authority mayors and the creation of the National infrastructure Commission, are changing the way in which policy is being developed, with an emphasis on prioritisation across sectors and meeting local aspirations.

3.6 The National Infrastructure Commission (NIC) provides Government with expert, impartial advice on the country's economic infrastructure needs over the long term, including transport. Last year, the NIC set out the first stage of the National Infrastructure Assessment (NIA), publishing its 'vision and priorities'. Later this summer, the completed NIA will, for the first time, take a comprehensive view of Britain's long term infrastructure needs out to 2050 and make associated recommendations to Government.

Uncertainty over the future of travel

3.7 We are facing significant uncertainty in the transport sector as a result of changes in travel behaviour that are not fully understood and the development of new technologies. Current technologies like mobile phones, social media and high speed

[10] https://www.gov.uk/government/publications/fixing-our-broken-housing-market

internet have changed how people interact with the world and have the potential to fundamentally change how people travel. Future technologies have the potential to impact travel behaviour further in ways we may not fully understand for decades to come.

Increasing complexity in appraisal

3.8 We recognise that, as our appraisal framework has become more sophisticated, the demands on those applying it have increased. Despite an emphasis on proportionality in our guidance, we are aware that the application of this principle is not always straightforward. We are also aware that the scope and details of the guidance are not consistently understood

Priority themes for the next five years

3.9 This document sets out our initial views on five key themes and priorities for developing the evidence base and supporting users of our guidance (WebTAG) over the next five years. These have been formed through discussions with stakeholders, in particular the Joint Analysis Development Panel which we established in 2015 to provide strategic level comment and advice on our modelling and appraisal priorities.

3.10 The themes are:

- **People and place: capturing the range of impacts relevant to transport policy** – cities and devolution are increasingly important dimensions of transport policy that require a fresh focus for certain aspects of our guidance. Physical infrastructure helps to define the build environment, with wide ranging implications for wellbeing. Well-connected communities are essential for a healthy society and transport has an integral role to play in this. Improvements to the urban realm, often considered alongside transport schemes, can also generate value for affected communities which we need to better capture in appraisal. There is a case for advancing analytical methods to value improved journey experiences including (but not limited to) journey time reliability, quantifying the value individuals place on a variety of aspects of customer experience and understanding the impact of technology (for example autonomous vehicles) on values of travel time savings.
- **Reflecting uncertainty over the future of travel** – the future of travel is highly uncertain, largely due to a combination of technological and behavioural uncertainties. We need to develop our understanding of emerging and future technologies that could fundamentally change the transport market. These include the impact of autonomous vehicles, mobility as a service and electric vehicles. On the behavioural side, we need to better understand trends including young people's travel behaviour, impact of an ageing population, flexible working and online shopping/LGV traffic. We also need better tools to capture and communicate uncertainty to decision makers, including the development and use of scenarios.
- **Modelling and appraising transformational investments and housing** – a number of potentially transformational schemes and programmes are being assessed and/or delivered, including East-West Rail, Oxford to Cambridge Express Way, Northern Powerhouse Rail, Crossrail 2 and the Trans-Pennine Tunnel. Their strategic objectives extend well beyond 'traditional' transport

outcomes. Recent guidance has taken big steps forward in capturing many of these impacts but we need to build on this to support the ambitions of the Transport Investment Strategy, for example, understanding transport's impact on housing growth along a corridor and a consideration of productivity benefits beyond those generated by agglomeration effects.

- **Supporting the application of WebTAG and making it more user friendly** – we recognise a need to tackle the possible tension between continually improving our guidance and making it more user friendly. We would like to explore options to build capability by better signposting and communicating the guidance and developing case studies and other materials to help those using it. We would also like to investigate options to streamline and simplify the guidance without affecting the overall quality of appraisal outputs.
- **Developing and maintaining modelling and appraisal tools to meet user needs** – given the challenges we are facing, different sources of evidence and modelling approaches may be needed to represent the transport market and undertake policy analysis in the future. We need to probe the use of 'big data' in transport models and get a better grasp of any inherent opportunities or shortcomings in its use. We also need to strengthen the link with evaluation so that the delivery of current schemes can better inform future appraisal decisions through evaluation and to ensure that existing evaluation activity effectively targets appraisal needs. And we need to ensure our national modelling capability is fit for purpose and able to robustly reflect uncertainty over the future of travel.

Consultation questions

- Do you agree that these themes reflect the most pressing priorities for development of our Appraisal and Modelling guidance? If not, what other themes do you think we should be exploring?
- What considerations should inform the scope and priorities of our strategy, particularly over the first 18-24 months?

4. People and Place: capturing the range of impacts relevant for transport policy

Background

4.1 Well-connected communities are essential for a healthy society. Transport infrastructure continues to play an important role in supporting this. Physical infrastructure also defines the built environment, with wide-ranging implications for wellbeing such as community severance, urban realm, safety and air quality. The transport policy landscape is also rapidly changing, with issues surrounding cities and devolution becoming increasingly important. This requires a fresh focus for many aspects of our appraisal guidance, as well as continued efforts on ongoing work programmes.

Valuing attractiveness

4.2 We know that transport infrastructure can cause changes in the benefits of locating in, or travelling to, certain locations. This can arise through a number of mechanisms, such as:

- impacts on environmental quality via congestion, such as noise and air pollution;
- location externalities, such as agglomeration; and
- spillover effects of induced land use change - where transport infrastructure causes land use changes - can have wider effects felt by non-transport users in the local area.

4.3 Despite some progress in the academic literature in the past two decades, techniques for capturing the total benefits accruing from transport investment in the case of changes in location attractiveness remain relatively untested and at the research frontier. One of the areas we propose to focus on in our strategy is to support research into this area in order to move towards a tractable approach for practical project appraisal. A significant constraint on what is possible in this space is the form of land use transport interaction models currently used within the UK context, which in most cases does not provide compatibility with the appraisal methodologies set out in the literature. We will therefore need to consider the availability and use of software tools alongside any development of our appraisal guidance.

4.4 There is also continued interest in the appraisal of integrated land-use / transport policies and programmes, for instance where public realm improvements are promoted alongside traditional ‘accessibility improvements’ to improve location attractiveness. As with the induced changes discussed above, the appraisal of direct interventions in this space requires a robust, consistent approach to estimating benefits which is founded on the principles of welfare maximisation underpinning the

current transport appraisal framework. To achieve this, we will need to develop tools to robustly assess the quality of the urban realm as perceived by those who live in it and link these measures to a robust valuation framework. A number of other agencies and public bodies, both across the UK and internationally, have developed their own approaches to these appraisal challenges in recent years and as the first step towards improving our guidance we would review this progress.

Appraisal methods for the future

4.5 With the pace of technology and rapid change in travel behaviour, there is likely to be increasing challenge to the basic analytical building blocks of our approach to appraisal such as four-stage transport modelling and the rule-of-a-half. There are possibilities of using more innovative approaches to yield better results, such as agent based modelling, a wider range of accessibility indices and measures of user benefits robust to land use change (e.g. incorporating location attractiveness effects). We propose that, as a priority for our strategy, we will continue to scrutinise the fundamentals of our approach and explore where changes to guidance, or at least greater flexibility in approach, may be warranted.

Public health and wellbeing

4.6 The external costs of transport continue to come under heavy scrutiny from the media, lobby groups, industry and Government. Despite major transformations in the way people travel in certain urban areas, such as London, private car travel remains dominant across the country as a whole and so these external costs remain a critical component of a robust transport appraisal framework.

4.7 Following recent updates to the HMT Green Book, the DfT is collaborating with other Government departments to undertake research into updating our value of a life year used to appraise impacts on the quality and length of life. This is a landmark opportunity to improve upon the current evidence base, which stretches back to the mid-1990s, on valuing road accident fatalities and injuries. Such an update will also likely have implications for the appraisal of noise and air quality impacts, as these forms of pollution have impacts on human health. We plan to actively support this long-term research programme over the next few years, undertaking additional primary valuation research if necessary.

4.8 There is also increasing interest in the effect transport can have on our ability to enjoy the natural environment. So far, our guidance has not contained monetised valuations of landscape impacts. We will shortly be reporting on the findings of a recent project to incorporate ecosystem service based valuations of landscape impacts into WebTAG, in line with best practice guidance now recommended by the Department for Environment, Food & Rural Affairs (DEFRA) as part of the HMT Green Book. Despite this, there will likely remain unanswered questions which require further research, such as robustly quantifying the benefits of mitigation measures and understanding the role transport can have in terms of affecting user access to the natural environment. Therefore, depending on the outcomes of the ongoing research we could consider further work in this area.

4.9 Interventions in the transport sector are critical for meeting the Government's ambitions for improving air quality in our cities. Recent scientific evidence, presented to DEFRA by the independent Committee for the Medical Effects of Air Pollution (COMEAP), has shown that the human health impacts of exposure to road traffic

pollutants are significant and more severe than previously assumed. Moreover, these impacts are strongly sensitive to local conditions around transport links, as the exposure of individuals to high pollutant concentrations drives the health impacts, rather than the total quantity of emissions. We propose to develop proportionate tools to allow promoters to more robustly capture these highly localised air quality impacts.

4.10 The Government also has strong ambitions to increase cycling uptake. Significant innovations have been made in this sector and in academia in the past 2-3 years to develop the evidence base, such as understanding the behavioural drivers of cycling uptake and building large scale cycling models based on real-world data (e.g. TfGM and TfL cycling models). We wish to review and consolidate industry best practice, before considering how to target further research into developing robust approaches for forecasting active modes. Ultimately, we aim to bring revised approaches forward into guidance.

Valuing journey improvements

4.11 The quality of the journey experience continues to be a key policy focus for the Government, as outlined in the DfT's Single Departmental Plan[11]. The term 'journey experiences' covers a variety of journey quality and ambience aspects such as journey time, ride quality, productive use of time, reliability, congestion, public transport crowding, service frequency and safety. Most of these aspects have long been a core part of our appraisal framework and during the course of the UVITI programme we made substantial improvements to guidance in this area. In particular, we made significant progress on updating our values of travel time savings (VTTS) and reliability, used to value the benefits of quicker and more reliable journeys. Moving forward, there is the question of how we should ensure our VTTS remain robust. One option we are exploring is whether to commit to a rolling programme of updates.

4.12 Recognising the continued importance of the VTTS for appraising transport scheme benefits we propose to undertake, as a priority in our strategy, work to embed a robust, long-term framework for updating our values of travel time savings in line with the latest available evidence. In this we will include the consideration of the impact of new technology such as Autonomous Vehicles and Mobility as a Service. This will be an ambitious, forward thinking strategy covering (but not necessarily limited to) survey techniques, possible use of big data, choice modelling, meta-analysis, stated and revealed preference valuation and considerations of statistical robustness and uncertainty around the VTTS.

4.13 One key area of emerging research is on VTTS in congested conditions. The Department recently undertook research to understand how congested values of time could feasibly be included in modelling and appraisal. Going forward the Department aims to further strengthen the evidence base for valuing congested values of travel time savings and to further understand how these could be implemented in our suite of modelling and appraisal tools.

4.14 There is also increasing interest in monetising further aspects of the customer experience, which hitherto have been assessed qualitatively. These include availability of information, ride quality and journey ambience. We will work with our

[11] https://www.gov.uk/government/publications/department-for-transport-single-departmental-plan/department-for-transport-single-departmental-plan-may-2018

stakeholders, including Highways England and Network Rail, to develop robust approaches for better capturing these impacts in appraisal.

4.15 In the recent value of time savings research we made significant improvements to the evidence base underpinning our estimate of the reliability ratio, which measures the weight travellers place on journey time reliability compared to total journey time. However, there remain some key gaps in our understanding, particularly around fully capturing the value of reliability for freight travel. With the rise of 'just in time' delivery and the strong scheduling constraints faced by the sector, freight reliability is an increasingly important consideration for policy appraisal. One option would be to undertake a feasibility study to better understand the evidence gaps in our approach to reliability and what different methods are out there, which will then lead into research aimed at improving our guidance. Relatedly, there is an increasing policy focus on questions of network resilience, but we do not have established approaches in guidance for appraising this. Again, we could undertake a review to better understand what improved approaches to resilience may be possible in our appraisal and modelling framework.

Person-centred business cases

4.16 We are also examining ways of using existing evidence and analysis to provide a richer picture of the impact transport schemes have on users and place. This could involve drawing upon existing evidence on social and distributional impacts to ensure that economic cases are user focused or considering other analysis which demonstrates impact at the level of transport user.

Consultation questions

- What should be our priorities for improving the appraisal of people and place and why? Please select up to three areas.

5. Reflecting uncertainty over the future of travel

Background

5.1 One of the key challenges in assessing the value for money of major transport investment projects is dealing with the significant uncertainty over the future of travel. Changes in people's travel behaviour, influenced by changes in transport and wider digital technology, mean that the future of travel is arguably more difficult to predict than ever before.

5.2 Current technologies like mobile phones, social media and high speed internet have changed how people interact with the world and have the potential to fundamentally change how people travel. Future technologies have the potential to impact travel behaviour further in ways we may not fully understand for decades to come.

Sources of uncertainty in modelling and appraisal

5.3 A number of potential changes to transport technology are on the horizon which may change how people choose to travel and in turn have implications for our appraisal and modelling tools. The shift to ultra-low emission vehicles (ULEVs) is already underway and, in the timeframe over which we appraise schemes and policies, there is the potential for the advent of Connected and Autonomous Vehicles (CAVs) to transform the way in which we travel. The ownership of these vehicles could be radically different from current vehicles if consumers opt to use them as a service rather than owning them directly.

5.4 While there has been considerable progress in the understanding of ULEVs as uptake has increased, there is still significant uncertainty around the non-fuel operating costs. These include depreciation and maintenance (e.g. replacing the battery) and the behavioural response to these vehicles given issues around range anxiety. There is also significant uncertainty around the levels of consumer acceptance of CAVs and the potential rates of uptake. Alternative ownership models may change people's willingness to rideshare as well as having impacts on road capacity. People may value their in-vehicle time differently if they no longer have to drive. This has important implications both for forecasting future travel demand and for assessing benefits of transport interventions. In an autonomous world we could also see "empty riding", where autonomous vehicles drive without any passengers, HGV platooning and increases in mobility among low-mobility groups such as older people which will have a resultant impact on road capacity and infrastructure requirements.

5.5 Future uncertainty around travel is not just confined to technology. The economy is constantly evolving, requiring people to live and work in different places and travel in different ways. There is also uncertainty over how many people we are building our

transport infrastructure for. Population projections, produced by the Office for National Statistics (ONS), depend on assumptions around net levels of migration, fertility rates and life expectancy; all of which are, to some degree, uncertain.

5.6 Different methods for estimating benefits will have different levels of uncertainty associated with them. Some methods for identifying outcomes, impacts and estimating their monetary values are more widely accepted than others, because they are well researched, tried and tested, and more robust. As a result, the Department distinguishes between three 'types' of monetised impacts: established, evolving and indicative monetised impacts in its Value for Money Framework.

5.7 One of the key sources of uncertainty is how travel preferences and behaviour may change over time. Over the past 15 years people have been making fewer trips on average and we are yet to fully understand what is causing this trend. This provides a significant challenge to forecasting trip rates in future. We have also seen a decline in the rate at which young people, especially young men, obtain driving licences. Understanding the likelihood of this trend continuing, and many others, has important implications for travel demand.

5.8 DfT has published research[12] that examines recent trends in young people's travel and has commissioned analysis on the impacts of ageing on travel demand. We will work with stakeholders to consider other research that may be needed to understand how travel behaviour may vary across segments of the population and the implications that has for our modelling tools and forecasts. We will also seek to understand how changes in commuting and leisure travel patterns could impact on our travel forecasts.

5.9 Our transport investment schemes deliver benefits decades into the future. The better we understand what that future holds in store, the more able we will be to make value for money assessments which are resilient in an ever changing world. While we will work to improve our understanding of the potential factors that could impact on future travel patterns and narrow that uncertainty wherever possible, we recognise that it will never be possible to fully predict what the future holds.

5.10 It is therefore important that we invest in techniques which allow us to deal with the uncertainty that is inevitable. These techniques should enable us to deliver analysis which presents a broad but robust picture of the future to decision makers.

Dealing with uncertainty in modelling and appraisal

5.11 Future uncertainty permeates our modelling and appraisal in a number of ways.

5.12 Our modelling takes a number of national level forecasts like GDP, population and fuel costs as inputs for forecasting travel demand. Uncertainty in these underlying inputs feed through to uncertainty in our forecasts. We could investigate the uncertainty in these forecasts to understand the amount of uncertainty that is imported from third party forecasts. One option could be to publish confidence intervals around forecasts that scheme promoters could use in sensitivity, scenario and Monte Carlo analysis.

5.13 There is also uncertainty in inputs and parameters used in models. We will continue to ensure these parameters are kept up to date and relevant including through undertaking a review of the recommended parameters in the modelling guidance, as

[12] https://www.gov.uk/government/publications/young-peoples-travel-whats-changed-and-why

described in Chapter 8. As part of this work, we could also consider the feasibility of providing ranges for demand model parameters in our guidance.

5.14 It is important that we have the appropriate tools to analyse and demonstrate the uncertainty around any new policy or investment to inform decision-making. To effectively support decision making, this information needs to be delivered in a clear and understandable way.

5.15 A number of methods are currently used to account for uncertainty in the modelling and appraisal of transport schemes. These include:

- sensitivity testing: varying one variable that is deemed important for the appraisal by a certain amount. This is a relatively simple approach which explores the relationship between key individual variables and our value for money indicators.
- switching values: instead of varying an input by a specified amount, the use of switching values shows how much that input would have to change in order for the value for money category of a scheme to change. This can be a useful tool for giving decision maker tangible information on which to make a decision.
- Monte Carlo analysis: a more sophisticated way of dealing with uncertainty which requires detailed information on the distribution of key variables and how they interact. Monte Carlo analysis can be used to derive the probability of a benefit cost ratio being above or below a certain value but it is important that users of this method communicate the underlying assumptions being made to avoid a false sense of certainty among decision makers.
- scenario testing: scenarios describe a plausible future with a coherent set of alternative inputs and assumptions. This helps decision makers understand how a scheme would perform in a variety of futures.

5.16 All of these approaches have different merits in their approach to uncertainty and different methods and tools will be appropriate for each situation. A key priority for our strategy is to explore the appetite for an 'uncertainty toolkit' as part of our guidance to provide support to practitioners in selecting the most appropriate and proportionate tool(s) given the scale of project and inherent uncertainty.

5.17 As part of this uncertainty toolkit, we could publish confidence intervals around key variables including GDP and population for use in sensitivity, scenario and Monte Carlo analysis. We could also include case studies illustrating how uncertainty has been presented for different schemes.

5.18 Another priority for our strategy is provide advice on scenario analysis within our forecasting guidance. This will allow users to test distinct aspects of national uncertainty on local scheme proposals, above and beyond standard high and low forecast ranges. This will enable a better understanding of resilience of decisions to different possible futures.

5.19 Uncertainty analysis can provide a rich picture of the potential futures in which transport infrastructure is to be built. There are different ways in which this information can be presented and communicated. Another option we could pursue is to review techniques for presenting uncertainty to ensure business cases present evidence to support resilient decision making. We could also provide case studies to demonstrate how uncertainty analysis has been meaningfully implemented.

Wider issues

5.20 WebTAG guidance for the technical project manager has recently been revised to recommend that the final reports of modelling should be stored as part of an appraisal handover pack to ensure that modelling assumptions and associated analysis of uncertainty can be understood in subsequent benefits management and evaluation work. We are adopting this practice to increase the value of the analysis conducted to support decision making so that it can also improve our understanding of the outturn for a scheme and provide a check on the assumptions used in appraisal and modelling.

5.21 Optimism bias remains a phenomenon that can be seen in project management – there is clear evidence that cost estimates systematically fall short of outturn costs. Therefore, to provide robust estimates of scheme value for money, optimism bias adjustments remain a vital part of our guidance.

5.22 We are currently undertaking research to update optimism bias rates in guidance. As part of this, we will be reviewing the approach to reference class forecasting, to determine the best form of disaggregating optimism bias rates (e.g. project characteristics, size, type, business case stage) and whether and how we can apply optimism bias adjustments to other variables besides capital costs (such as schedule delay, operating costs and benefits). There is also a cross-Government move to better data sharing on cost overruns, which will enable us to more robustly monitor trends once this research is complete. As part of our new analytical strategy, we propose to regularly review this data to test the quality of our optimism bias assumptions in guidance.

Consultation questions

- What should our priorities be for improving our understanding and treatment of uncertainty in modelling and appraisal and why? Please select up to three.
- What do you see as the main challenges to adopting a more sophisticated approach to uncertainty in Business Cases and what suggestions do you have for overcoming these?

6. Modelling and appraising transformational investments and housing

Background

6.1 Transport investments may have transformational impacts if they result in significant changes to the spatial distribution and structure of a local economy.

6.2 The Department is currently involved in the assessment and/or delivery of a number of potentially transformational schemes and programmes whose strategic objectives extend into structural economic improvements such as job creation and fundamentally relocating businesses and housing. For example, East-West Rail, Oxford to Cambridge Express Way, Northern Powerhouse Rail, Crossrail 2 and the Trans-Pennine Tunnel. This reflects key Transport Investment Strategy (TIS) priorities of improving productivity, rebalancing growth across the UK and supporting the creation of new housing.

6.3 Recently updated wider economic impacts guidance has taken big steps forward in enabling many of these impacts to be captured in appraisals. In particular, the emphasis placed on defining the context in which an investment occurs; and the introduction of a series of modelling principles relating to the development and assessment of supplementary economic models that provide methods of assessing transformational impacts. The Department has commissioned research into how to include the impacts of inter-dependent packages of road schemes within appraisals. The Department's Monitoring and Evaluation Programme includes work to develop approaches to measure wider economic impacts of Crossrail, High Speed Rail 2 and for roads schemes.

6.4 However, we are committed to making further progress under the theme of appraising transformational investments. For example, clearly establishing the pre-requisite factors (especially non-transport investments and policy conditions) for a scheme to have transformational impacts; the development of robust models for forecasting such impacts; a consideration of productivity benefits beyond those generated by agglomeration effects; and interactions between different forms of investments.

Definition of a transformational investment and its impact

6.5 A key challenge under the theme of transformational investment is identifying and defining a transformational scheme or programme and its impact. However, there is no consensus around when such impacts will arise or the precise speed of the process.

6.6 To improve understanding in this area, one proposal would be to develop a commonly agreed framework to help people build knowledge about how local economies work and consider the impacts of transport investment on those economies. It should include considerations for example of household and business location decisions; as well as the size of the labour market and the non-transport investments that may be required.

6.7 We further propose that a priority for our strategy should be pulling together a series of case studies, both from a UK and international perspective, which contain an historical analysis of how transformed areas developed over time and the underlying policy context. This should provide us with a clearer idea of what works (and what does not) and what other factors are required to be in place for a transport scheme to have transformational impacts. This should also give us insight into the extent to which a transport investment directly impacts on economic performance; as well as whether it just acts as a signal for private sector investment that the Government is focused on regenerating an area.

Supplementary Economic Modelling

6.8 Once a coherent narrative can be established for when a transport scheme is likely to have transformational impacts, the next challenge is forecasting and quantifying these impacts.

6.9 The development of supplementary economic modelling, such as additionality, land-use transport interaction and spatial general equilibrium modelling, has the potential to play an important role in forecasting potential transformational impacts from a transport investment. Recently updated guidance provides a series of principles for developing and assessing the results of modelling to supplement existing guidance methods and capture additional impacts. However, this is a rapidly developing field of work and we need further work to understand the models' robustness and how their outputs should best inform appraisal.

6.10 To date, the private sector has developed a range of models. As noted under the modelling theme, we think an important focus of our strategy should be to review the Department's role in encouraging the development of these models to provide robust analysis on a comparable basis across DfT's portfolio. This might include consideration of the development of models for DfT.

6.11 There remain significant issues with ensuring that supplementary economic modelling is robust, both in terms of inputs and results. The modelling suffers from a lack of evaluation evidence to inform its input assumptions. It is very difficult to obtain such evidence just from case studies and we think that it is unlikely that a set of standardised elasticities capturing the responsiveness of individual and firm location decisions to transport investments could be readily derived to inform our guidance. While we are committed to using evaluation approaches to improve our understanding of the impacts of transformational investments such as Crossrail and High Speed 2, we recognise that this will only partially address the evidence gap in this area. However, we could consider the feasibility of providing a range of estimates based on case studies and evaluation evidence. There is also a gap in the level of publicly available, local level, UK data such as inter-regional trade statistics that makes development of such models even more challenging. We may want to consider ways in which this gap could be closed.

Housing and productivity

6.12 The ability of transport schemes and programmes to transform an economy through inducing house building and boosting productivity are key objectives for both the Department and wider Government.

6.13 Existing guidance on dependent development, originally developed jointly by DfT and the Ministry of Housing, Communities & Local Government (MHCLG), provides scheme promoters with the tools they need to include the benefits of unlocked housing development in their appraisals. The WebTAG methodology for quantifying the benefits of housing growth, which includes using land value uplift estimates to monetise those benefits, is consistent with MHCLG's appraisal guide.

6.14 Estimates of land value uplift are classified as an indicative monetised impact and inform the value for money assessment of a scheme. We could consider whether there are steps we could take to improve our confidence in those estimates in the context of transport schemes and move towards including them in the adjusted benefit-cost ratio. There are a number of places where we could improve the evidence base, including understanding the extent to which developments may be dependent on other non-transport interventions and using evaluation evidence to determine the likelihood of new housing being brought forward once a scheme is in place.

6.15 The Department's guidance has provision to include the impacts of a transport scheme on land and property markets and their potential feedback effects on the transport network. This is an area we propose to look at in depth in the period of this strategy.

6.16 Current appraisal methods allow us to capture the impacts of transport increasing economic mass, both effectively and physically, enabling more individuals and firms to lie within close proximity to each other. This improves opportunities for matching, learning and sharing; and in turn enhances productivity. The empirical evidence also suggests that these effects diminish relatively rapidly with distance and this is reflected in our methods.

6.17 However, there are other forms of productivity impacts that are not captured by our existing guidance methods. Improvements in long distance travel links between areas could enhance productivity through channels such as encouraging cities and towns to specialise in one particular industry or part of the production process. DfT is currently involved in deciding on major long-distance investments such as High Speed Rail 2, the second Road Investment Strategy and Northern Powerhouse Rail that could potentially have such impacts and our strategy could address this gap in our evidence base and guidance.

6.18 Another area we could look at is the method around the move to more productive jobs currently within our guidance. In its current form it can lead to counter-intuitive results. These are the result of the application of productivity averages rather than context specific evidence. The use of survey based evidence, industry productivity averages or more detailed area wide productivity averages could be explored to develop more robust guidance.

Transport's interactions with other forms of investment

6.19 Transport schemes alone are unlikely to have transformational impacts unless part of a carefully targeted package of different policy interventions such as skills

investment, land remediation and the creation of enterprise zones. However, this creates challenges both in times of isolating the transformational impacts of transport schemes in appraisals, as well as coordinating actions by different government departments.

6.20 The Department has already commissioned research into the appraisal of different components of a package of road investments in the presence of synergies between the components. As part of this theme, we could explore whether this method can be extended to consider a package of different forms of investments by different Departments. The greatest difficulty is expected to be in quantifying these impacts and disentangling the effects of different forms of investment. For example, building a transport scheme, improved broadband and utilities infrastructure, a new school and loosening planning regulations all have the potential to influence property prices. We intend to further strengthen our relationships with and explore evidence collected by other Government departments on the economic impacts of transport investments.

6.21 Through this work, we hope to better understand the timing and sequencing of different forms of investment to establish which parts of a package of investments are critical for its success. This should be a key consideration when developing case studies as referred to under the 'definition of a transformational investment and its impact' section of this chapter.

Consultation questions

- What should our priorities be for improving the modelling and appraisal of transformational investments and housing and why? Please select up to three.
- What transformational impacts do you currently find it difficult to represent in appraisal? What are the barriers to their inclusion and how would you suggest these are overcome whilst maintaining a consistent and robust approach?

7. Supporting the application of WebTAG and making it more user friendly

Background

7.1 As our ability to capture and refine the impacts of transport investment develops, the potential requirements and complexity of transport analysis can similarly increase. While we are committed to a proportionate approach to appraisal - using the cost, risk and scale of projects to determine the amount of resources and detail required - we recognise that it can be challenging to apply this in practice. There is a balance to be struck between sophistication of analysis and a transparent, fit for purpose system that is well understood by both those conducting the analysis and those using the outputs to make decisions.

7.2 We have a large and diverse network of stakeholders including decision makers, scheme promoters and practitioners. WebTAG provides tailored levels of guidance to support the range of backgrounds and expertise. A high level overview[13] describes the role of WebTAG in the decision making process. There is also separate guidance aimed at the Senior Responsible Officer[14] and technical project manager[15], which explains how the appraisal process works and how the evidence derived from the appraisal process can be used to support the transport business case. Best practice guidance is provided for appraisal[16] and modelling[17] practitioners.

7.3 Working with stakeholders to identify options for supporting users of WebTAG and making the guidance more user friendly will be central to our strategy.

Case studies

7.4 To share and promote best practice, we intend to develop a set of case studies for schemes which demonstrate how different elements of the guidance can be applied. As a first step, we will be working with the Ministry of Housing, Communities & Local Government to develop case studies which show how housing can be taken account of in decision making. Other potential studies include transformational investments, different uses of the National Trip End Model and those that demonstrate the use of innovative approaches.

7.5 Evaluation can be used to provide feedback on appraisal and modelling assumptions by examining any divergences between forecasts and outturn benefits. There is particular scope for learning where portfolios of schemes follow consistent evaluation

[13] https://www.gov.uk/government/publications/webtag-tag-overview
[14] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/670296/tag-sro-guidance-for-the-senior-responsible-officer-dec2017.pdf
[15] https://www.gov.uk/guidance/transport-analysis-guidance-webtag#guidance-for-the-technical-project-manager-tpm
[16] https://www.gov.uk/guidance/transport-analysis-guidance-webtag#guidance-for-the-appraisal-practitioner
[17] https://www.gov.uk/guidance/transport-analysis-guidance-webtag#guidance-for-the-modelling-practitioner

approaches, as is the case for Highways England's Post Opening Project Evaluation (POPE) series, for example.

Building capability

7.6 We are aware of difficulties with analytical resourcing in the industry which make it even more important that practitioners are supported and their capability developed. In recent years we have held a number of workshops and engagement events and we would like to explore what else our stakeholders might find helpful, including WebTAG training courses.

7.7 We are also considering options to make our guidance more accessible. This may include 'at a glance' leaflets explaining key elements, for example, our guidance on wider economic impacts. It could also include more detailed 'how to' guides explaining the types of analysis and considerations needed for different types of scheme. We would welcome views on what supporting materials users would find most helpful.

7.8 When engaging with our stakeholders, it is apparent that there are misunderstandings or misinterpretations of some aspects of WebTAG that may obstruct the proportionate application of guidance. We intend to produce a high-level brochure that clarifies the role of appraisal, the status of WebTAG as best practice guidance and the holistic nature of the appraisal framework and how impacts are considered together. The brochure will also reassert the objectives of the analytical process, namely to provide the most suitable evidence base to inform important investment decisions.

Review of guidance

7.9 We would like to work with stakeholders to better understand the issues and challenges faced when using and understanding the guidance.

7.10 As part of this, we think a key focus of our strategy should be a review of the existing guidance, gathering opinions and suggestions from a broad range of stakeholders and practitioners regarding its application, both in terms of what works well and what works less well. This is with a view to clarifying the flexibilities within the guidance and encouraging interpretation in a proportionate way.

7.11 The review could also explore the scope for using more simple or alternative approaches and how the user can evidence that the approach taken provides a sound basis for analysis.

7.12 We also intend to explore ways of seeking more routine feedback on the application of the guidance and platforms for sharing experiences.

Consultation questions

- What are the main barriers and challenges to applying WebTAG? How do you think these could be overcome?
- What more could be done to articulate the flexibilities in WebTAG and support scheme promoters apply the guidance?

- How can we improve the way in which WebTAG is presented? Why? We are particularly interested to hear about how we can improve accessibility and clarity of the guidance.

8. Developing and maintaining modelling and appraisal tools to meet user needs

Background

8.1 Transport models and analytical tools provide critical insight into the performance of the transport network. Models are important tools that are used to assess how proposed interventions may impact on transport users, the wider economy, the environment and on society. They provide not only an indication of whether proposals offer value for money, but a crucial indication of the holistic range of impacts reported in a transport appraisal, so that decision-makers have a rounded understanding of how interventions may perform across a range of indicators.

8.2 Most of the themes in this strategy include recommendations on how to enhance our modelling methods and guidance in the areas of uncertainty. This theme expands on some of the steps we could take to improve modelling and appraisal tools to better meet user needs by enhancing the current toolkit.

8.3 As discussed previously, the presence of WebTAG does not preclude modelling approaches that are different from more conventional approaches and standards within the guidance. The Department acknowledges the challenges and complexities of preparing transport analysis for business cases and we intend to make it clearer how to provide evidence and analytical assurance around the chosen approach, including expanding on what 'proportionality' means when preparing models and how the guidance may be used flexibly to produce suitable analysis.

8.4 Finally this theme describes the development of the Department's own analytical tools used in testing national policies and provision of key products such as the National Road Traffic Forecasts. This includes how we are looking to enhance the capabilities of these models in order to better forecast in the face of expanding uncertainty over the future of travel, accommodating methods that may also reflect policies aimed at providing for future technology. This work will also reflect on wider modelling practices. By working with analysts across the Department and engaging with the academic, practitioner and research community, we shall explore how modelling approaches not currently established within the National Transport Model (NTM) framework may be used to pick up some of the intricacies of behavioural change to enhance our forecasting capability.

Providing guidance and tools to better reflect uncertainty over the future of travel

8.5 A key benefit to developing a transport model is that it is a bespoke tool that may be used to analyse the performance of proposals under a range of different assumptions. They are tools that essentially give us a better insight into the most

resilient solutions under different future scenarios and hence are in themselves crucial in testing the effects of uncertainty, rather than tools that specifically aim to reduce it to provide the most likely outcome.

8.6 Taking together the themes of uncertainty and improving the user experience of the guidance, we intend to provide updated guidance and tools to allow and encourage users to provide transport analysis that embraces uncertainty in business cases to arrive at more sound proposals and ultimately decisions on the most appropriate interventions.

8.7 We propose that a priority for this strategy should be to provide advice on scenario analysis within our forecasting guidance. This will allow users to test distinct aspects of national uncertainty on local scheme proposals, above and beyond standard high and low forecast ranges. This will facilitate testing of the robustness of proposals to more specific and meaningful aspects of different futures.

8.8 This will also include developing the functionality of the Department's tool that presents the output from the National Trip End Model, the TEMPRO software. We aim to develop the software in order to facilitate analysis of national scenarios in the local context, including the provision of different scenarios of traffic output from the National Transport Model.

8.9 Given the scale of uncertainty around recent trends in travel behaviour, demand forecasting is a challenging area. As part of our programme of continuous improvement to evidence and methods, we could continue to review the forecasting approach in the National Trip End Model suite, including the influences on car ownership and the changing behaviours of different demographic groups. This would build on our research into trip rate forecasting[18]. We could also review the use and interpretation of the model's forecasts and look to improve the ability for practitioners to generate more bespoke local forecasts.

Exploring wider techniques

8.10 This consultation provides a great opportunity to take stock of the challenges ahead of us and to review the appropriateness of current modelling practice to meet these challenges.

8.11 As described in the theme on modelling and appraising transformational investments and housing, understanding the impact of transport on the economy is more important than it has ever been. We propose that a focus for our strategy should be to examine the approaches to land use and economic modelling and consider the potential for providing more robust advice as these approaches develop and evolve, as well as considering the benefits of such approaches at the national policy level.

8.12 Given the increasing wealth of research and improvements in data sources and computing power, we propose to take the opportunity to examine the capability and potential of other innovative modelling approaches that thus far have not formed the convention in UK modelling applications. For instance, activity-based models have the potential to provide a detailed representation of individual travel behaviours and decisions that may be more effective in assessing certain aspects of this behaviour compared to conventional demand models.

8.13 We propose that we do this by engaging with the academic and research community via a series of workshops. These will start by taking a broader view on the strategic

[18] https://www.gov.uk/government/publications/trip-rates-research-for-a-range-of-journey-types

forecasting challenges and then exploring the detail potentially required, where conventional approaches may be used or may fall short and where other methods that may be used to address these challenges. As discussed, this is primarily with a view to enhancing our national modelling capability.

8.14 On the scheme modelling side, we believe that it will also be useful to examine more simple alternative approaches that may be used at earlier stages in option generation and appraisals, such as system dynamics approaches and more logic-based sifting toolkits.

Development of guidance on new and emerging techniques

8.15 Transport modelling is a continuously developing discipline, in light of increased availability of emerging data sources, new forecasting challenges to face (such as emerging technology considerations) and new research and methods aimed at addressing them. Transport models should be robust analytical tools that can most effectively support decisions on transport intervention, as well as the wider policy context beyond the transport sector.

8.16 On consulting with stakeholders across the transport modelling community, we have identified the need to provide advice on the development of base year trip matrices, which are a fundamental component of transport models that are critical to the measurement of all impacts used for appraisals.

8.17 The Department undertook two pieces of research as part of the Understanding and Valuing the Impacts of Transport Investment analytical strategy of 2013. These aimed to recommend an appropriate way forward on proposing best practice methods on matrix building in guidance and exploring the use of mobile network data (MND) in transport modelling applications. As a priority for this strategy we intend to take stock of the position on best practice and develop guidance for users to assist them in creating robust matrices and making best use of MND sources, whilst also accounting for the considerable uncertainty in these sources.

8.18 We shall consult with our stakeholders on these recommendations, acknowledging that there are many potential approaches to building models and matrices, continuing to encourage innovation and proportionate approaches where appropriate to the model's purpose. We shall also engage with the wider industry on the opportunities presented by 'Big Data' sources for use in transport modelling applications, aiming to reflect best practice as it emerges to enhance existing guidance, where appropriate, in addition to guidance on matrix development.

8.19 As described in the uncertainty theme, we intend to undertake a review of the recommended parameters throughout the modelling guidance in WebTAG. This aims to refresh the evidence base that forms the basis of model calibration and validation to ensure that the advice that the Department gives is up-to-date with the latest evaluation data. As part of this work we shall also consider how this evidence has trended over time and provide up-to-date recommendations for using models in forecasting and the impact on the appraisal.

8.20 It is acknowledged that whilst continued enhancements have been made on the modelling of transport users and passengers, the modelling of freight requires a more concerted effort to improve. This includes the data sources that are available, as well as the techniques to more accurately forecast freight flows on the network. As part of this strategy we intend to review current best practice in freight modelling and

propose a way forward on evolving methods to provide more robust representation of this vital part of Britain's traffic in our analysis.

Developing the appraisal toolkit

8.21 As part of our development of WebTAG into more structured and succinct guidance in 2014, users have fed back positively on the creation of the WebTAG data book, which provides access to all of the appraisal values and indicators recommended for use in the guidance. The data book also allows users to adjust economic parameters such as the price year in order to more quickly provide the values for individual user's needs. We propose to continue to develop the data book in light of emerging research to provide the most robust and up-to-date values, as well as incorporating any new development within it.

8.22 The Department also provides several tools for use in modelling and appraisal, including the wider impacts tool WITA, the transport user benefits tool TUBA, the accidents module COBALT, the trip end presentation software TEMPRO and the variable demand model DIADEM. As part of the ongoing development of methods and evidence, we propose to incorporate new methods into these software products, such as incorporating distance-based values of time and congested values of time into TUBA where appropriate. We will also consult stakeholders on exploring the need for additional tools to facilitate the development of scheme business cases.

Strengthening links with evaluation

8.23 We have made progress to improve the alignment of appraisal and modelling with ex-post evaluation. Our guide for this topic is our 2016 study 'Strengthening the links between Appraisal and Evaluation'[19] which made the following three broad recommendations for improvement:

- Implement appraisal handover packs as a method of passing forward appraisal and modelling information to the evaluator.
- Develop portfolio approaches for evaluation, since the use of more consistent approaches across similar types of scheme will help identify areas where appraisal tools are systematically mis-forecasting outcomes.
- Align evaluation work with appraisal evidence needs by considering how evaluation can be used to inform appraisal and consulting appraisal leads to identify, at a strategic level, areas where evaluations can be used to address knowledge gaps going forward.

8.24 In 2017, we revised WebTAG's guidance for the technical project manager to advocate the use of appraisal handover packs to ensure that modelling assumptions can be understood in subsequent benefits management and evaluation work. One option would be to develop an evaluation unit for WebTAG to provide fuller guidance on how to develop proportionate approaches to provide learning about the outturns of schemes.

8.25 We propose to continue to look for opportunities to embed these approaches in our work, including development of additional guidance and identifying demonstration

[19] https://www.gov.uk/government/publications/strengthening-the-links-between-appraisal-and-evaluation

projects to trial new approaches. We would welcome stakeholder feedback on these plans and any suggestions for how they might be expedited or improved.

Improving the accessibility of guidance

8.26 The transport system is complex. The Department recognises that the task of producing transport models that adequately reflect this complexity of interaction between transport supply and user demand to considerable detail can be technically challenging and resource intensive.

8.27 The intent of the guidance is to provide recommendations to users undertaking transport model development in order to produce proportionate analysis that is fit for the purpose of examining these often complex interactions, providing a sound platform on which to analyse potential options and the wealth of economic, environmental and social outputs from them.

8.28 As described in the theme on supporting the application of WebTAG and making it more user friendly, we propose a priority for our strategy should be to undertake a review of the existing modelling guidance, gathering opinions and suggestions from a broad range of stakeholders and practitioners regarding its application. This is with a view to clarifying the flexibilities within the guidance and encouraging interpretation of the guidance in a proportionate way.

8.29 It is acknowledged that specific areas of the guidance may be misperceived as compliance gateways that are in themselves the objective of the modelling exercise, whilst losing sight of the ultimate question of a model's fitness for purpose for the specific area and the specific problem. This review therefore aims to increase the transparency of the guidance in these areas, more specifically to identify the scope to take more simple or alternative approaches and how the user may evidence that the approach taken provides a sounds basis for analysis.

National model development

8.30 The current National Transport Model is a tool that the Department uses to produce its National Road Traffic Forecasts and to inform national-scale policy development. During the period of this strategy, we are developing a new model with enhanced capabilities that will be a more detailed and modern tool that will be able to assess policies and infrastructure in more detail.

8.31 A significant enhancement in the new model will be the inclusion of a detailed national traffic assignment model. This will include the entire strategic road network and a significant level of detail on the non-trunk network, including some representation in urban areas. The highly segmented demand model will also be based on geographically detailed zoning. These features will allow a finer, geographically-specific analysis of the impact of investment, chiefly on the national road network.

8.32 With the opportunities presented from moving to a more modern software platform, we could also assess how we may employ more innovative modelling techniques within the framework to tackle some of the more difficult forthcoming forecasting challenges. This would include examining how we may better forecast changes to personal travel behaviour and trip rates. It would also include how the emergence of significant new technologies might be proportionately assessed within the model, or through the use of new bespoke tools. On the freight side, we have identified the

need for more informed techniques to forecast light goods vehicles and propose to review the role of the Great Britain Freight Model.

8.33 The Department also develops, maintains and operates a comprehensive aviation model. Following the recent publication of aviation forecasts in October 2017[20] and the use of these forecasts in support of the recent Airports National Policy Statement, we are starting the process to update and further develop the aviation model. We intend to undertake a number of significant model updates over the next two to three years in advance of the next set of UK aviation forecasts. We will also keep a watch on wider modelling activities to see what tools or techniques can be incorporated so we can potentially draw on other work to enhance the aviation model's freight modelling capability.

8.34 On rail forecasting we have recently updated our guidance[21] to take account of the latest available evidence including the Department's interpretation of the Rail Demand Forecasting Estimation (RDFE) and the Passenger Demand Forecasting Handbook (PDFH) version 6.0. The Department is going to continue to improve its evidence base to back further improvements by commissioning further research and co-operating with colleagues on the Passenger Demand Forecasting Council (PDFC) to enable us to keep our guidance in line with the latest available evidence.

Consultation questions

- What should our priorities be for improving the development of modelling and appraisal tools and why? Please select up to three.
- How can we best encourage innovation whilst maintaining a consistent and robust approach?
- What new and emerging techniques and methods should we potentially explore and what specific problems might they solve?

[20] https://www.gov.uk/government/publications/uk-aviation-forecasts-2017
[21] https://www.gov.uk/government/publications/webtag-tag-unit-m4-forecasting-and-uncertainty-july-2017

9. Stakeholder engagement

Active engagement

9.1 We look forward to listening to, and working with, stakeholders and experts both as we develop a more detailed programme of work for our Appraisal and Modelling Strategy and throughout its delivery. To support this, we will open our next phase of engagement with an event to which we will invite stakeholders and experts to begin to shape this strategy. While we will be proactive in involving a wide range of stakeholders, we welcome expressions of interest from all parties.

9.2 We are also planning to hold a series of regional events to encourage views and responses from a wide range of stakeholders. Looking further ahead, we plan to explore options to make it easier for stakeholders to provide routine feedback and maintain engagement throughout the delivery of the Appraisal and Modelling Strategy.

9.3 We will continue to work closely with the Joint Analysis Development Panel as we develop the strategy. Panel members will be leading workshops on some of the key themes and priorities to ensure we listen to a broad spectrum of views.

Delivering our ambitions

9.4 We cannot deliver the ambitions in this document alone. The development of a new strategy provides the perfect opportunity to review our delivery approach, in particular how we cultivate the UK's transport research expertise.

9.5 Over the last year, we have spoken with academics about sharing topics of interest to DfT that could potentially be taken forward by MSc or PhD students. We also recognise the importance of developing and sharing a more detailed forward look of our research priorities to enable research institutions to prepare.

9.6 We will also explore options to better publicise the outputs of our research programme, including through attendance and presentations at conferences and potentially hosting appraisal and modelling research conferences to share findings and provide opportunities for academics to showcase their research.

9.7 Finally, we will seek to identify opportunities for undertaking joint research in wider collaboration with partners.

Next steps

9.8 Following the end of the consultation period, the Department will consider the feedback and review priorities for developing the evidence base. A summary of responses will be published alongside our new Appraisal and Modelling Strategy early next year.

Annex A: Full list of consultation questions

Priorities

1 Do you agree that these themes reflect the most pressing priorities for development of our Appraisal and Modelling guidance? If not, what other themes do you think we should be exploring?

2 What considerations should inform the scope and priorities of our strategy, particularly over the first 18-24 months?

People and Place: capturing the range of impacts relevant to transport policy today

3 What should be our priorities for improving the appraisal of people and place and why? Please select up to three areas.

Reflecting uncertainty over the future of travel

4 What should our priorities be for improving our understanding and treatment of uncertainty in modelling and appraisal and why? Please select up to three.

5 What do you see as the main challenges to adopting a more sophisticated approach to uncertainty in Business Cases and what suggestions do you have for overcoming these??

Modelling and appraising transformational investments and housing

6 What should our priorities be for improving the modelling and appraisal of transformational investments and housing and why? Please select up to three.

7 What transformational impacts do you currently find it difficult to represent in a scheme appraisal? What are the barriers to their inclusion and how would you suggest these are overcome whilst maintaining a consistent and robust approach?

Supporting the application of WebTAG and making it more user friendly

8 What are the main barriers and challenges to applying WebTAG? How do you think these could be overcome?

9 What more could be done to articulate the flexibilities in WebTAG and support scheme promoters apply the guidance?

10 How can we improve the way in which WebTAG is presented? Why? We are particularly interested to hear about how we can improve accessibility and clarity of the guidance.

Developing modelling and appraisal tools that meet user needs

11 What should our priorities be for improving the development of modelling and appraisal tools and why? Please select up to three.

12 How can we best encourage innovation whilst maintaining a consistent and robust approach?

13 What new and emerging techniques and methods should we potentially explore and what specific problems might they solve?

Annex B: Consultation principles

The consultation is being conducted in line with the Government's key consultation principles. Further information is available at https://www.gov.uk/government/publications/consultation-principles-guidance

If you have any comments about the consultation process please contact:

Consultation Co-ordinator
Department for Transport
Zone 1/29 Great Minster House
London SW1P 4DR
Email consultation@dft.gsi.gov.uk